

# Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

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## That Same Old Stitch in Time Still Saves the Nine

WHAT appears to us to be the correct attitude on the part of a railway management toward the recommendations of the engineering department is illustrated by this incident. A company was recently complimented by the chairman of the state commission, who credited it with the best conditioned track of any company in that state. The engineer responsible for this condition disclaimed all credit. He says the entire credit belongs to the management, which is far sighted enough to allow him all the maintenance tools and equipment which he needs.

It isn't a question of method, always, but a habit of eternal vigilance and keeping at the job, coupled with the possession of sufficient materials and tools to work effectively.

## Steam Railroad Men to Discuss Electrification Past and Future

THE annual meeting of the mechanical section of the American Railroad Association, formerly the Master Mechanics' and Master Car Builders' Associations, will be held at Atlantic City next week. The subject of electrification will come in for a share of attention, an excellent symposium contributed by operating men being a feature of the program. In this issue of the ELECTRIC RAILWAY JOURNAL, which will be distributed at the convention, several articles are published which are of a nature to be helpful in connection with the discussion. At the same time they have broad application in the electric transportation field generally.

In the planning of this and the next following issue the heavy multiple-unit car has been made the focus of interest. The electric locomotive has been in the limelight a great deal lately, and deservedly so, for wonderful progress has been made with the several types of this machine. However, the bulk of the transportation of passengers on steam roads has been handled by multiple-unit cars and trailers, which are admirably adapted to supplying suburban service on steam railroads; in fact, locomotives are used in such service only where absolutely necessary in bringing steam trains into a terminal, in general through tunnels where steam locomotive smoke and gases are offensive and otherwise objectionable to the railroad's patrons and employees.

Multiple-unit cars have been in use under heavy traction conditions for so long and in such numbers that a valuable body of experience in regard to operation and maintenance has been accumulated. While practice here can hardly as yet be considered standardized, it is tending in that direction. This fact stands out as one reads, in the articles of this issue, of the way in which the Long Island and other railroads have solved their maintenance problems. Considering the carrying capacity of these units and the severe service which is required

of them multiple-unit cars are being maintained at very reasonable cost. The present group of articles, all of which are based on first-hand information, will help in the control of this cost by rendering available full information as to the what, why and how of the subject.

## It Pays to Provide Rapid, Safe and Reliable Transportation

FIFTEEN years ago the Long Island Railroad launched a comprehensive plan of electrification. To provide for the growth in traffic that was foreseen, due to its ability to reach all parts of Long Island and give transportation to a vast rural population, it was evident that rapid, safe and reliable transportation with clean, well-heated and well-lighted cars was necessary. The policy adopted was first to electrify the lines leading to its two great passenger terminals at Flatbush Avenue, Brooklyn, and the Pennsylvania station in New York, and so to provide the flexibility necessary for speed, safety and reliability. Between 1905 and 1919 the company expended approximately \$60,000,000 for electrification, new equipment, elimination of grade crossings and additional trucks, yards and stations.

What has been the result? The number of passengers handled per year has increased from 18,199,000 to 64,067,000 and the road now carries a daily average of 175,000 people. In addition to this great passenger service, the Long Island Railroad has developed a large business in distributing fuel, building material, food supplies and all classes of freight. This service has hastened the development of hundreds of factories all over the boroughs of Brooklyn and Queens and the amount of freight handled has increased from 2,745,000 tons to 5,912,000 per year.

This large increase has been realized in spite of the fact that during this period five rapid transit lines have been built into the territory served by the railroad, and in several cases parallel to it, which carry passengers to New York at a flat rate of 5 cents. It is evident, then, that the rate of fare is not the most essential factor in obtaining increase in passengers, but rather rapid transportation, with the assurance of promptness in arriving at business or home. Roads with few stops are in the best position to give this service, and by electrifying its road the Long Island Railroad has demonstrated that it can not only compete with other cheaper rates of transportation but also build up a large increase in traffic as well.

Passengers want to feel that the cars they ride in are well maintained and safe and that the employees who handle them are competent. The methods used by the Long Island Railroad in maintaining its cars are described in another part of this issue. It is evident that the thorough and systematic manner in which the electric rolling stock is cared for has contributed largely to the success of its electrification.

## Steps in Single-Phase Motor Evolution

FROM the technical standpoint one of the most fascinating pieces of electrical apparatus is the single-phase motor of the series type. While the success of high-voltage direct-current equipment has removed some of the *raison d'être* of the single-phase motor, nevertheless it is still undergoing steady improvement in design and construction. The recent motors are substantial and capable of easy maintenance and the older ones have been largely rehabilitated to reduce maintenance costs, which were undoubtedly large in the early days.

The design difficulties in the way of producing a durable single-phase motor at reasonable cost have been considerable. There is such a tangle of electric circuits and magnetic fields in an electric motor that the mere forcing of alternating current through it is a problem, to say nothing of producing torque at high power factor. The difficulties have, however, been conquered, first by rather crude and later by refined methods, so that today the series a.-c. motor is a machine which compares favorably from the operating standpoint with its direct-current rival.

It will be remembered that the early-built motors have resistance inserted between the commutator bars and the winding to limit the current in the coils short-circuited by the brushes. An ingenious system of magnetic balancing now permits the omission of this resistance, with consequent increase in capacity due to the removal of this heat-producing element. The starting properties of the motor have also been improved by the adoption of the repulsion principle for low-speed operation. In an early issue we shall publish an article telling of some of the latest and best things in the design and control of the single-phase motor as worked out for and on one of our most important railroad systems.

It would be idle to predict as to the ultimate economic fate of the single-phase motor, for it is economics that will determine its fate in the long run. Technically it is still on the map and in process of improvement.

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## Telephone and Trolley Loads Are Not Always Parallel

IN THESE days of kaleidoscopic changes in rates of fare every factor that helps to explain whether the changes in traffic had or had not anything to do with the increase in fare is entitled to consideration. Epidemics, long spells of bad weather, layoffs by large employers and the bunching of winter holidays are among the obvious causes of losses in traffic. A study of the bank clearings of a community is a well-recognized measure of general industrial fluctuations which one may reasonably expect to see paralleled in the patronage of the electric railway.

Another gage to general industrial conditions is afforded by the telephone load. Offhand one would be inclined to assume that the telephone and trolley loads would run in parallel, for each is very sensitive to the industrial and social circulation of a community. Generally speaking this is so, but before using the rule we must familiarize ourselves with the exceptions that prove it true. In the first place, the telephone is somewhat slower in reflecting a decline than is the trolley, because telephone contracts are made by the month or

year and trolley contracts are made, one might say, by the day. Hence, a workman's family might continue to use the telephone for some time after unemployment had decreased their riding. In the second place, it must be clear that weather, which is the bane of the trolley, is the boon of the telephone. When it is too muddy or icy to ride to merchant or friend, the telephone gets the benefit. In the third place, it is well to bear in mind that the influenza scourge, while cutting so deeply into car riding, resulted in a terrific strain on the telephone. In part this was due directly to the plague, because of the calls for aid and the inquiries of anxious friends, and in part it was the result of the use of the telephone for the transaction of business that would otherwise have been handled man to man.

Doubtless, other factors in addition to those noted will occur to the reader, but enough have been presented to prove the desirability of going "behind the returns" of both the telephone and the trolley loads if one is to be used to interpret the other.

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## One-Way Versus Two-Way Trailers

WHERE a street railway is equipped with double-end type motor cars the question of whether one-way or two-way center-entrance trailers should be adopted for the inauguration of trailer operation has recently been a live topic in several parts of the country. In our opinion there is not a great deal to be said in behalf of the two-way trailer, but there are many considerations favoring the one-way type. As soon as a car without motors or control equipment is attached to a motor car the train thus formed becomes inherently a one-direction unit. So long as the two cars remain coupled together it continues to be a one-way unit. With a two-sided trailer it is true that by uncoupling the motor and trailer the cars can be jockeyed about at a crossover for operation in the opposite direction, but the complications in this process involve a time delay which largely offsets the advantage. But even if this ability to turn at a crossover were an important advantage, the opinion of most of the operators of wide experience in the operation of one-way equipment is that the need to switch back at a crossover, or, as an alternative, to back one-way units long distances to a wying point, is of such rare occurrence as to be worthy of little consideration.

To make use of two-way trailers for what slight advantage there may be a company must make the sacrifice of adding nearly \$1,000 to the initial cost of the trailer, plus the continuing expense of hauling around from 1,500 to 2,000 lb. additional weight, and of maintaining two sets of doors and door engines and control valves instead of one.

It goes almost without saying that because of the mono-direction characteristic of the motor-trailer train it is essential to have either a loop or wye at the terminus of every line. Hence it may be assumed that the building of loops or wyes is an essential part of the preparation for trailer operation whether the type of trailer adopted is one-way or two-way. This leads to the thought that the cost of constructing loops and wyes could be eliminated and the full advantages of the two-way single-car units retained by doing what has been done at Milwaukee to a limited extent—move the rear controller from the motor car to the rear end of the trailer. With this done, we can see a real advantage

in the double-sided trailer, as this plan would add only the additional weight to the train of the power cables on the trailer, with the added cost of only the small amount involved in the cables and labor of running them under the car. With the trailer thus equipped, it could be successfully contended that greater flexibility of operation was secured. But without the controller we do not believe that the two-way trailer improves the flexibility of operation enough to be a controlling factor in the problem.

### Higher Fares and Simpler Financial Structure Proposed for Philadelphia

THE two outstanding events of the last few days in Philadelphia are the report of the Mayor's committee and the publication by the Philadelphia Rapid Transit Company of its intention to apply to the Public Service Commission for higher fares.

The plea of the company for higher fares contains a strong argument for making the extra charge one for transfers. The 5-cent initial fare, it believes, should be retained first to attract and then to retain the profitable short ride business. Many of the free transfer passengers ride only because they can do so without charge, and the company points out that with the transfer charge the car capacity, thus in part wasted, could be used by passengers who must depend on the cars for their necessary rides. Discontinuance of all transfers in the delivery district would still further conserve the car capacity there for terminal purposes, and with the \$3,000,000 additional earnings thus obtainable it is hoped to provide sufficient funds to meet such improvement costs as are chargeable to earnings under the commission rulings and also to take care of the company's increased operating expenses.

The report of the Mayor's committee indorses the need for increased facilities, and for a permanent remedy recommends the now standard formula of a valuation of the property by the State Public Service Commission, rates sufficient to pay a fair return on this valuation and the necessary expansion of the system through the credit thereby established. The report calls attention, however, in the corporate organization of the present company to the large number of underlying companies whose individual interests do not always lie along identical lines with that of the public or that of the operating company. It is obviously much simpler for the public to deal with an organization which owns all or the greater part of the system which it operates than with one having leasehold only of much of its operating property.

The remedy for this condition recommended in the report is a radical one, but is justified, according to the committee, on the ground of the public nature of the service rendered. It is no less than the exercise by the State of the right of revision of the contracts made with the underlying companies under the principle of eminent domain if the results sought are not reached by mutual agreement between the companies involved. In that case the roads would not be taken over for operation by the city, but merely to bring about the "one big company" idea, which is properly considered to be more conducive to good transportation than a number of separated undertakings.

This is recommended as a permanent remedy. Pending the completion of the valuation of the property by the State, the committee recommends an increased fare

provided the company discontinues its dividends and puts the surplus after paying fixed charges and rentals into a rental of the city's Frankford Elevated Railway at a sum at least equal to interest on the city's investment and then to other improvements and extensions of the service.

We sincerely hope that the proposed charge for transfers will add sufficiently to the company's receipts, so as to encourage other companies to proportion their fares at least in some degree to the service rendered. The principle of a simple corporate structure for a transportation company is also worth a serious effort. Altogether, Philadelphia promises to be the scene of much electric railway interest during the next year.

### The Place of the Multiple-Unit Car in Heavy Transportation

WHEN Frank J. Sprague invented his plan for controlling the motors on several cars of a train from one point, applying the principle first on a large scale in the electrification of a steam road, the South Side Elevated Railway in Chicago, he paved the way for an important element in steam railroad electrification. Such electrification comprises two varieties, the handling of heavy freight and passenger trains on trunk lines and the caring for suburban traffic, usually of very large volume. The electric locomotive and the passenger motor car equipped with multiple-unit control are respectively fitted for these services. On several large railways both kinds of equipment are in use, on others only the latter.

The multiple-unit car as used on electrified steam roads is essentially the same as that which operates on subway and elevated railways in several large cities, and on many interurban lines. In fact no hard and fast line can be drawn between these classes of service. Thus in electrifying a terminal for suburban service a railroad management is undertaking nothing new or experimental as far as rolling stock and contact system are concerned.

The multiple-unit car is an ideal transportation unit for this purpose. It is reversible, hence facilitates terminal switching, the ruling consideration in the case of the Broad Street station terminal in Philadelphia. It permits large motor capacity, thus providing for rapid acceleration and consequent high schedule speed even with frequent stops. It permits train length and motor capacity to be adjusted to requirements. As compared with steam equipment it furnishes cleanly transportation. Furthermore, it permits all of the space in the train to be occupied by revenue-producing load, which is a particularly important item when the trains are short; in fact, a 1-car "train" would be impracticable with steam operation.

One of the large railways operating multiple-unit equipment had a recent experience with a temporary return to steam operation when it became necessary to shut down a power plant for some essential repairs. The steam engines went back to their task as of yore, but the schedules dragged badly as compared with multiple-unit electric operation. It isn't a bad idea to go back to the old régime now and then so that the public will realize what the electric motor can do for them in the line of transportation. They will demand more of the modern type of rolling stock and, presumably, will be willing to pay reasonably for electric service.

# Multiple-Unit Car Maintenance on Electrified Steam Railroads

Notes on Inspection Procedure and Shop Practice on Two Roads Having Comparable Equipment but of A.-C. and D.-C. Types Respectively

WITH a view to securing information as to the present practice in maintaining heavy, multiple-unit equipment on electrified sections of steam railroads, the editors of this paper have within the past few months studied this practice by visits to many of the principal shops and discussions with the master mechanics. The results are given in this and succeeding articles. In this article the methods of two important roads are discussed, one of which employs 600-volt direct current with third rail, the other 11,000 volts alternating current with overhead contact. As the information relates solely to the maintenance practice, without reference to the general features of the electrified sections of these roads as wholes, no reference to the names of the roads or of the individuals entitled to credit for the practices will be given. The roads will be referred to as the direct-current and alternating-current roads, respectively.

As the multiple-unit car is the ideal transportation unit for electrification of steam railroad terminals for the handling of local passenger traffic, it is important that maintenance procedure be systematized and simplified early. The experience of these and other roads will help toward that end.

The direct-current road was electrified in 1906. The value of the maintenance methods adopted early is demonstrated by the fact that a number of their features have been retained, although the progress that has been made in general in maintenance procedure has enabled many labor and materials saving improvements to be made. This is particularly true with regard to progress in electric and gas welding and cutting, improved methods of installation, development of standardization, etc. The road has now 107 multiple-unit cars in use, all motor cars, ninety-one being of wood construction and sixteen of steel construction. The steel coaches are standard steam railroad type, as were the wooden ones when first assigned to this division.

The multiple-unit cars are provided each with a motor truck and a trailer truck, the two motors on the older

cars being of the GE—67 type, 225 hp. capacity, while the newer cars have interpole motors, type GE—212F, also of 225 hp.

On the first-mentioned road the inspection is done at the terminal carhouse, which contains three tracks, with a capacity of three cars each. All of these tracks are provided with pits. Here all but "class" or major

repairs are made, the class repairs being taken care of at the general shops. At the latter, at present, quite a little work is being done also on steam locomotives, including thermit welding of frames, etc.

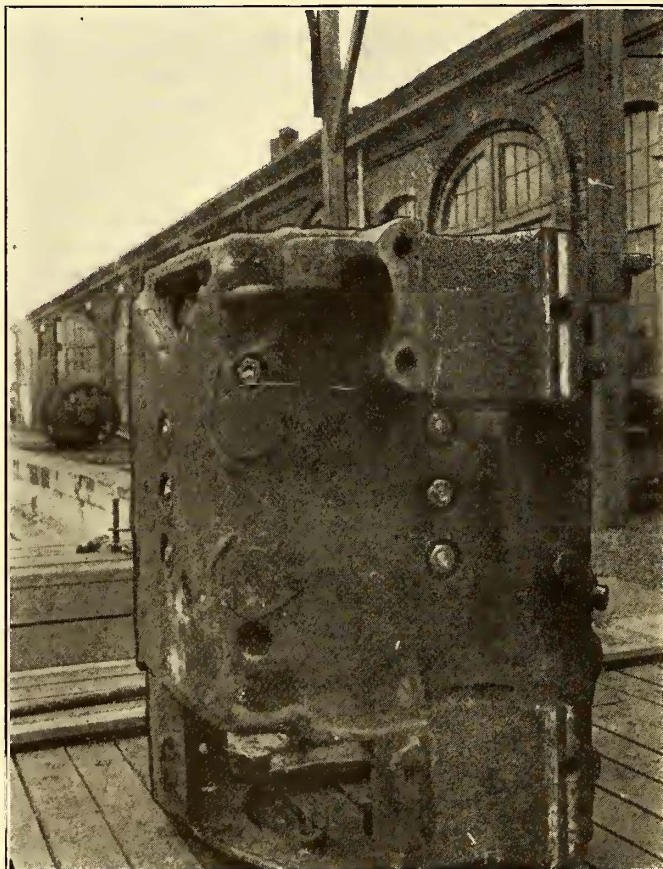
The maintenance shops are of old construction, having been in service during the entire electrification period of about fifteen years and dating back long before that era. While the buildings are old, the equipment is being constantly improved to permit the making of motor and other equipment repairs and a high degree of efficiency has been obtained.

At present the mileage of multiple-unit cars being made on this road is about 450,000 car-miles per month in winter and 650,000 or more in summer. The cars are inspected on a mileage basis, which, on account of the present excellent maintenance results, was raised to 1,500 miles per inspection on March 15 of this year. The cars receive a general overhauling about

every 100,000 miles, or, roughly, once in two years.

The 107 cars already mentioned comprise ninety coaches, four passenger and baggage cars, nine full baggage cars and four combination mail-and-baggage cars. Inspection and maintenance work on these cars at the terminal requires a day force of forty men, who work from 7 a.m. to 3.30 p.m., and a night force of nine men, who work from 3.30 p.m. to 11.30 p.m.

There are usually about two cars in the shop for light repairs in addition to those in for general inspection. With the eight-hour day now in force, it is possible to inspect eleven cars on the new 1,500-mile basis. In addition to the routine maintenance and emergency repair work there has been going on for the past year and a half a general rehabilitation process in connection



AXLE BEARING HOUSINGS BUILT UP BY ELECTRIC WELDING

(Deposited metal is carried well out at ends to provide material for fillet).

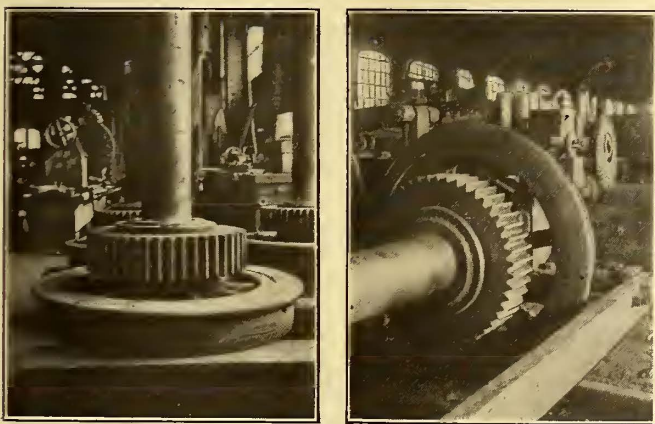
with the motors, which, after fifteen years of service, have become rather well worn out. Some features of this will be taken up later.

#### MAINTENANCE WORK IS SPECIALIZED

The maintenance work is done by a force of thirteen men and a gang foreman. This force is divided up as follows: Two men on contactors, one man on motors, one on controllers, one on poles and retrievers (used to supplement the third rail shoes at certain points) and lighting, two men on third rail shoes, three on brakes, one on armature oiling, one on journal oiling and one on axles. The work of these men is, of course, supplemented by the more casual inspection made at stations, according to the plan used by all steam railroads.

While the duties of the members of the section gang are almost self-evident, a few notes regarding their duties may be of interest: For example, the controller man is responsible also for rheostats, the circuit breakers, the main fuse box, the bus fuses and some other details. The third rail shoe man applies and gages the third rail fuses, changes and repairs the third rail fuse boxes when these are injured and looks after all fuses on the car. The motor inspector examines the brushes, sees that the brushholders are in first-class condition, tests the armature clearance to see that the armatures are not rubbing on the poles and cleans the main and compressor motors. The man assigned to brake duty applies brake shoes, of which from thirty to forty are required daily, and insures the keeping of the piston travel under 6 in. The control man, in addition to adjusting fingers and changing them and arc deflectors if necessary, looks after the lighting circuits, cleans switchboards and inspects current-limit relays and all switches. Two men on the inspection force tighten up axle-cap bolts and change axle bearings, which is done every 15,000 miles regardless of condition.

The night force is, of course, not large enough to make the elaborate inspection made by the day force,



ATTACHING HUB LINER BY ELECTRIC WELDING

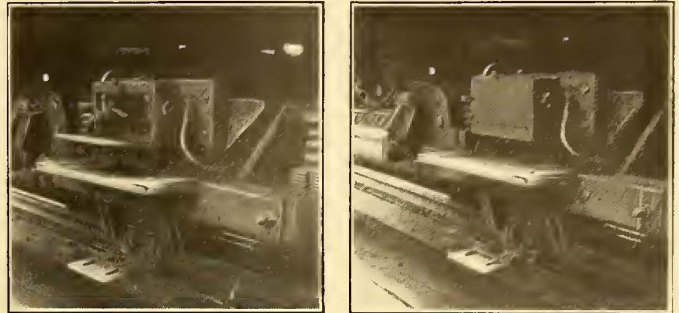
(At left, liner in two sections laid loosely in place. At right, liner welded securely to hub.)

but the night men make a casual inspection and also continue work on light repairs. They are available especially for emergency work.

All inspectors are furnished with copies of a standard printed instruction book provided by the railroad system which shows all equipment and its method of operation, both air and electric.

Among the record forms used in the electrical main-

tenance shop one is a car inspection card, which is carried in a detachable metal holder on the car while it is in the shop. The holder is returned to rack when the car leaves the shop, from which the card is removed by a clerk. This inspection card is initialed by the man performing the operation mentioned. A daily report of



SUMMER THIRD RAIL SHOE, WITH PROTECTING SHELF AND FUSE BOX ABOVE

(At left, fuse box open. At right, fuse box closed.)

cars inspected is made up from the car cards and a daily mileage report is made up on the records of the transportation department. The shop foreman keeps a book in which the continuous inspection records for each car are maintained, with the mileages between inspections.

#### REHABILITATION OF THE OLDER TYPE MOTORS

As mentioned earlier, the older type motors are being largely rebuilt. Wear in these motors has been excessive due to the fact that they are used on unballasted track, through a very sandy country and at high speed. In fact, the service given by the cars on this road is performed under steam road conditions in every particular.

The effect of the sand is seen particularly in the wear of axle bearings and axles. When wear has occurred the resultant vibration causes loosening of the caps and extra wear due to chafing of surfaces in contact. To offset the result of this action the axle bearings are being partially restored to their original diameter by means of electric welding. In one of the shops is an alternating-current outfit, by means of which a layer of iron about  $\frac{3}{8}$  in. deep is deposited on the inside surface of the bearing housing, which is afterward bored out to a diameter about  $\frac{1}{4}$  in. greater than the original. It is not considered necessary to build up the housing so as to reduce it to the original diameter, because future motors purchased will not be of the same type and there is no necessity for conforming to the manufacturers' standards. For the convenience of the welder the motor shell is mounted in the welding room on a dummy shaft, passed through the armature bearings, this shaft in turn being supported on a frame at a height convenient for the welder. By this means the welder can rotate the motor shell so that, in building up the part of the bearing forming a part of the shell, he can deposit the welding metal to the best advantage.

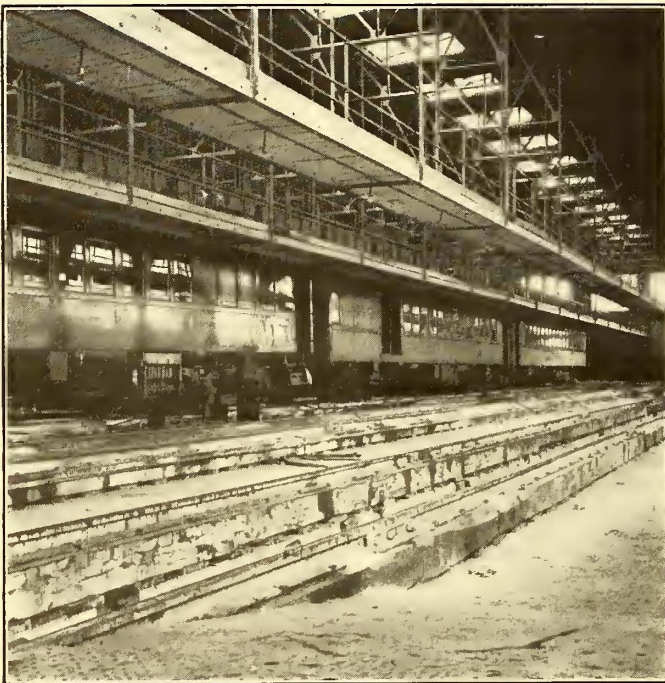
What the local people consider a most important item in the rebuilding of the motors is the keying of the axle-bearing cap to its seat. Looseness of the axle-bearing cap has been one of the principal maintenance difficulties during the past. By planing a keyway in the cap seat and mounting a steel key in a keyway planed in the cap, the key being electrically welded in place, proper registration of the cap in position is insured

and vibration is prevented. In addition, a stud bolt is used in place of the cap bolt formerly employed, the stud being pinned in place to prevent loosening. As an extra insurance against loosening, castle nuts and cotter pins are used in clamping down the cap, and, as previously mentioned, at each inspection special attention is given to tightening up these bearings.

In passing, it may be said that formerly vibration of the caps caused considerable wear of the bolts, which were the main dependence for holding the caps in place. The keying eliminated all wear on the bolts.

#### GOOD USE MADE OF ELECTRIC WELDING

Another practice which has produced wonderful results is the welding of hub liners on the wheel hubs inside the gear seat, to limit end play of the motors. The grinding effect of the sand causes excessive clearance and difficulty has been experienced in controlling this.



SUSPENDED PLATFORM FOR WORK ON PANTOGRAPHS, ETC.

At first the attempt was made to screw the hub liners in place, and later to spot-weld them, but both without great success. Now the steel liner, of the necessary thickness, usually about  $\frac{1}{2}$  in. and made in two sections so that it can be placed without removal of a wheel, is welded around the edge by means of the electric arc. Two illustrations are reproduced to show the process and the result.

Mention has been made of axle wear. The axle bearings cut into the axle and in time form shoulders which wear the end of the bearings and prevent normal end play. This tends to aggravate the wear on both bearing and axle. To prevent the formation of the shoulder, the centers of the axles are being cut down below the minimum to which the parts within the bearing are allowed to wear. The result has been the elimination of a very troublesome item in maintenance.

In addition to rehabilitation of motors, a program of improvement of car details is also under way. This is being done as a matter of maintenance procedure in the interest of economy. One item is the replacing on several cars of the wooden ends by steel ends, conform-

ing to the railroad standards. This tends to uniformity in appearance and reduction of maintenance expense because the steel ends are injured less in minor collisions than the wooden ones. This replacement is made whenever a car is damaged sufficiently to warrant the replacement of the vestibules.

A more important item is the relocation of the third rail fuse boxes in a vertical position above the shoe. This arrangement with the fuse box cover closed and open is illustrated from photographs. The hinged cover is made to open downward for convenience in inspecting and replacing fuses.

Attention is also being given to the third rail shoes themselves. The shoes have been standardized, so that now only two types are used, the one illustrated being the summer shoe. The shoe, especially designed for conditions on this road, is light and has excellent wearing qualities. In winter a sleet-cutting shoe, differing from this one in that it has open spaces in it to facilitate the removal of the sleet, is used. The company is considering abandoning the summer shoe and using the winter one altogether in the interest of simplicity.

The reclaiming of resistance grids is another important item. There has been considerable burning of the contact surfaces of the grids, rendering them unfit for use. A special grinding machine has been put in for the purpose of surfacing off the contact surfaces. Where they can be smoothed up by grinding nothing more is done except to replace the lost metal by washers when the grids are assembled. When the surfaces are badly pitted they are built up by means of electric welding, followed by grinding. In all cases after the grids have been assembled they are joined by welding to prevent vibration and improve electrical contact.

Among the minor maintenance troubles here, as elsewhere, has been the abuse and loss of jumpers. On this system the Sprague-General Electric type M control is used, with line voltage on the control circuit. The insulation of the jumpers and jumper sockets is therefore an important item. A No. 000 bus line is also carried through each train to insure contact while a third rail break is being passed. The bus-line jumper is, of course, rather heavy and is apt to become detached from the car when it is out of service or when trains are being made up. On this system the trains are not kept made up, but are assembled as required. To simplify the work with the jumpers, it is now planned to clamp one end of each in its socket by means of clamping bolts secured to the socket covers. This will not prevent the ready removal of the jumper, but will prevent its accidental detachment.

#### MAINTENANCE PROCEDURE ON THE A.C. ROAD

On the alternating-current electrification mentioned 115 multiple-unit cars are operated. They are equipped with Westinghouse single-phase alternating-current motors. All maintenance work on the multiple-unit cars is done at one shop. While, of course, the 225-hp. motors and control are somewhat more complicated than those used in direct-current heavy traction, it is gratifying to note that the design and maintenance procedure have been brought to such a degree of perfection that the whole equipment is easily kept in excellent running condition with a moderate force of men. For the entire 115 cars it is necessary only to employ 234 motors, four being "spares," and there are but one or two cars out for running repairs at any one time, ordinarily, and three are out for overhauling. The schedule permits

five cars to be out of commission for painting at any one time. As it is the number of cars in the shop that is the test of design and operating efficiency, it is obvious that this alternating-current electrification is giving a good account of itself. These remarks are made because some of the readers of the JOURNAL, like the writer, may have had the impression that alternating equipment was difficult to keep in good condition.

The maintenance shop is, roughly, 100 ft. x 290 ft. in dimension, and adjoining it is a small service building. There are five tracks, all equipped with pits, and along one side of the building are the machine tools, dipping and baking facilities, offices, etc. The building is divided into two bays, one served by a 25-ton electric crane with a 10-ton car hoist. The other contains two suspended platforms for use in working upon the pantographs and roofs of the cars. This crane, by the way, is equipped with a "dead-man" control feature, in that the brake is applied if the operator's foot is removed from the pedals which control the operation of the brake.

Important items of shop equipment, in addition to the crane, are three lathes of, respectively, 20-in., 16-in. and 12½-in. throw, a heavy drill press, a sensitive drill, a large water-cooled emery wheel, a shaper, a motor-driven hammer, a babbitt furnace with pots, a universal armature machine, a dipping and baking outfit, a blacksmith's forge and miscellaneous minor apparatus. The cars are overhauled in detail after making 100,000 miles, or approximately every two years, although theoretically they are scheduled for attention in the railroad paint shop (located at another point) every year.

The painting work is done in accordance with the railroad's regular plan, the work to be done depending upon the condition, which is classified as follows: All exteriors are classified as "Class 1," "Class 2" and "Class 3," respectively "very bad," "medium" and "needing touching up only." The interior is rated as "A," "B," "C" or "D," the graduations covering the same extremes as the exterior. Where a complete removal of the paint is required, varnish remover is employed in getting it off. The coaches are painted the standard color of the road, the color being brought out and the surface protected by varnish.

The general shop overhauling process involves putting the whole equipment in practically new condition, including dipping and baking of armatures and fields.

There are, in addition, less thorough overhauling and inspection, beginning with the casual "once over" given by the usual inspector located at terminals. They are given a more thorough inspection on a mileage basis, from 1,200 to 1,500 miles, the standard for multiple-unit equipment on the system. The schedule calls for inspecting nine cars a day, which can be readily done.

In this 1,500-mile inspection a man and helper are assigned to the air equipment, a man and helper to the control equipment, a man each to motors, blowing motors, trucks, oiling and pantograph, while two go over the entire car interior.

Pantograph shoes are changed about every 6,000 miles, and every five inspections, say, 6,000 to 7,500 miles, the cars are gone over in somewhat more detail, especially with a view to repairing any parts that have given trouble. The cable in the switch group is given special attention, the switch-group cover being removed, magnet valves are cleaned, etc.

A still more thorough inspection is given every 14,000 or 15,000 miles, when the motors are given special attention and any minor improvements that are in process of installation are taken care of.

#### REMOVING SLEET FROM PANTOGRAPH FRAMES

As in every other shop, certain problems have arisen in this one which required special solution, partly due to the nature of the equipment. One interesting example, which is really more an operating problem than a maintenance one, is the removal of sleet from pantograph frames. The pantograph shoe is pressed upward with a force of 18 lb., hence it does not take a very heavy accumulation of sleet to counterbalance this force. After various experiments, the steam jet arrangement at present in use was devised in the shop. A nozzle was made from pipe, the orifice being thin and curved to conform to the curvature of the tubing making up the pantograph frame. This nozzle is moved along the frame close to it and the sleet is melted off with economy of steam and effort. To protect the hands of the operator a piece of air brake hose is slipped over the nozzle, effectively heat-insulating it.

The steam jet is operated from a platform in the yard, the floor of which is at the level of the car roof.

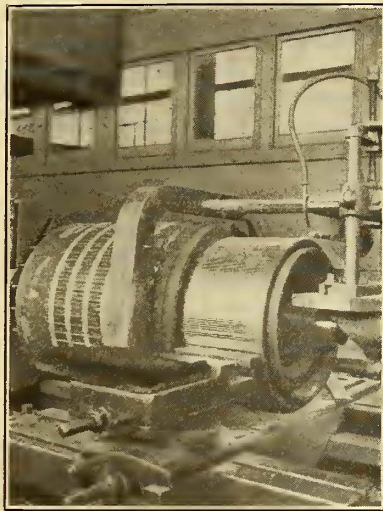
#### OTHER SPECIAL DEVICES

Among the novel devices in the shop one of the most interesting is a revolving frame for holding the motor shell or stator while work is being done upon the field and compensating winding. Several photographs have been reproduced to show the details of this device. It consists of a frame made of two flat steel rings spaced about 18 in. apart by means of bolts. This rests on four rollers mounted on a turntable frame. Straps are bolted to the rings in such positions that the motor shell can be held with its axis coincident with that of the frame by means of wedges. This arrangement permits the winder to adjust the shell to suit the requirements of winding or soldering.

The turntable consists of a circular flat steel plate, mounted above a duplicate plate supported on legs made of steel strap and separated from the latter plate about ¼ in. by means of washers. The turntable can thus be rocked slightly and is tilted by means of wedges when it is desired to give a slight incline to the winding to facilitate the flowing of solder.

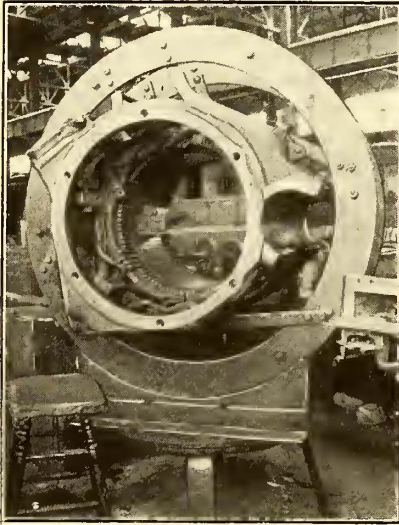
Another device which attracts attention, also illustrated herewith, is a heavy steel yoke, mounted on the traveling carriage of the lathe used for slotting work, and used to brace the guide of the slotting saw. As the commutator bars are long, it was found that this bracing was necessary in order to prevent vibration and secure a uniform depth for the undercutting.

But most important of all the new practices in the shop is that now used for changing wheels. This oper-

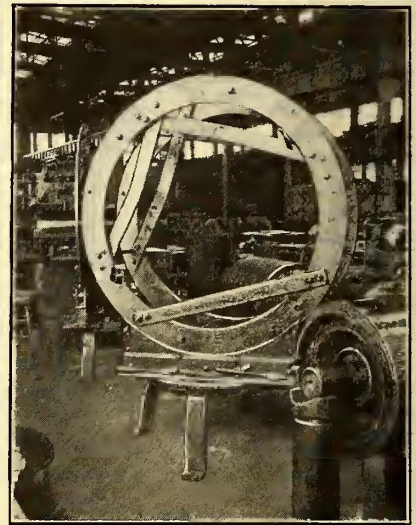
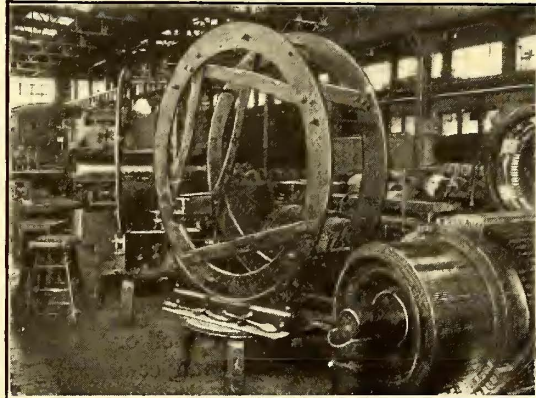
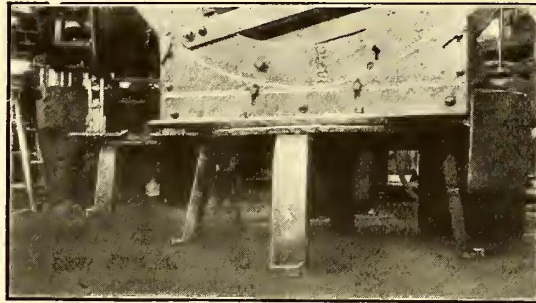


A HEAVY YOKE WHICH PREVENTS VIBRATION OF SLOTTER GUIDES

ation formerly required five men for an entire day when the truck was removed from under the car and the wheels removed in the manner usual with direct-current motors. As there are several heavy cables to be disconnected and reconnected with alternating-current motors, it was decided to follow a plan for removing the wheels without disconnecting the motors. The result is that three men can now replace a pair of wheels in two hours by the following method: The truck is first placed with the center of the axle carrying the wheels to be removed directly above the center of the drop-pit ram. The axle caps are removed and set to one side and a yoke is then fastened to the head of the ram, the yoke being simply a heavy piece of flat steel with the ends bent up. The yoke is then raised by hydraulic pressure so that the extreme ends, which have V-shaped notches in them lined with babbitt, engage with the axle between the motor housing and the wheel hub in the space left by the removal of the axle bearings. This space is approximately  $1\frac{1}{8}$  in.



A DEVICE FOR SUPPORTING AN ALTERNATING-CURRENT MOTOR FIELD FRAME OR STATOR



This apparatus permits rotation about the motor axis, or the turntable axis, and may be tilted to facilitate soldering.

wide. The pedestal castings are next removed and the helical springs are compressed. The removable sections of the tracks are then swung outward and the wheels are lowered by means of the control of the hydraulic pump, while the hydraulic ram is brought up through a section of the small wheel truck which travels in a cross-pit which spans two tracks. As the ram is lowered it permits the yoke and the removed wheels to rest on this truck, the ram disappearing and going to a point underneath the truck.

The wheel truck is equipped with roller bearings, which, by the way, were developed in the shop, and it rolls so easily that one man can push it along the transverse pit to a point underneath the crane where the wheels can be taken from the truck or the truck and wheels can be placed over the hydraulic jack on the adjoining track. This in turn can raise the wheels to the rail and another pair of wheels can be substituted. The wheels can then be replaced in the car by reversing the procedure described.

On account of the shape of the motor housing it is impossible to drop the wheels directly out of the cavity in the motor housing which accommodates the axle

bearings. It is therefore necessary to lower the motor 4 in. on the axle-bearing side, thus permitting it to swing through an arc and displacing the motor casting far enough so that the axle will clear it as the latter is being lowered.

It is interesting to note that the drop pit here consists of a transverse track taking in a pair of tracks and pits as stated and reaching out to a point 12 ft. from the side of the car. Normally the pit is covered with plank floor to prevent accidents. When this flooring is removed chains are stretched across the passage so that no one will be injured by falling into the pit. In this pit is a three-cylinder hydraulic pump, having a capacity of about 1,200 lb. per square inch, with suitable high-pressure connections to control valves and the jacks. Each jack consists of a heavy steel cylinder, with the stuffing box, packing and gland at one end and suitable pipe connections, with a solid steel piston having a 72-in. run-out. This was necessarily designed for rugged service, as it is not always possible

to centralize the wheels accurately; there had to be, therefore, a certain amount of "give and take" in the jack arrangement. A set of head, yokes and brackets has been developed so that any piece of apparatus that comes in line with the drop pit can be removed from the car.

As would be expected, the crane plays an important part in maintenance operation in this shop. As the motors are of large size, the crane is almost a necessity in handling them. It is also useful in removing trucks from under the cars. In this operation a crane yoke is hooked under one end of the body and the body is thus easily raised. Special iron horses with rollers are used for supporting the car bodies when the trucks are out.

Electric welding is, of course, used here as elsewhere. A one-man a.c.-d.c. outfit, using about 100 amp., is found to be sufficient for the work.

While the shop described above is unusually well equipped for its work, one of its best features is the excellent natural lighting provided. As will be seen in the photographs on this and the preceding pages there are ample windows and skylights, which greatly facilitate inspection work.



## Solving Track Problems at St. Joseph

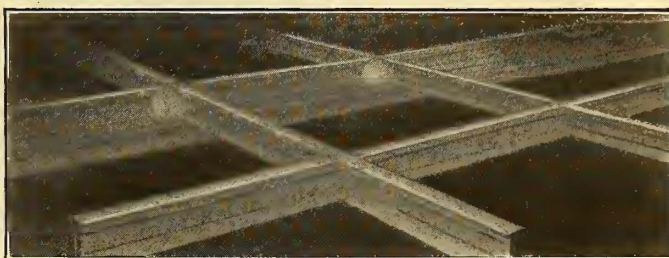
Thermit Welding Has Been Used Quite Extensively to Eliminate Bolted Joints and Rail Bending

BY H. L. CHAFFEE

St. Joseph Railway, Light, Heat & Power Company,  
St. Joseph, Mo.

ONE of the most important questions facing a street railway property today is the proper bonding of the rails in the return system. Experience has shown that great loss of power results from broken and imperfect bonds. The method generally used employs the expanded copper bond, but we have obtained excellent results with the thermit weld, thus eliminating the necessity for using a copper bond. The cost of the thermit weld as compared with the bolted joint is also favorable to the former when the cost of maintenance is taken into consideration. The necessary material for making the thermit insert weld can be obtained at a cost not exceeding \$8.50, depending on the size and type of rail, and if labor is included the weld costs from \$10 to \$11. The thermit-welded joint reinforces not only the web of the rail but the ball as well, there being a continuous rein-

forcement directly under one side of the ball, down the side of the web, around and under the flange, up to and under the other side of the ball. The rails themselves are thoroughly welded into a single homogenous mass, with every vestige of the joint eliminated. By the elimination of the joint at least two years of life is added to the rail and a saving is made in the return current, as well as in the cost of maintenance. Also by eliminating the joint the possibility of cupping is practically removed, due to the fact that the vibration set up by the wheels is transmitted along the rail as if no joint were present.



AT TOP, MANGANESE INLAID CROSSING REPLACED WITH THERMIT WELDED CROSSING. AT LEFT, THERMIT WELDED CROSSOVER WHICH REPLACED CAST MANGANESE INSERT AT ST. JOSEPH. AT RIGHT, THERMIT WELDED CROSSING FOR INTERSECTION WITH STEAM RAILROAD.

This vibration can be transferred only through a complete union of the metal of the rails at the joint. This is not theory, but is a fact that has been proved often in actual practice. For instance, it has been found that if a slight hack-saw cut is made in the head of a rail, the rail will cup, due to the fact that the wave of vibration is not transmitted along the top fibers of the rail where the cut is made, even though the remainder of the rail is solid and continuous. This illustrates the desirability of thoroughly welding the

head of the rail as well as welding the base and flange. So far as known, this is the first case where thermit-welded rails have been installed at an intersection of steam railroad and electric railway tracks.

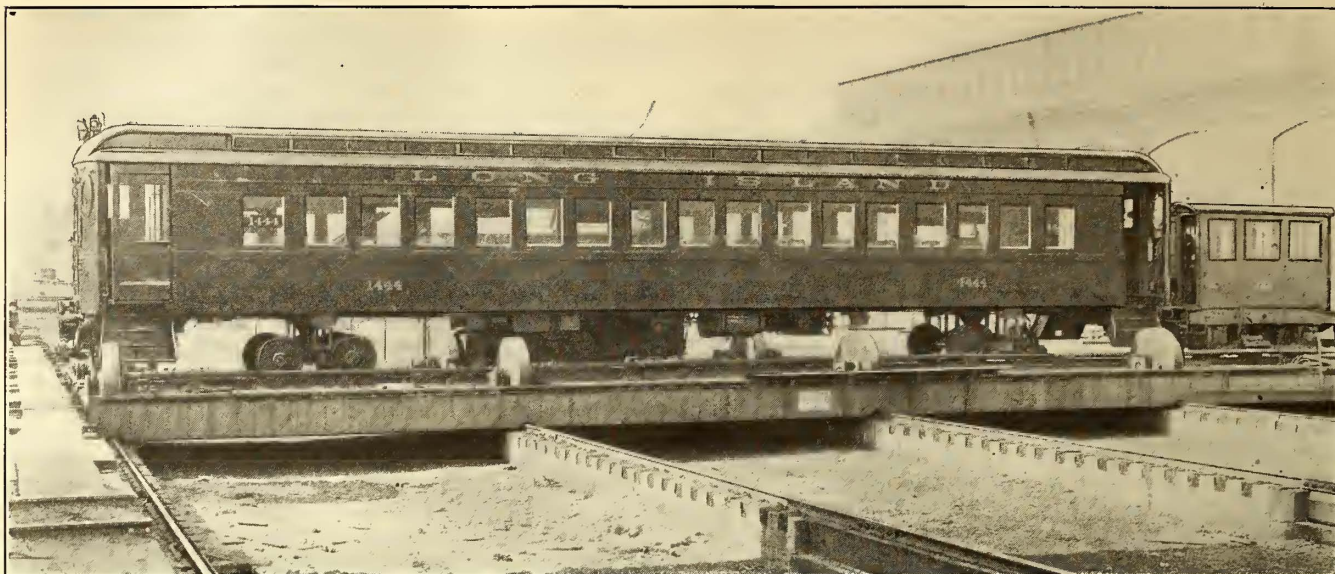
Aside from track use, thermit welding has many other advantages which the street railway can utilize. For instance, every property is more or less troubled with broken truck frames, car axles, motor cases, power-house machinery, shop machinery, and very often valuable castings and forgings are consigned to the junk pile or sent out to be welded when the welding could just as well be done on the premises. It is a general rule on electric railways that when an axle is broken it is either scrapped or cut up and put to other uses. We find here that by taking the old axles and cutting them so that our weld will come in the middle, thus getting it away from the old bearing which might be crystallized, we have the stock for a new axle at a cost not exceeding \$10.50 on a 6-in. axle, which includes labor and materials.

The average truck frame can be repaired at a cost of \$12, not including machine work.

In building special work by welding together short lengths of rail large savings can be effected by using the thermit process. The average crossing can be built in this way at about one-half the cost of the purchased variety and will outlast the latter by a good many years. In addition to this the thermit-welded crossing will cut down the cost of maintenance by eliminating straps and bolts. The accompanying illustrations show two of the many pieces we have built and are building in St. Joseph, as well as a section of a manganese inlaid crossing which we replaced with a thermit-welded crossing built of 91-lb. rail at a cost of \$75, not including the rail.

One of the illustrations shows a crossover which replaced a cast manganese insert, also located in the loop district. This is used by our heavy city cars in turning the corner, and is also located where both interurban lines pass over it. It was built out of 7-in. girder rail at a cost of \$90, not including the rail. The

old crossover was broken through the cast, which seems to be our main trouble here with this style of crossovers and frogs. Another illustration shows a crossing built of 100-lb. rail to replace one located where our tracks cross a branch of the Burlington Railroad. This was built at a cost of



TRANSFER TABLE TAKES LONG CAR AND TRACTOR AT SAME TIME

# Equipment Repairs on Long Island Railroad

Fifteen Years' Experience in the Maintenance of Heavy Electric Railway Rolling Stock Has Brought About Many Improvements in Methods and Organization

THE Long Island Railroad substituted electric traction for steam on the first of its lines fifteen years ago. Since that time the mileage of its electrified lines has been gradually increased and the volume of commuter traffic now exceeds all early expectations. Electric operation has proved a successful venture for this road and one of the factors which has contributed largely to its success is the thorough and systematic inspection and repair of car equipment which have been carried out. In an article in the *ELECTRIC RAILWAY JOURNAL* for June 10, 1911, the inspection and maintenance organization and methods then in use at the Morris Park shops of the company were described. Since that time 164 steel multiple-unit motor cars and ninety steel trailer cars have been added to the passenger rolling stock. These cars were all equipped at the Morris Park shops, which also handle repairs to many industrial motors as well as car equipments.

Additional shop equipment has been found necessary to carry on the work. New methods have also been introduced which materially shorten the time and decrease the labor necessary for doing much of the work. A subsequent article, published in the *ELECTRIC RAILWAY JOURNAL* for March 20, 1915, page 566, dealt particularly with repairs to all-steel cars, and in this article some details were given of the late types of steel passenger cars which had been purchased.

An accompanying table gives a list of the rolling stock which the Long Island Railroad now has in service on its electrified divisions. For convenience in making reports and for general reference the different types of cars have been divided into classes and each class is given a specific designating number. This consists of letters followed by a numeral; thus the MP-54 class includes motor passenger cars, 54 ft. long; the MPB-54 class covers motor passenger and baggage cars, 54 ft.

long, and the MPBM-54 includes motor passenger, baggage and mail cars, 54 ft. long.

The organization in charge of maintenance repairs is headed by G. C. Bishop, superintendent of motive power. Reporting to him and in direct supervision of all electrical repairs and inspection is R. W. Brodmann, general foreman of electrical equipment. All repair and inspection shop foremen report to the general foreman.

### ALL-STEEL ROLLING STOCK ADDED

For the electrified service which was inaugurated in 1905, 134 MP-41 and five MB-45 cars were ordered. This number of cars soon became inadequate to handle the

| TABLE OF LONG ISLAND ELECTRIC ROLLING STOCK |            |                 |
|---|------------|-----------------|
| Number of Cars                              | Class      | Motor Equipment |
| 133   | M P-41     | West. 113       |
| 5   | M B-45     | West. 113       |
| 10  | M B-62     | West. 308       |
| 47  | M P B-54   | West. 308       |
| 3   | M P B M-54 | West. 308       |
| 276   | M P-54     | West. 308       |
| 90  | T-54       |                 |

traffic and in 1908 it was found necessary to place another order for cars. These cars were of entirely different design, conforming to the M. C. B. standard and equipped with automatic drawheads and automatic air couplers, whereas on the first cars ordered the drawheads and heights did not conform with M. C. B. standards. It is possible, however, to couple up the two types of equipment with a compromise coupler between drawheads. One of these compromise couplers is carried in each of the first 134 cars, and compromise train line jumpers, which are also necessary, are located at all terminals. It is also necessary to use a compromise air coupler for the air brake lines. It is seldom found necessary to couple up the two dissimilar types of cars, however, as the MP-41 class are used principally on the

Flatbush-Rockaway Beach and Atlantic Avenue divisions in local service.

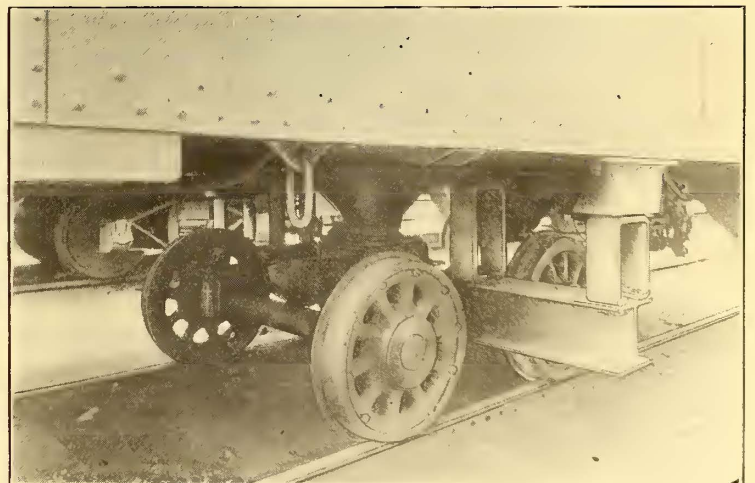
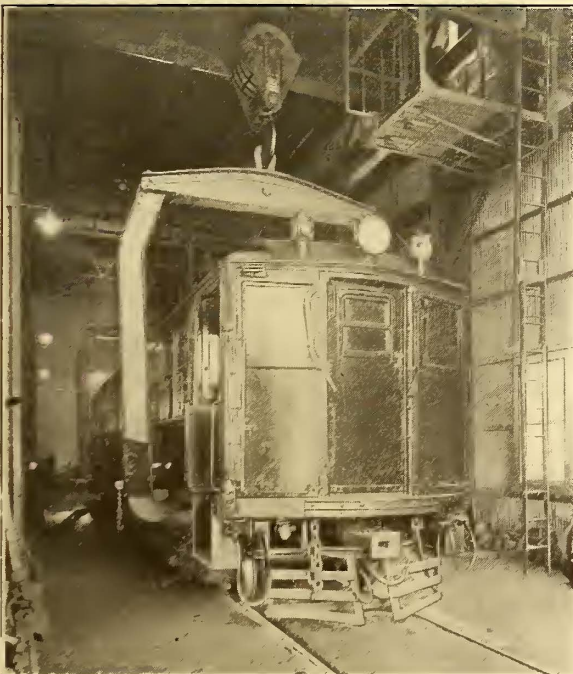
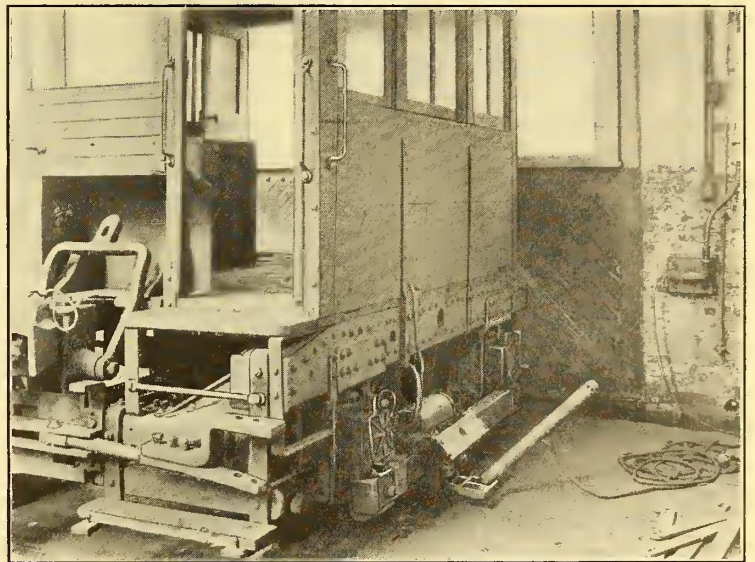
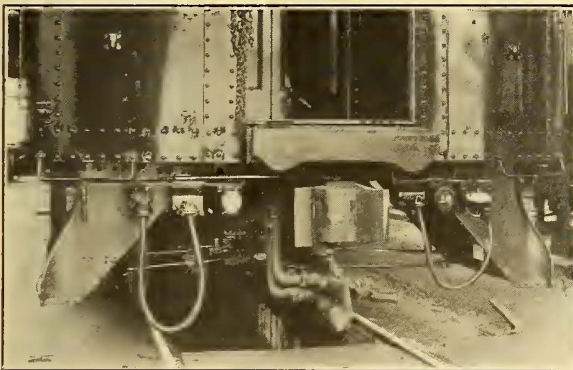
The drawheads of the MP-41 cars were of the Van Dorn type. These drawheads and the anchorage are now becoming worn to such an extent that the company is replacing them with the form 8 Tomlinson couplers which have air connections in the drawheads. The height and design of this coupler does not correspond with M. C. B. standards, so that in order to couple up these cars with the larger equipment it will still be necessary to use the arrangement already explained.

The latest addition to the electric equipment of this road was three orders for steel trailer cars, known as T-54 cars. Ninety of this class of trailer are now in service. This is a very light car and was ordered principally to replace wooden trailers previously used between MP-41 cars, which had to be retired, due to the fact that all motor cars are of steel, excepting five MP-45 baggage cars, and they are used through tunnels to the Pennsylvania station, New York, and to the Flatbush Avenue station, Brooklyn.

These trailer cars in class T-54 are single-sheet, arched roof, unlined cars, but are designed to protect passengers in case of a collision or accident. A box girder, built of two 9-in. channels, 15 lb. to the foot, with

plates riveted to the lips of the channels, extends from the back end of the draft gear past the body bolster to the first cantilever. These girders terminate at each end in a large steel casting which forms the center portion of the platform bumper. Two 12-in. I-beams are fastened to the same casting at their lower ends and the upper ends fastened to the roof and to the roof supports. These form openings for outside, center vestibule doors. A  $\frac{7}{8}$ -in. x  $3\frac{1}{2}$ -in. x 5-in. angle-iron runs along each side of the car and is riveted to the end of the cantilevers. This is supported at the box girders and the body bolsters by a 5-in. channel. The ends of these angles are riveted to a special casting which forms the main body end sill. These angle-irons support the floors and the outside sheathing is riveted to the 5-in. side of the angle. The general design of the under-frame of the trailer cars is almost identical with that in the MP-54 motor cars. The box girder protects the ends from collision and the vertical I-beams prevent telescoping. These cars conform with M. C. B. rules and also with those of the United States Safety Appliances. They have automatic couplers and automatic air couplers and can be used in steam service as well as in electric service.

These trailer cars were originally intended for sum-



AT LEFT (TOP), JUMPERS ARE FASTENED PERMANENTLY TO CAR. AT LEFT (BOTTOM), THE CRANE HOUSE IS AN IMPORTANT ADJUNCT. AT RIGHT (TOP) POWER FOR MOVING CARS INSIDE OF SHOP IS TAKEN FROM RECEPTACLES ALONGSIDE DOOR. AT RIGHT (BOTTOM), DUMMY TRUCKS ARE PROVIDED WITH TWO SIDE BEARING SUPPORTS TO FIT TWO DIFFERENT TYPES OF CARS



On one side, close to the entrance to the tunnel, the concrete reinforcing wall between posts was extended up to the bottom of the girders supporting the street and an additional wall with windows and doors opening into the car barn was constructed. This provided a space 20 ft. long by 12 ft. wide, which is used for a heating plant and boiler. Adjoining this there is a brick wall on the opposite side from the reinforcing wall, which provides space for coal storage. A balcony is suspended on hangers from the roof of the tunnel on one side and the other end rests on the tunnel retaining wall. The balcony is provided with wash basins and toilets. Both this inspection shed and the one at Dunton are provided with compressed-air plants for blowing out the equipment. In the Carlton Avenue shed there is a mono-rail hoisting tramway of 2½-ton capacity, which runs the full length of the pits. This is electrically operated, using 220-volt, 25-cycle alternating current, and is controlled

from the ground. This is used to handle heavy materials, such as compressors, or for distributing brake shoes, contact shoes, etc., as required.

During the war period great difficulty was experienced in obtaining mileage records, so that the inspection work, which was previously done on a mileage basis, was changed to a time basis. This system has been working so satisfactorily that it is still being continued. All car records are kept in the general foreman's office at Morris Park and cars are ordered in for inspection from that office daily. The overhauling periods are also computed there and car numbers are given to the inspection sheds for shopping. This work was formerly done by each inspection shop force, but was changed to avoid duplication of records, etc. The following instructions for carrying on this work, issued by G. C. Bishop, superintendent of motive power, show the latest practice for the maintenance of electric rolling stock:

## Long Island Railroad Company

### Motor Passenger Car Maintenance Instructions

#### INSPECTION PERIODS

1. Multiple-unit cars shall be inspected at inspection sheds every ten days, this period being known as a "regular inspection."

2. Every fifth regular inspection shall be termed a "semi-general inspection," at which time certain work shall be done which is not included in a regular inspection as given below.

3. Every tenth regular inspection or second semi-general inspection shall be termed a "general inspection."

4. Every tenth general inspection, or every 100,000 miles, cars will be taken to the shops for class repairs.

#### REGULAR INSPECTION

1. *Motors:* Motors are to be cleaned and blown out with compressed air; brushes removed, brushholders, commutators, armature clearance and motor leads inspected; brushes cleaned and returned; brushholder shunts, hammers and springs examined. Tension on brushes to be minimum 6 lb. per square inch, maximum 8 lb.

2. *Switch Group:* To be blown out and cleaned; all worn parts replaced; interlock fingers examined for tension and contact; switch group operated for sluggish switches or leaking valves.

3. *Line Switch:* Same as switch group.

4. *Reverser:* Same as switch group.

5. *Switchboard:* To be blown out with compressed air and all switches and other apparatus examined and wiped off; heater circuits tested, light circuits tested; battery charging relay on MP-41 cars inspected.

6. *Rheostats:* All rheostats to be inspected for broken grids and leads and jumpers for loose or broken connections; also all insulated bolts to be inspected for defective insulation.

7. *Conductor's Electro-Pneumatic Signal Switch:* To be examined and tested.

8. *Automatic Heat Regulators:* Thermostats, thermometers and regulating switch and relays to be inspected and tested.

9. *Coasting Time Recorders:* Clocks to be inspected and paper tape and keys replaced if necessary.

10. *Emergency Light Relays:* To be inspected, tested and cleaned and worn parts to be replaced.

11. *Master Controller:* To be inspected for worn or loose contact fingers; fingers and drum to be cleaned and examined for loose wire terminals.

12. *Main, Bus and Shoe Fuse Boxes:* To be inspected for blown fuses and defective boxes.

13. *Lights:* To be replaced when burnt out (this includes headlight lamps, car lamps and emergency lamps). Defective sockets and resistances to be replaced.

14. *Heaters* (during heating season only): Broken coils and porcelain tubes to be replaced. This includes cab heaters.

15. *Control Circuit* (including control jumpers): To be inspected for mechanical defects and all parts found defective to be repaired or renewed.

16. *Bus Wiring* (including bus jumpers): Same as No. 15.

17. *Control Batteries:* To be inspected and tested for grounds and charge.

18. *Trucks:* Shoe fuses, shoe fuse boxes, shoe beams and contact shoes to be inspected, broken and blown fuses replaced and contact shoes gaged. Journal brasses to be inspected for loose or broken babbitt and broken brasses. Worn brake shoes replaced and brake rigging readjusted; side bearings and center plates oiled; swing motion hangers, equalizer bars, safety hangers to be inspected for defects. All truck bolts to be inspected and tightened, brake rigging and chafing plates to be oiled. Wheels gaged, tires and flanges inspected. If axle bearings are worn to exceed ½ in. they are to be replaced.

19. *Airbrake:* Compressor motor to be blown out, cleaned and inspected; armature clearance gaged; brushes removed, brushholders examined and cleaned, and tension readjusted if necessary, brushes cleaned and re-

placed. Commutator cleaned if necessary. Compressor bearings and crank chamber oiled; air strainer inspected and cleaned. Piston travel and slack adjuster examined and set; main reservoirs drained; control reservoirs drained; conductor's valve, motor-man's brake valve, feed and reducing valves tested; whistle tested; air hose and automatic couplers inspected; hand brakes inspected and tested. Air gages compared for accuracy and piping tested for leaks. Master governor and pneumatic pump switch inspected and auto train stop tested.

20. *Car Bodies:* All bolts to be inspected and tightened; drawbars, pilots, trap doors, windows, seats, sliding doors, end doors, safety tread, flooring, bells, bell cords, gates, chains, sliding door devices, roofs, ventilators, etc., to be inspected.

21. *Lubrication:* Armature bearings to be oiled. Oil wells are first gaged then replenished with oil to a depth of 3½ in., commutator end, and 4 in. pinion end. Axle bearings gaged and replenished with free oil to a depth of 2½ in. Waste pushed back and one gill of oil added in journal boxes.

21. *Fire Extinguishers:* (a) To be examined as to quantity of liquid contained; replaced if necessary.

(b) J. M. Fyro type to be tested as to pressure, if below 90-lb. recharge.

(c) Pyrene type to be tested as to operation of pump, replace any found defective.

22. *Operation Test:* After all work is completed each car is operated from both ends in both forward and reverse directions with line switch out. Train is made up and entire train operated from both ends, operating switch groups and reverser; circuit breaker tripped and reset; automatic emergency train brake tried and airbrakes tested; storage batteries tested for charge.

#### SEMI-GENERAL INSPECTION

23. In addition to the work outlined for regular inspection, the apparatus shall be given the attention outlined.

24. *Line Switches*: Covers removed and terminals inspected.

25. *Control Batteries*: Flushed with distilled water.

26. *Feed Valves*: Removed and placed on test rack for vibration test.

27. *Air Strainers*: Removed and cleaned.

28. *Lubrication*: (a) Waste removed, teased and replaced in axle bearings.

(b) Gears greased with 2½-lb. compound per gear.

#### GENERAL INSPECTION

29. In addition to the work outlined for regular inspection and semi-general inspection, the apparatus shall be given the attention outlined below.

30. Packing to be removed from all boxes; waste teased and boxes repacked with same waste if in good condition; free oil in armature and axle boxes to be brought up to proper level; supplied with 2½ lb. of gear grease per motor; car wiring to be examined and tested; junction boxes, switch group, reverser, line switch and other apparatus to be examined as to general condition of wiring and wire terminals and connection blocks. Switch groups, line switch, reverser and rheostat frames and batteries to be tested for grounds; all insulated bolts, washers and pipe insulators to be cleaned and shellacked; plug to be removed from switch group air chamber and air chamber blown

out; all power connections in switch group and line switch to be examined and tightened; pistons of air cylinders in switch group to be oiled when necessary, pin valves on all electro-pneumatic switches to be removed and cleaned. Airbrake valves, feed valves, pneumatic pump switches, pilot governors, check valves and other air brake apparatus to be cleaned, oiled and adjusted. Line relay, battery charging relay and potential relays to be cleaned and adjusted. Cars to be cut for inspection of automatic air and car couplers.

#### SPECIALS

31. *Brake Cylinders*: To be cleaned and lubricated every six months.

32. *Control Batteries*: To be removed and sent to battery house for cleaning every eighteen months.

33. *Motor Compressors*: To be removed and sent to air brake room for overhauling every eighteen months.

#### TRAILER CARS OPERATED IN MULTIPLE-UNIT TRAINS

34. *Regular Inspection*: Every thirty days. All apparatus on these cars of a similar nature to that on motor cars is given the same attention.

35. *Electro-Pneumatic Door Engines*: Air piping system to be drained. Push buttons to be examined. Engine mechanism to be inspected, oiled and adjusted.

36. *General Inspection*: Every fourth

regular inspection. Same as general inspection of motor cars as far as journals and air brake apparatus are concerned.

37. *Class Repairs*: Cars will be taken to shops for class repairs on plant schedule.

#### LUBRICATION TABLE

| Materials                                 | Where used                                  |
|---|---|
| Special long strand waste                 | Armature bearings                           |
| Special long strand waste                 | Axle bearings and journals                  |
| Texas car oil                             | All bearings                                |
| Texas Crater compound                     | Gears                                       |
| Car oil                                   | Side bearings, pedestals, etc.              |
| Texas Merak oil                           | Compressor, control cylinder                |
| <b>Regular Inspection</b>                 |   |
| <i>Part Lubricated</i>                    | <i>Quantity of Lubricant</i>                |
| Armature bearings, commutator end         | Fill well to free oil depth of 3½ in.       |
| Armature bearings, pinion end             | Fill well to free oil depth of 4 in.        |
| Axle bearings                             | 2 in.                                       |
| Journals                                  | 1 gill                                      |
| <b>General Inspection</b>                 |   |
| <i>Part Lubricated</i>                    | <i>Quantity of Lubricant</i>                |
| Armature bearings, commutator end         | Fill well to free oil depth of 3½ in.       |
| Armature bearings, pinion end             | Fill well to free oil depth of 4 in.        |
| Axle bearings                             | 2 in.                                       |
| Journals                                  | 1 gill in each box                          |
| Sector bars, circular bars, brake rigging | Thick paste made of gear grease and old oil |
| Side bearings, center castings, pedestals | Waste oil                                   |
| Chafing plate on truck                    | Greased or oiled as necessary               |
| Gears                                     | 2½ lb. grease on each gear                  |
| Motor compressor                          | Compressor oil to top of plug holes         |
| Switch group, line switch, reverser       | Compressor oil                              |

#### ALL EQUIPMENT OVERHAULING DONE AT MORRIS PARK

Overhauling of cars and equipment is done on a mileage basis. The period between general overhauls has now been increased from 60,000 miles to 100,000 miles. Whenever a car has completed this mileage it is taken into the general overhauling shop at Morris Park for class repairs and a careful general overhauling. At the time that electric operation was begun, in 1905, this car repair shop had been in operation for a considerable time for taking care of the steam railway equipment. Additions were built and new shops were constructed in order to provide facilities for handling the repairs to the electric cars. The structural features of these shops were described in the STREET RAILWAY JOURNAL for August 18, 1906. Increased facilities and new apparatus for handling the equipment, as well as more modern methods, have altered somewhat the procedure followed in general overhauling from that previously described in connection with the article in the June 10, 1911, issue of the ELECTRIC RAILWAY JOURNAL. In describing this a special effort has been made to eliminate work which was previously described.

When cars are brought in for equipment repairs or general overhauling they are placed on storage tracks at the north end of the electric overhauling shop. From this location they are placed on overhauling tracks by means of a transfer table which is electrically operated and equipped with third rail to facilitate the movement of cars onto and off the table. Outside the overhauling shop are five short tracks which are served by the transfer table. Each of these tracks is of sufficient length to accommodate two cars, and these tracks are

usually filled up from the transfer table and the cars are then moved from this location to the overhauling pit as required. In handling a car when it is necessary to remove the car body from the truck it is first run off the transfer table into the crane house. For placing the cars in the different locations the Long Island Railroad has built the electric tractor described in the issue of the ELECTRIC RAILWAY JOURNAL for Dec. 9, 1916, page 1209. As soon as the car is placed in the crane house various measurements are taken to determine the adjustments that will be necessary before it is again ready for service and to detect any weak springs or defective parts that need attention. Dimensions are marked with chalk on the lower portion of the truck side-bearing supports which is toward the north end of the room. By having a definite location for these dimensions much time is saved in looking for them.

The brake rigging and motor leads are next disconnected. In order to disconnect the brake rigging it is only necessary to remove two pins at each end and after the motor leads are disconnected the body is released from the truck. For lifting the car body from the trucks two 40-ton electric cranes are used. These are fitted with special rigging for making the connection underneath the car body. The rigging consists of a yoke with two supporting arms that extend down along the side of the car and have projections at the bottom ends which extend underneath the car body cantilever. These projections have each a raised lip which fits into a recess in the car body cantilever so that when once applied there is no danger of slipping or changing position. As soon as the car body has been lifted the trucks are drawn onto the transfer table by hooking a rope to the rear truck so that both trucks can be pulled from beneath the car

by means of a drum which is driven through a clutch by the main driving motor on the transfer table. The electric tractor is then coupled to the trucks and they are either placed in the overhauling shop or on adjoining tracks for any repairs that are necessary. Dummy trucks are next placed underneath the car body and the tractor then takes the car and places it in the electric car shop for any repairs to the car body and car equipment.

Previous to the building and equipping of this crane room, the car bodies were jacked up from the trucks. A great saving in time has been effected by this improved method and a car can be placed in the crane room, have the trucks removed and the car body and trucks placed on tracks for overhauling in from a half hour to forty minutes and with absolute safety.

The overhauling shop is not equipped with third rail and, to provide for operating the tractor inside the shop, a standard bus line receptacle is located between alternate tracks just inside the door openings of the shop. This is connected to the 600-volt supply through a circuit breaker, so that when the contact shoe on the tractor leaves the third rail on the transfer table a short jumper with a standard bus-line head on one end and with a fork on the other can be used to furnish power for operation.

#### PREARRANGED SCHEDULE OF REPAIRS CHECKS PRODUCTION

A schedule of repairs is laid out when cars are brought to the shops and dates are established for beginning and finishing the work. These dates must be met to insure the necessary output. As soon as a car is received in the crane room the fact is entered on the repair schedule. The repairs which are carried out in this department are divided into five classes, and as soon as the trucks and car body are placed in position ready for work the head inspector, who has charge of following up the working schedule, reports to the general foreman, confers with the foremen in charge of the several classes of repairs and obtains an estimate as to the length of time necessary to complete the work. The inspector can thus determine how long the car must remain in the shop and when it will again be available for service. This information is entered in the electric shop working schedule form shown in an accompanying illustration. The several dates at which the work is to be completed are checked up closely by the department foremen, and every Monday a report is made out in the office of the general foreman of electrical equipment, which is sent to the superintendent of motive power, with copies to the foremen interested. This form of report is also shown in an accompanying illustration. It gives the car number, the class of the car, the date it was received at the shop and the dates when work was started and is to be completed. Whenever repairs are not completed in the estimated time, or within twenty-four hours thereafter, a special letter of explanation must be written by the foreman responsible, giving reasons. Also, in case a car has the work completed in a shorter time than that estimated, the foreman must give a written explanation as to why the time necessary was not correctly calculated. This method of following up the various operations necessary for repairing the car and making certain that they all dovetail together so that the car can be returned to service in the least possible time has worked out very satisfactorily on this system.

Two tracks in the overhauling shops which are served by two 10-ton Niles traveling cranes are used for truck and motor overhauling. As soon as a truck, with its equipment, is placed on one of these tracks by the shop tractor the motors are removed from the trucks and the armatures are taken out of the motor shells and thoroughly blown off and cleaned. After this they are sent to the armature room for further testing and repairs. This electric shop, where all armatures, fields, controllers and other electrical equipment are repaired, is at the south side of the shop used for truck overhauling. The various pieces of equipment are handled inside this room on a runway which leads to a door opening into the truck repair shop. Other portions of the floor are used for impregnating tanks, wheel lathes, brass lathes and one large turret lathe for machining and finishing bearings.

Any defects found in armatures are repaired, loose bands are replaced and special attention is given to see that commutators are undercut to a depth of about  $\frac{3}{4}$  in. After the armature repairs have been completed the armature is tested for grounds and short and open circuits, and it is then given a high-voltage test of 1,500 volts between the windings and ground. If any field coils are found to be defective they are also removed and sent to the armature shop for repairs and are replaced with new ones. If the fields test out "O.K." they are cleaned carefully and tightened up firmly. Brushholders are removed from the shell and sent to the repair shop, where they are dipped and repaired, after which they are reinstalled in the motor shell and the brushes are replaced if not excessively worn. Brush tension is set at from 5 to 6 lb. per brush.

All wiring inside the motor frame is inspected to make certain that it is well cleated and that there are no loose connections. All motor-frame bolts are tightened and all commutator covers are inspected to make certain they fit tightly so as to exclude dirt, snow and water. Gear cases are cleaned and examined for cracks and defects and if found defective are replaced with new ones. After this inspection and the repairs have been completed the inside of the motor shell is given a coat of insulating paint.

Armature bearing housings are put into a lye pot and boiled out thoroughly, after which they are cleaned and painted inside to prevent rusting. Oil wells are thoroughly inspected to make certain that there are no leaks and the opening between the free oil well and the waste pocket is cleaned. When a car is sent to the shop for having hot armature bearings and the cause is not at once evident the housing is removed and filled with kerosene and set over white cardboard or paper to detect leaks.

The connections to knuckle-joint connectors, which are used on all motor leads, are inspected to make certain that none of the strands of wire are broken and that the soldering is in good repair. The insulation on the motor leads and the armor, which consists of brass wire spirally wound around the leads, is inspected. All motor parts are then reassembled and the motor is ready for reinstallation on the truck.

#### OVERHAULING OF OTHER TRUCK PARTS

All parts of the truck brake rigging are gone over carefully and badly worn hangers, pins, bolts, chafing plates, truck brake levers and brake heads are either repaired or replaced. Wheels are measured for diameter and flange wear and if any turning or repair is neces-



TRAVELING CRANES ARE IMPORTANT FOR HEAVY TRUCK OVERHAULING

sary they are removed and sent to the wheel room. Blueprint tables showing the limits of wear are furnished for the guidance of the shop men in making replacements. Some of the old tired wheels are still in service on the MP-41 type of cars, but these are being replaced with rolled steel wheels or with Davis cast steel wheels, and a considerable number of Davis wheels are now in service. In case it is not necessary to remove the wheels for turning, the brasses and keepers are removed so as to allow ready inspection of the journals. All axles and journals are tested for taper and examined for excessive wear. Blueprint tables are also furnished for the guidance of the men in deciding the limit of wear.

If the flange of a wheel shows excessive wear the truck frame is checked up carefully for square and is trued up where necessary. Pairs of wheels are kept within  $\frac{3}{32}$  in. of the same diameter when turned to prevent crowding one rail or the other, with a consequent destruction of flanges and an increased wear to the tread. All wheels are carefully gaged by the man who does the turning and are "O.K.'d" by the foreman of the truck department before they are installed in the trucks. A double check is thus provided by two separate departments so as to make certain that no wheels will be installed until they are brought to the required dimensions.

#### GEARS SHOW VERY LITTLE WEAR

The original gears furnished with the MP-41 and MB-45 equipments were cast steel solid gears. These were replaced with cast-steel center-rim type and these latter are now being replaced by solid steel heat-treated gears. The gears now being replaced are not excessively worn, but careful inspection has disclosed fatigue cracks at the base of the teeth. A few teeth have broken off and it is evident that they have outlived their useful life, so rather than take a chance of their breaking in service they are being replaced. Excellent service is being obtained from all heat-treated gears. Helical gearing is now being tried and has been specified for the new cars on order.

Before the pinions are reinstalled on the armature

shaft they are heated in a lye pot in boiling water and are put on hot. This makes installation very easy and the boiling of the pinions in the lye pot cleans as well as heats them. New brake shoes are installed as found necessary and where irregular wear is occurring on a brake shoe they are reversed to obtain additional service.

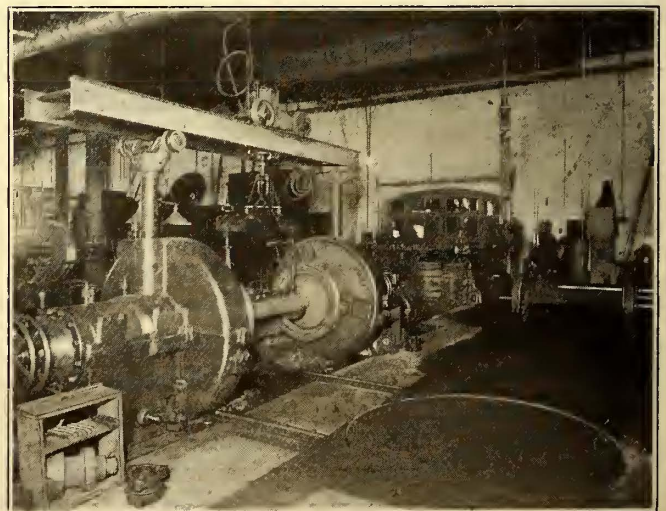
#### CONTACT SHOES AND BEAMS ARE CAREFULLY TESTED

Third rail shoes are of a hinged slipper type and are supported on wooden beams. These contact-shoe beams are fastened to lips which are cast on the bottom of the journal boxes. Vertical adjustment is provided by the use of a grooved plate with slotted holes. This is set up against the shoe beam and fulcrum casting. Two bolts pass through the shoe beam and the adjusting plate and hold it firmly in place. The slipper or contact part of the shoes is made of cast iron, with the weakest part close up to the fulcrum pin, so that if an obstruction is hit the shoe will be broken off close to the beam and the remaining part is sure to clear the third rail and insulators. Each shoe has two spiral springs, one on each side of the fulcrum pin between the inside of the fulcrum casting and the outside of the contact slipper lug. These provide a pressure of 17 lb. per shoe against the third rail. In order to provide additional pressure during sleet and snow storms two additional springs with a cam arrangement are applied to the contact shoes during the winter season. By the use of this cam arrangement an additional 100 lb. pressure is obtained on each shoe. These cams are thrown to their pressure position by a socket wrench whenever occasion demands the additional pressure.

On overhauling, all parts are carefully examined and excessively worn parts are replaced. Shoe fuses are removed and the hand screws are turned back and forth to make certain they work easily. After all parts are put in proper condition the shoes and wiring on the trucks are tested with 2,500 volts to ground.

#### ORIGINAL TRUCKS STILL IN GOOD CONDITION

The motor and trailer trucks under the MP-41 and MB-45 class of cars are still in good condition and practically no changes have been made from the original design. Of course parts have become worn and have been replaced from time to time and a considerable number of transom channels have been replaced, due to



THE TURNTABLE AND HOISTS SAVE TIME IN WHEEL TURNING



cracking. Some equalizers have been changed on both motor and trailer trucks due to their becoming chafed by the truck frame and journal box pedestals.

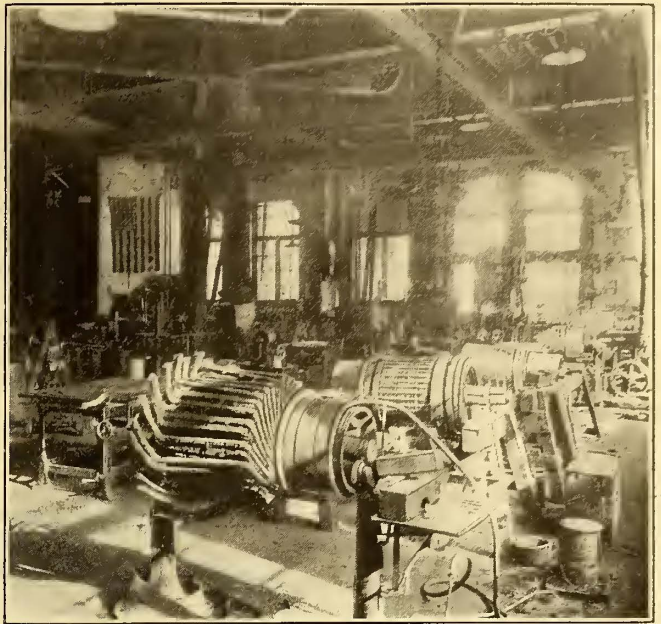
On fifty of the motor passenger-baggage cars there are riveted to the front and back crossbar of trailer trucks two U-shaped iron pieces with suitable holes for mounting a 6-in. x 6-in. x 8-ft. 4-in. wooden beam, which carries a snow flanger on each end. The lower edge of this flanger is 17 in. wide and is set  $2\frac{1}{4}$  in. above the running rail and extends outside so that the flanger clears the third rail and protection board. These flangers clean the snow from between the third rail and running rail and are put on each fall, when the pilots are removed to permit their installation.

#### EQUIPMENT OF CAR BODY IS OVERHAULED AT SAME TIME AS TRUCKS

The switch groups used on all Long Island cars are Westinghouse type 250, which are electro-pneumatic. The magnet valves are energized from a 14-volt storage battery.

In overhauling the control switch group the frames are not removed from the car body, but all parts are dismantled so that they can be more readily cleaned and repaired. The pistons for the air cylinders are taken out and cleaned and all piston packing leathers are renewed. Cylinder-head paper gaskets are replaced and the insulating joints in the piston arms are cleaned off and washed with gasoline, after which they are given a high-voltage test. All arcing tips are removed, cleaned and dipped and, if not excessively worn, filed to insure proper contact and reinstalled. Arcing boxes are removed, thoroughly cleaned and scraped and any that are thin or have holes burned in them are changed. Contact shunts are carefully examined and the arcing horns are renewed when necessary. Blowout-coil connections are carefully examined and bolts are tightened up carefully. Any blowout coils which are defective are replaced. The top of the switch group containing the wiring and connections is carefully cleaned with compressed air and all connections are examined and carefully tightened.

All low-voltage interlocks, fingers and finger blocks are cleaned and smoothed up with emery paper. Blocks are cleaned and shellacked and parts found defective are replaced. Magnet valves are removed from their



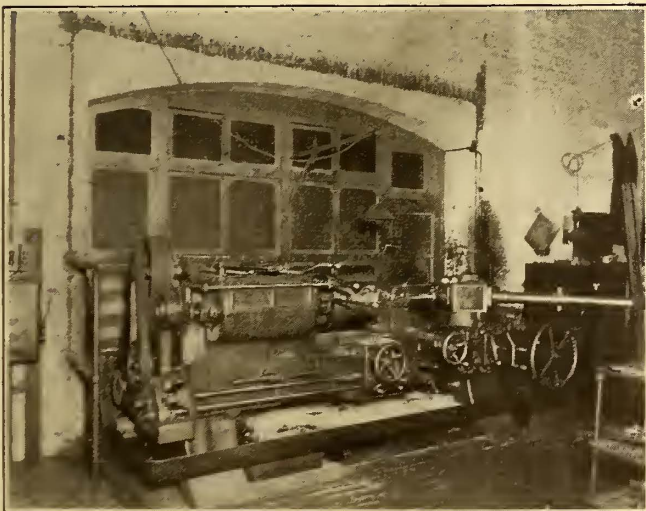
ARMATURES IN ALL STAGES OF WINDING ARE FOUND IN THE ARMATURE ROOM

mountings and the armatures, pin valves and pin valve springs are removed and thoroughly cleaned. New paper gaskets are installed and when the magnets are again assembled proper adjustments are made so that they will operate at the required speed. After all parts of the switch group have again been reassembled all 600-volt contacts and wiring are given a high-voltage test between the frame and ground of 1,500 volts and between the contacts and the frame of 2,000 volts. All 14-volt wiring and contacts are tested with 1,000 volts. Similar overhauling and repairs are carried on the reverser line switches.

All master controller drums are removed and the contacts dressed up and replaced where necessary. Connections are inspected and tested and all bearings are properly lubricated.

#### 14-VOLT 50-AMP. STORAGE BATTERIES ARE USED

Each multiple-unit motor car is provided with two trays of seven storage battery cells. Each battery is rated at 50 amp. at 14 volts. These batteries furnish power for energizing the control circuits and emergency lights and are charged through the compressor circuit, as was described in the previous article dealing with the maintenance of this equipment. In regular operation all batteries are tested every ten days, as already described under the heading of "Inspection Methods." When a car is shopped for overhauling the batteries are examined carefully and if any defective plates or cells are found they are removed and sent to the battery house for overhauling and a new set is installed. Battery overhauling methods are similar to those which have been in use on roads operating this type of equipment for a number of years. The Morris Park shops are provided with a very complete equipment for their battery house and all car-lighting equipment for their steam coaches is overhauled and tested here in addition to the battery work on multiple-unit cars. A plant for distilling water occupies one room of the building; other rooms contain washing tanks, acid mixing tanks and overhauling and testing tables. Batteries are charged from a low-voltage, motor-driven generator.



FINISHING AXLE BEARINGS IN A TURRET LATHE WITH SPECIAL TOOLS

Space limitation of this article will not permit a detailed description of this battery house and the equipment used; a subsequent article, however, will take up this phase of the work.

#### JUMPERS ARE FASTENED PERMANENTLY TO CARS

A train and bus line with jumpers run throughout the trains. One of these is a 600-volt bus line and the other a 14-volt control line. As cars are laid up at various points within the electrified zone considerable trouble was experienced from jumpers being stolen. The bus-line jumpers are made of 200,000-circ.mil cable with copper terminal heads. There is nearly 6 lb. of copper in each of these, so that they were particularly attractive to thieves. In order to prevent loss, it was decided to fasten all types of jumpers permanently to the cars. All electric cars have four receptacles on each end, that is, a train line and bus line receptacle at each corner. One train-line jumper and one bus-line jumper are fastened permanently to its receptacle on each end of the car. This fastening consists of a strap iron clamp that passes underneath the two bolts used for holding the receptacle to the car body. The end of this clamp turns down and fits over a raised portion on the jumper head, so that after the bolts are securely fastened the jumper cannot be removed from its receptacle. Two dummy receptacles are installed on each end of the car to carry the ends of the jumpers while not in use. The train-line and bus-line jumpers are installed on diagonally opposite ends of the car. The train line for the MP-41 cars consists of seven wires, so that a 7-point jumper is used for connecting two of these cars. On the MP-54 cars a 10-point train line is used, so that a 10-point jumper is required. All class T-54 trailer cars have jumpers attached, but instead of a standard jumper and receptacle, with the clamping arrangement just described, a piece of standard jumper cable is used with a regular jumper head fastened to one end. This cable is left loose to form the jumpers and is clamped to the car bodies by hardwood blocks. From this fastening the cable is carried through conduit to a junction box, located under the ends of the car. The officials of the Long Island Railroad have found that while the installing of permanent jumpers involved a higher first cost than otherwise, eventually money is saved in labor and material that is necessary to repair the jumpers, theft is prevented and many annoying train delays are avoided, as the jumpers are always in place, ready for making connection, while with the use of loose jumpers it sometimes happens that the man making up the train does not have jumpers at hand.

In the overhauling of jumpers at the shop they are removed by loosening the supporting bolts of the receptacle and are examined for damaged insulation or broken strands in the conductors. After they are reinstalled on the cars they are given a high-voltage test, 2,000 volts being used for the testing of bus-line jumpers and 1,000 volts for the low-voltage jumpers.

The original control equipment of all cars had Westinghouse type 222-D line switches, but these are now being replaced with a new type, No. 267; approximately 300 cars now have this later type. For general overhauling both the line switches and the current-limit switches are removed from the car body and a careful inspection with necessary repairs and replacements is made at the bench. When the parts are reassembled both line switches and limit switches are calibrated and set by means of a water rheostat to reg-

ulate the current and an ammeter and voltmeter to give necessary readings.

Grid resistors are thoroughly cleaned of all dust and dirt with compressed air, after which all cracked or broken grids are replaced, and the nuts on all bolts holding the frame together and supporting the frames are tightened to make certain they will not work loose in service. All terminals and connections are carefully examined and put in proper condition. If any grids are found broken or other extensive repairs are necessary the complete frame is removed from the car body and sent to the repair shop and another frame of resistors is installed in its place. After all repairs are made the resistors receive a high-voltage test between the grids and frame and also between the frame and ground.

After the overhauling of the entire control equipment is completed it is given a careful operation test. The control equipment is operated from each master controller and from each receptacle through a jumper with a portable master controller. All switches are observed for proper sequence and the main motors are tested for direction. After this test the control is arranged to operate automatically and the equipment is then allowed to operate for from 1 to 1½ hours in this manner to insure that all new parts are properly worked in and to disclose any defects which might develop shortly after the car is returned to service.

#### POWER CIRCUITS ARE BELOW CAR FLOOR

The only 600-volt power circuit that goes above the floor of the car is a tap-off from the bus line leading to the main switchboard panels. There is a three-blade, single-pole, single-throw quick-break knife switch inserted in this circuit to cut off current from the line switch. Other switches control the auxiliary circuits for lighting and heating. The limit switch is also located on the main switchboard of the car and two wires come up to the limit switch so that its pick-up coil is in series with No. 1 motor.

The power circuits on all types of cars are run in conduit. The motor leads are brought from the motor to a wooden cleat on top of the motors, then through brass armor to a wooden cleat on the car body. Knuckle-joint connectors are used for connecting the motor leads to the car-body leads. These are located between the first wooden cleat on the car body and a second wooden cleat through which the leads pass to enter the conduit. Rubber tubing is installed over the knuckle-joint connectors to prevent short circuits from dirt or dampness.

#### LIGHTING INSPECTION AND MAINTENANCE

The interior lighting of passenger cars is furnished by five circuits with five 36-watt 130-volt lamps in series in each circuit. On the older type of MP-41 cars the lamps are of the single-socket type and are distributed along each side of the car. On the later type of car, MP-54, five electroliers are installed along the center headlining. In addition to these five circuits there is another circuit of five 20-watt 130-volt lamps, which supply the markers, vestibule lights and one lamp in the headlining inside the car. These lights are controlled by a three-point snap switch so that either marker or vestibule lights can be used as desired. When the marker lights are lighted a small low-voltage lamp in series with this circuit illuminates the air gage for the motorman. Headlights contain a 36-watt 130-volt lamp with resistance in series. All circuits are

controlled from the main switchboard located in the vestibule in a steel compartment. A single-throw knife switch cuts in all lights and there is a 3-amp. fuse in each circuit. Emergency lamps are also provided which are energized from the storage battery.

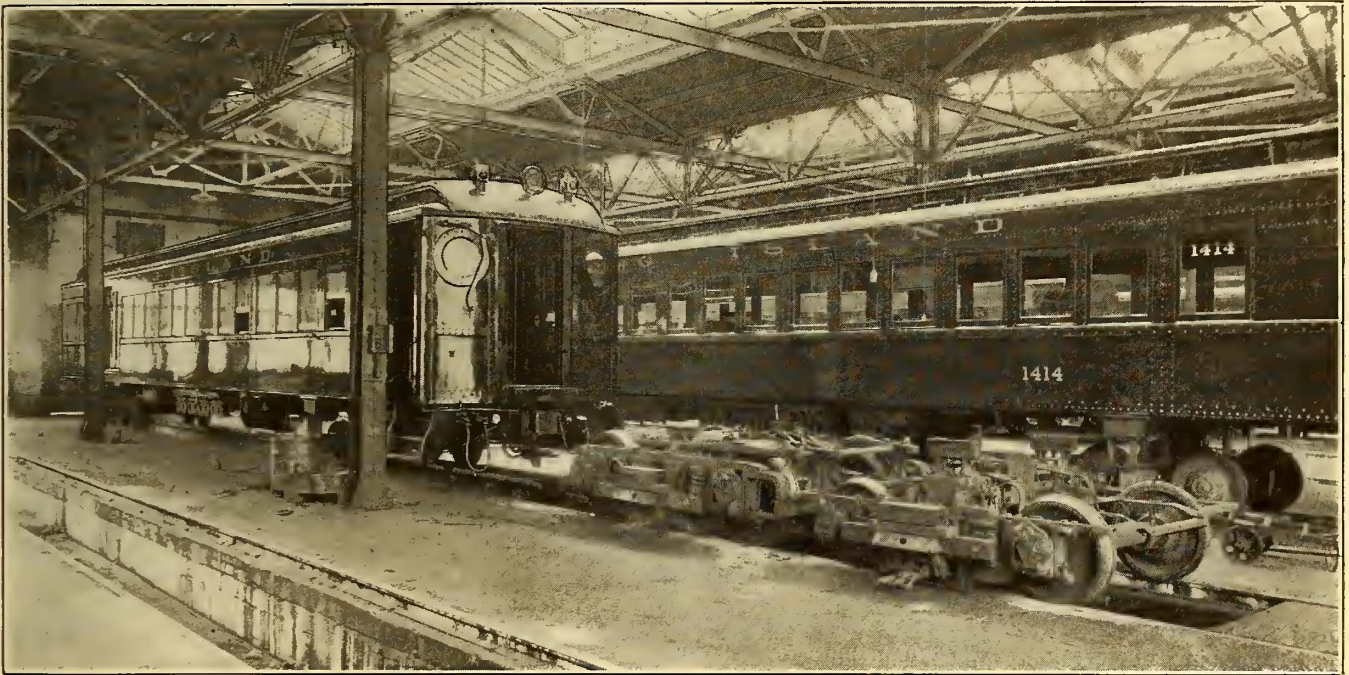
On overhauling all lighting switch blades are removed and dipped, together with all fuse clips. The remaining parts are carefully cleaned and blown out with compressed air. All wiring connections and terminals are carefully tested and inspected and any worn or defective parts are replaced. All receptacles for lamps are carefully gone over and any found defective are repaired or replaced.

Electric heaters are installed in all passenger cars and are controlled from the main switchboard. Cab heaters are installed in the motorman's cab. The cab

brake room, where they are dismantled and thoroughly cleaned. The armatures and field coils are removed and sent to the armature room for cleaning, repairing and testing. Piston rings, connecting rods, crankshafts and bearings are all carefully examined and all necessary repairs are made.

Other parts of the air brake equipment, consisting of the brake valves, feed valves, safety valves, governors, triple valves, air gages and "dead-man's" control relay valve, are also removed from the cars and sent to the air brake room for any necessary repairs. Automatic train stops are installed on the MP-54 type of cars which operate in connection with the signals in the East River tunnel.

Brake cylinders and all air piping are tested for leakage and the automatic air couplers are tested for



PIT TRACKS ACCOMMODATE A CAR AND TWO TRUCKS AT THE SAME TIME

heater switch is so designed that when it is desired to cut in a cab heater a plug on one side of the switch is pushed. When a motorman leaves the cab the closing of the outside vestibule door to cover up the controller and brake valve hits a knob on the switch and cuts it out. These cab heater switches are entirely inclosed except the two knobs that cut them in and out. Whenever a car is in for general overhauling all heater coils are carefully inspected and any found defective are replaced, after which the circuits are tested to determine that the proper amount of current is used as necessary. All heaters are carefully cleaned and blown out with compressed air. Fifty of the MP-54 and MPB-54 cars are equipped with automatic heat regulators. These are set to cut in at 58 deg. F. and out at 61 deg.

The fifty large baggage cars are each equipped with costing recorders. As each train operated has one of these cars, this installation takes care of the service,

#### OVERHAULING OF AIR BRAKE EQUIPMENT

Compressors are overhauled on a time basis and they may not be due for overhauling at the time the car is stopped. Air compressors which are due for overhauling are removed from the car body and sent to the air

leakage and gaged for height and clearance. All air reservoirs are blown out and the cocks are inspected and any leaky ones are replaced and the old ones sent to the air brake room for repairs.

All brake rigging is carefully overhauled and all worn pins are replaced and holes bushed. When the air brake equipment is again connected up the piston travel is adjusted to 4½ in. for the small cars and from 6½ to 7 in. for large cars.

#### ALL MACHINE WORK ON BEARINGS IS DONE IN COMPANY'S SHOP

Brass axle bearings are used on the two types of motors which constitute the Long Island Company's equipment. These are purchased in rough form from brass foundries, which make the bearings according to the drawings and specifications of the railway company. All machine work is done at the Morris Park shops. For machining these bearings a Warner & Swasey turret lathe with special tool equipment is used. An accompanying illustration shows this lathe set up for rough boring of the inside and smooth finishing of the outside of a split axle bearing at one operation. The turret of this lathe is fitted with three boring bars for rough

boring and finishing the inside of the bearing. The tool post turret also carries turning, facing-off and fillet tools. The rough boring bar carries a ring, so that as soon as  $\frac{3}{8}$  in. has been turned off the end furthest away from the chuck this ring is pushed off the bar and placed over the bearing, so that it is thus clamped together and the inside can be rough-bored at the same time that the outside is finished. The final finishing of bearings is done in a pot chuck, where they are finished to the exact size of the axle they are to fit. To insure that the bearing faces are finished so that when installed there will be a standard clearance of  $\frac{1}{16}$  in. between the inside of the gear and wheel hubs and the ends of the bearings a special extended micrometer is used. This consists of a steel rod with a gage point at one end and the other fitted with a micrometer. The measurement between the gear and wheel hubs is accurately taken with this micrometer gage and the bearings are then machined so that the total distance over their faces will be  $\frac{1}{16}$  in. less. After bearings are finished they are clamped to the axle on which they are to be mounted to avoid any danger of misapplication.

New bearings are first fitted to small-sized axles, and when worn they are rebored to fit axles of the same design, but not worn to so small a diameter. When an axle bearing is applied the date is stamped on the outer edge of the collar, so that a record is kept of the life of each bearing. Armature bearings are of brass, but they are lined with tin base babbitt metal.

The Westinghouse type-113 motors, which are in service on the older cars, classes MP-41 and MB-45, have the axle housings somewhat worn, so these are now being rebored from  $7\frac{3}{8}$  in. to  $7\frac{1}{2}$  in. and new bearings are installed of larger diameter to give a tight fit.

A new wheel lathe, manufactured by William Sellers & Company, has recently been installed. This is shown in an accompanying illustration. The top is fitted with a hoist for handling the wheels and immediately in front of the wheel lathe is a turntable, which is also of great assistance in this work. A  $2\frac{1}{2}$ -ton monorail electric hoist is another convenient addition. This handles wheels from the truck shop to both the wheel and axle lathes and facilitates this work very much.

### "Get In" in South America

"AMERICA should send out some American representatives, clean and stalwart men who are willing to do a day's work and who look like men with good American products to sell." This is a message from Verne Le Roy Haven, editor of *Ingenieria Internacional*, now in South America.

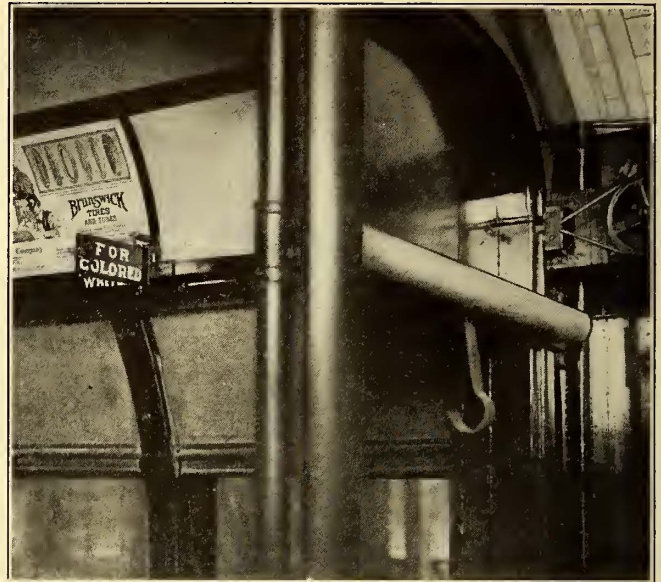
Mr. Haven reports that public works are being started and are in course of construction all along the western coast from northern Peru to Valparaiso. Many of the local projects are financed locally and the people at large are prepared to invest in much-needed improvements and apparently have the money to do the work. A highway, irrigation canal or railway in South America means bringing much greater productive capacity. South America can double her output and find a market for everything, whereas a doubling of output in the United States would glut the world's market. This means much greater opportunity for expansion, relatively, in South America, and hence the activity in the production of all kinds of public works.

Help is needed, it is said, in the construction of these various public works, including railways.

### Adjustable Sign for Negro and White Separation

MOVABLE seat signs which can be shifted forward or backward in the car as the proportion of negro and white passengers changes have not worked out satisfactorily on safety cars, due to the operator being too busy to give proper attention to their location. This situation has been overcome in Houston, Tex., by the installation of a mechanism in the cars which makes the sign adjustable from the vestibule. This was designed and a patent applied for by F. J. Bennett, master mechanic Houston Electric Company.

Instead of being mounted on the seat backs the sign is mounted on either side of the car on a  $\frac{1}{2}$ -in. x 1-in.



AUTOMATIC PASSENGER SEPARATION SIGN AS SEEN FROM REAR VESTIBULE

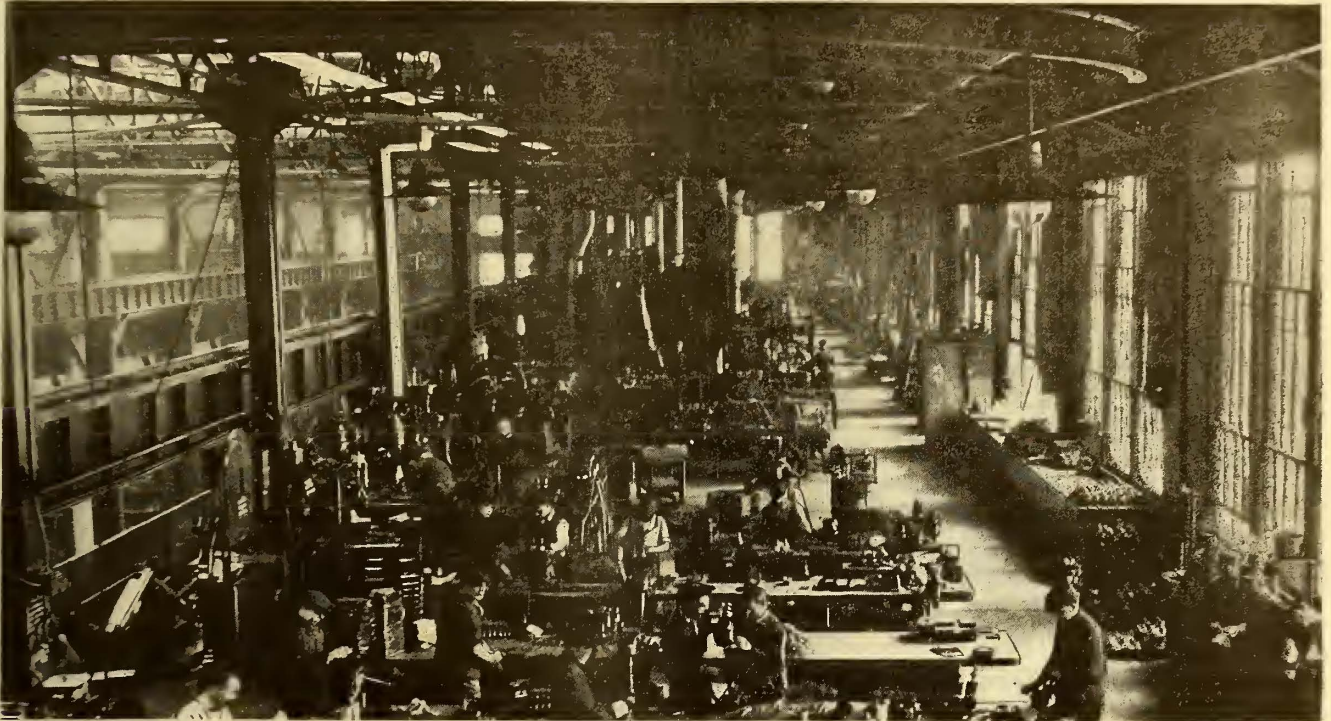
strip placed just below the advertising moulding and extending from one bulkhead to the other. The mechanism is duplicated on each side of the car and each is separately operated. The sign is attached to a small steel cable, which extends through the car behind this strip and passes over a pulley in either vestibule. A handle is provided on the pulley so that it may be rotated and the sign thereby moved forward or backward from either vestibule.

Because of the convenience of this arrangement a safety-car operator glancing back into his car and noting that the seats for the white people are about filled, whereas there are vacant seats at the rear of the car, will reach up and rotate the pulley to move the sign farther back. He can do this while running along without leaving his post. Consequently this detail is taken care of, whereas when changing the sign involved leaving his post and going back into the car it was usually neglected. Another feature of this sign is that it cannot be moved except by turning the pulley in the vestibule, thus preventing negroes from shifting the sign.

When the end of a line is reached the operator can quickly reset the sign for opposite running by simply turning the pulley in either direction until the sign comes to the bulkhead, where it strikes a bumper which reverses the sign. The sign is made in the form of an L, with the words "For Whites" painted on the two inner sides of the L and the words "For Colored" painted on the two outer sides.

# A.C.-D.C. Multiple-Unit Maintenance on the New Haven

A Description of the Methods of Inspection and Maintenance of Multiple-Unit Equipment on the New York, New Haven & Hartford Railroad Is Given and Operation and Maintenance Costs Are Furnished



IN THIS DEPARTMENT ALL SWITCH GROUPS ARE OVERHAULED AND SMALL PARTS MANUFACTURED. WHILE AT THE REAR THIRD RAIL EQUIPMENT IS TESTED AND BEARINGS ARE BABBITTED

SINCE the first electrification of the New York, New Haven & Hartford Railroad a number of articles have been published in the *ELECTRIC RAILWAY JOURNAL* describing the electric locomotives and the service which they perform. When the Van Nest shops were opened at Morris Park, New York City, in 1914, another article was published covering the shops and shop equipment. Little has been said, however, concerning the multiple-unit equipment of the New Haven, and practically no data have been published covering the cost of inspecting and maintaining it.

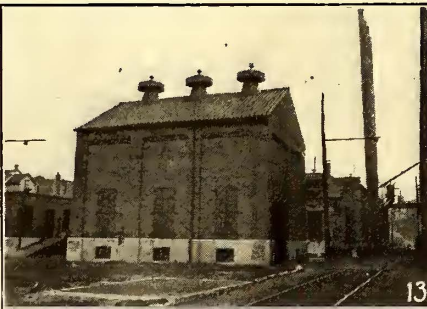
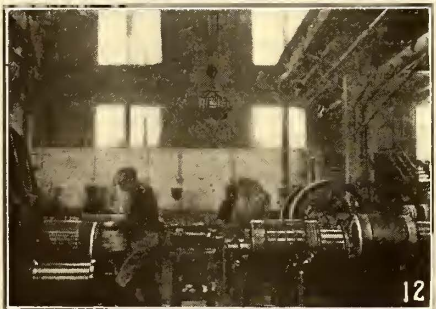
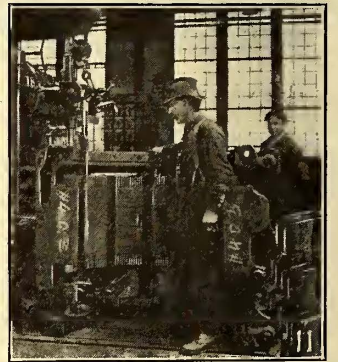
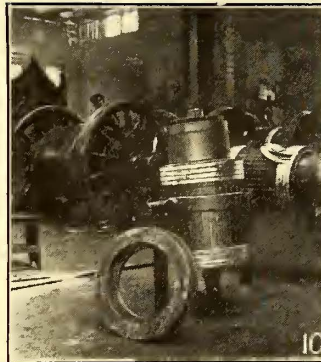
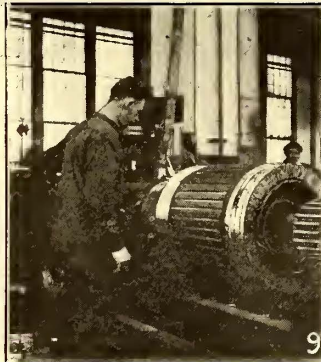
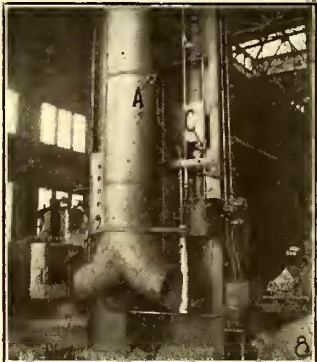
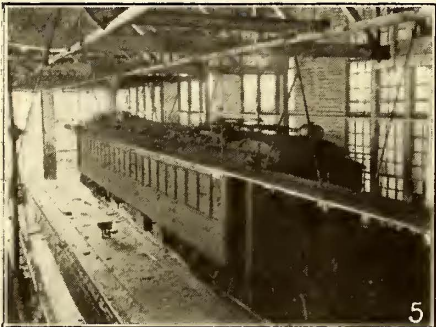
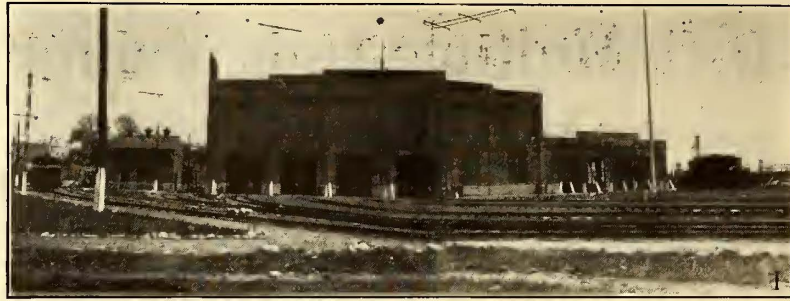
In examining any maintenance or operating cost figures for multiple-unit equipment on the New Haven it must be remembered that these cars are equipped both with a pantograph for alternating-current operation over the private right-of-way of the New Haven and with third rail contact shoes for direct-current operation over the right-of-way of the New York Central Railroad. This double equipment of the multiple-unit "motors" is an important factor governing any figures of cost both of operation and maintenance. Furthermore, while multiple-unit cars on some properties are equipped with only two motors, the New Haven's have four each. On the former properties few and generally no trailers are carried, while on the New Haven the four-motor equipment permits the use of two with every motor car.

The multiple-unit equipment of the New Haven in-

cludes, all told, twenty-seven motor cars and fifty-two trailers. The first cars were purchased in 1909 and placed in service in 1910. These and other cars purchased shortly afterward had open platforms, and of these there are nine motors and twenty trailers. Eighteen motors and thirty-two trailers purchased later have closed platforms. Two of the motor cars and six of the trailers are combination passenger and baggage cars and all but one motor and two trailers are of steel construction throughout. All of the motor cars are equipped with four motors and all but four of them have Westinghouse equipment. There are twenty-one cars equipped with four Westinghouse a.c.-d.c. 175-hp. motors, two with four Westinghouse a.c. 200-hp. motors, two with four G. E., a.c. 150-hp. motors and two with four G. E. 200-hp. motors. In addition to this equipment there are two mail cars which are not equipped with control, but have bus lines and electric heaters.

### GENERAL DATA OF MULTIPLE-UNIT CARS

|   |               |                                       |             |
|---|---------------|---------------------------------------|-------------|
| Length over couplers....                                | 71 ft. 11 in. | Weight of motor.....                  | 32,448 lb.  |
| Length over bumpers....                                 | 70 ft. 7 in.  | Weight of air brake equipment.....    | 6,900 lb.   |
| Over all width.....                                     | 9 ft. 8½ in.  | Weight of control equipment, etc..... | 27,292 lb.  |
| Height from top of rail to top of a.c. trolley (locked) | 14 ft. 3 in.  | Total weight.....                     | 176,180 lb. |
| Wheelbase.....  | 8 ft.         | Weight of mechanical equipment.....   | 109,540 lb. |
| Distance center to center of trucks.....                | 47 ft. 7½ in. | Weight of electrical equipment.....   | 69,640 lb.  |
| Length over end sills....                               | 61 ft. 4½ in. | Seating capacity.....                 | 84          |
| Diameter of wheels.....                                 | 42 in.        |                                       |             |
| Weight car body.....                                    | 69,100 lb.    |                                       |             |
| Weight of trucks.....                                   | 40,440 lb.    |                                       |             |



1. The New Haven shops at Van Nest are spacious and completely equipped and the grounds are beautified with flowers.  
 2. Typical five-car multiple-unit train ready for service. In this case the first car is a trailer.  
 3. Interior of multiple-unit car showing white enamel ceiling and lighting arrangement.  
 4. Inspection shed at Stamford, where all multiple-unit cars receive general inspection.  
 5. Interior of Stamford inspection shed showing pantograph platform and pits.  
 6. The inspection shed at Van Nest, where multiple-unit cars are given heavy inspection and overhaul and where all painting is done.  
 7. Acetylene storage tank with carbide generator at each side.

8. Oxyacetylene welding connections in the shop; A, back pressure pipe; B, acetylene pipe; C, oxygen pipe.  
 9. Banding and soldering a multiple-unit armature.  
 10. Bakelite is applied to each end of the armature and held in place by large iron rings while the armature is baked before dipping.  
 11. "Nipper" devised to pull bars from auxiliary motor fields.  
 12. Armatures are handled by the overhead crane to the bake-oven and lowered through the roof.  
 13. Fireproof diphouse. Note lever on wall for emptying tank in case of fire.  
 14. Interior of diphouse, showing tank and draining platform. Note winch on rear wall for raising lid and arrangement at side of tank for automatic emptying in case of fire.

An accompanying illustration shows a plan and elevation of a closed-platform multiple-unit motor car, while another indicates the location of the larger part of the electrical equipment. The general data of these cars are as shown in table on previous page.

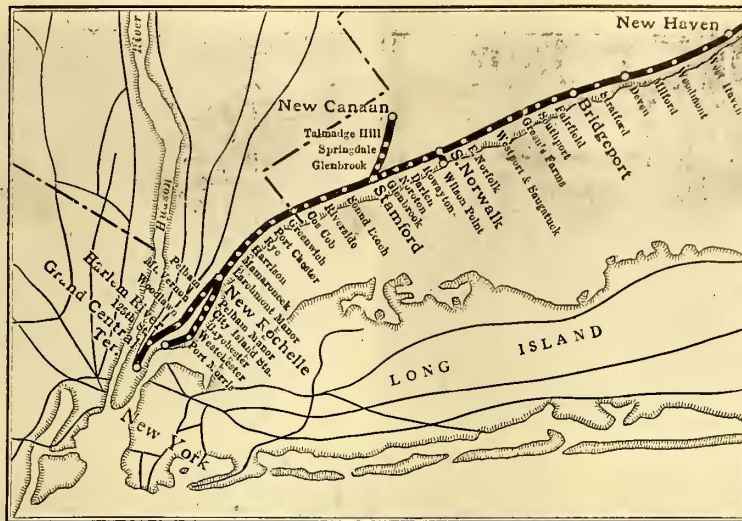
The multiple-unit operating zone of the New Haven Railroad is shown in an accompanying illustration. There are four operating sections as follows:

1. Stamford to Grand Central Terminal, New York City, 33 miles, of which 12 miles is over the New York Central right-of-way and is d.c. operation, while 21 miles is on the New Haven right-of-way and is a.c. operation. The section is four-track construction throughout.
2. New Rochelle to Grand Central Terminal, New York City, 17 miles. Five miles on New Haven right-of-way is a.c. operation and 12 miles on New York Central right-of-way is d.c. operation. This section is four-track construction throughout.
3. New Rochelle to Harlem River, 12 miles. This is all a.c. operation over the private right-of-way of the New Haven road and is six-track construction throughout.
4. Stamford to New Canaan, Conn., 8 miles. This section is all on New Haven right-of-way, a.c. operation, and includes only one track.

Multiple-unit trains are occasionally called upon to operate as far as Bridgeport, Conn., and on exceptional occasions have operated as far as New Haven.

The average number of multiple-unit trains per day, including all four sections, for the month of April, 1920, was ninety-two. The week-day schedule calls for the following trains:

|                                    |             |
|------------------------------------|-------------|
| Stamford to Grand Central.....     | 14 each way |
| New Rochelle to Grand Central..... | 6 each way  |
| New Rochelle to Harlem River.....  | 21 each way |
| Stamford to New Canaan.....        | 14 each way |



MAP OF NEW HAVEN RAILROAD LINES OVER WHICH MULTIPLE-UNIT EQUIPMENT OPERATES

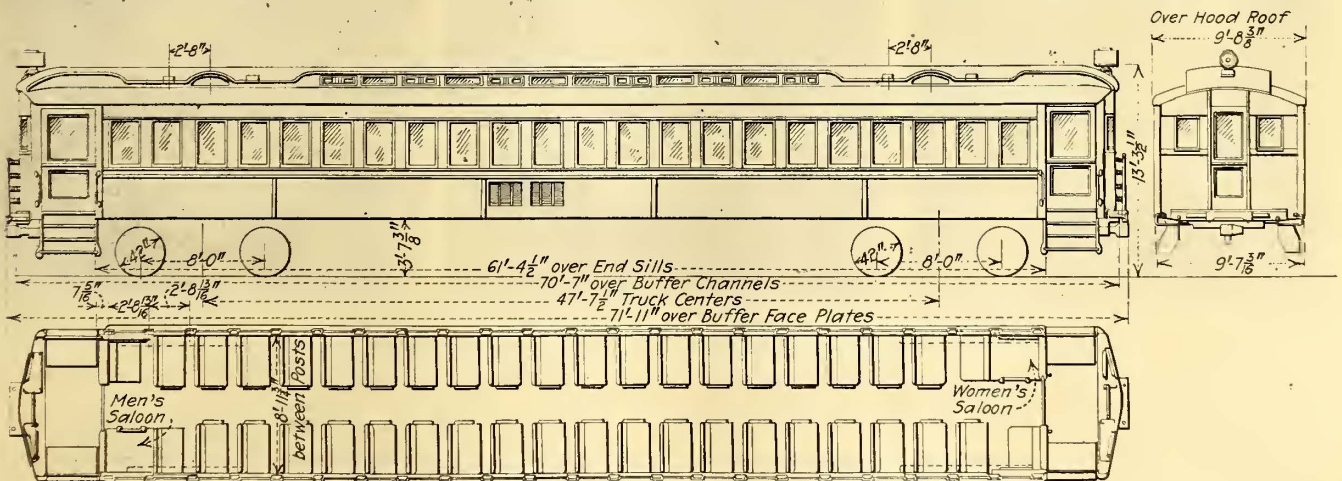
The trains operating between Stamford and Grand Central are made up of from three to nine cars, mostly six or nine cars; those from New Rochelle to Grand Central are made up almost entirely of six and nine cars; those from New Rochelle to Harlem River are mostly two-car trains, but run up as high as five cars, and in the summer average four cars, increasing in length at times to eight and nine cars; those from Stamford to New Canaan are all

two-car trains. On the New Canaan and Harlem River branches approximately 4,800 passengers are handled per day, while approximately 9,000 passengers per day are handled in and out of Grand Central Terminal by multiple-unit trains.

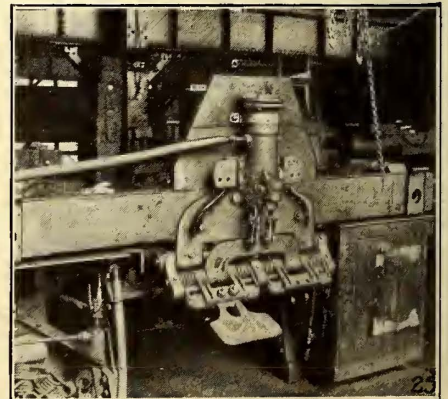
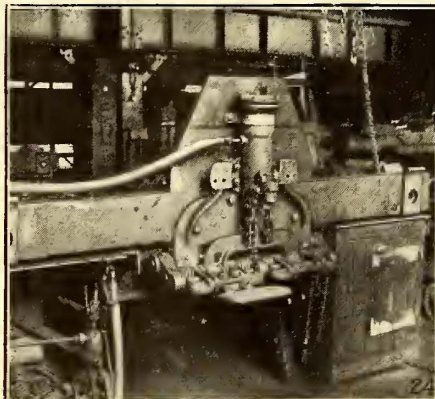
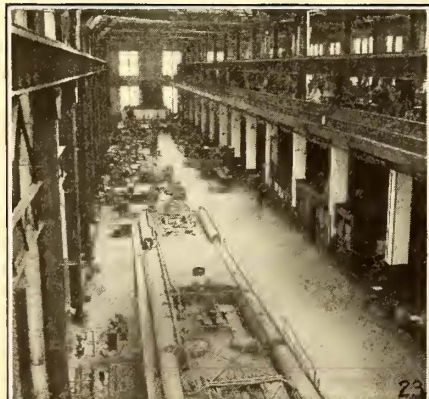
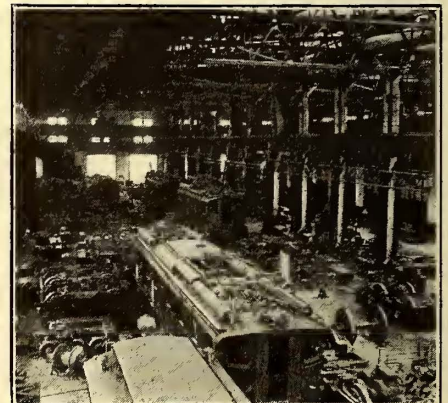
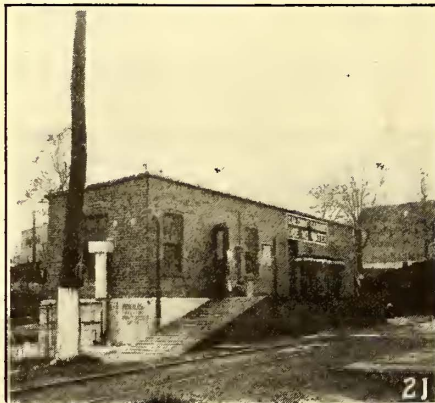
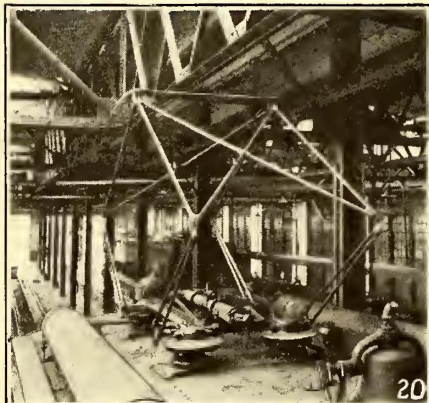
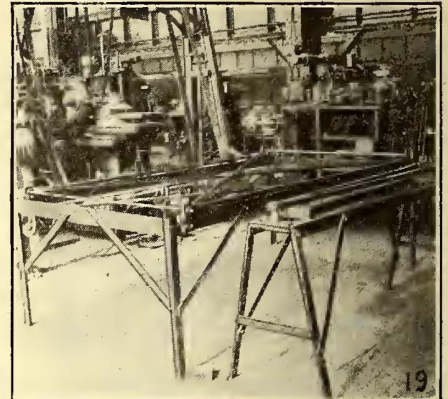
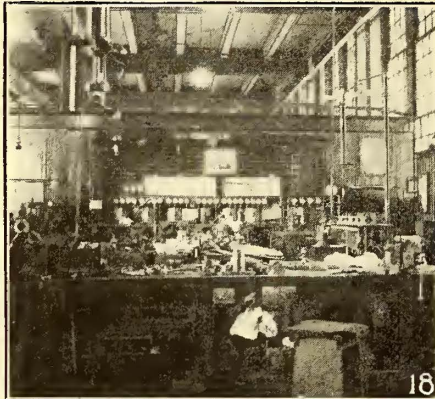
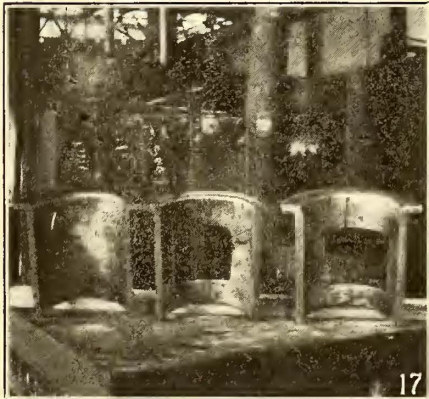
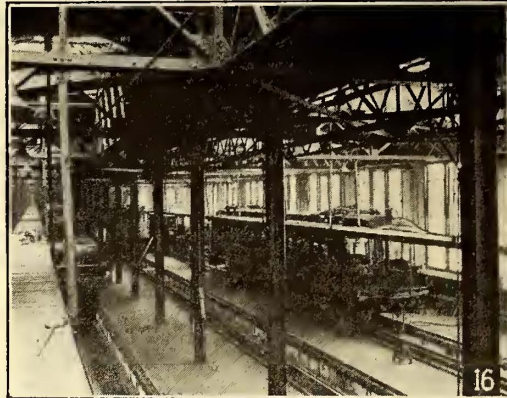
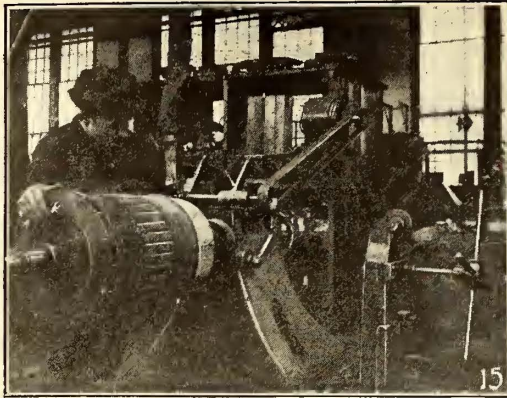
THERE ARE THREE CLASSES OF INSPECTION

Inspections made on the multiple-unit equipment are divided into three classes, the customary terminal inspection at the end of every run, the regular light and heavy inspection on a mileage basis and the complete overhaul. The regular inspection is that of greatest importance and is the one which will receive detailed consideration in this article. This inspection is made at Stamford, Conn., on the basis of every 2,000 miles of operation of the motor cars. The multiple-unit service calls for between 60,000 and 70,000 motor car-miles per month, resulting in an average of approximately 2,500 miles per car per month. This results in a general inspection at intervals of slightly less than a month.

Trailer cars are inspected at the rate of three or four a week, resulting roughly in one inspection per car about once every two months. This inspection amounts to very little as compared with the motor car inspection, but is necessary due to the location on the car of motor-generator sets, change-over switches for emergency



PLAN AND ELEVATION OF NEW HAVEN CLOSED-PLATFORM MULTIPLE-UNIT MOTOR CAR



15. Device used for undercutting commutator and exhaust to remove mica dust.

16. Multiple-unit car undergoing painting at Van Nest.

17. Babbitting axle and armature bearings. At left, new bearing; center, worn bearing dovetailed and tinned; right, babbitted bearing ready for service.

18. Air brake department with rack for testing all valves.

19. Jigs used for squaring up pantograph frames during assembly.

20. Details of pantograph construction with pantograph in position on car ready for service.

21. The oxyacetylene generating plant is also of fireproof construction.

22. The erecting bay at the Van Nest shop.

23. Heavy machine tool bay with bake oven at rear.

24 and 25. Third rail contact improvement, showing in Fig. 24 the shoe in the running position, and in Fig. 25 the shoe in the emergency down position.



lighting, controllers, relays and other equipment necessary for multiple-unit operation.

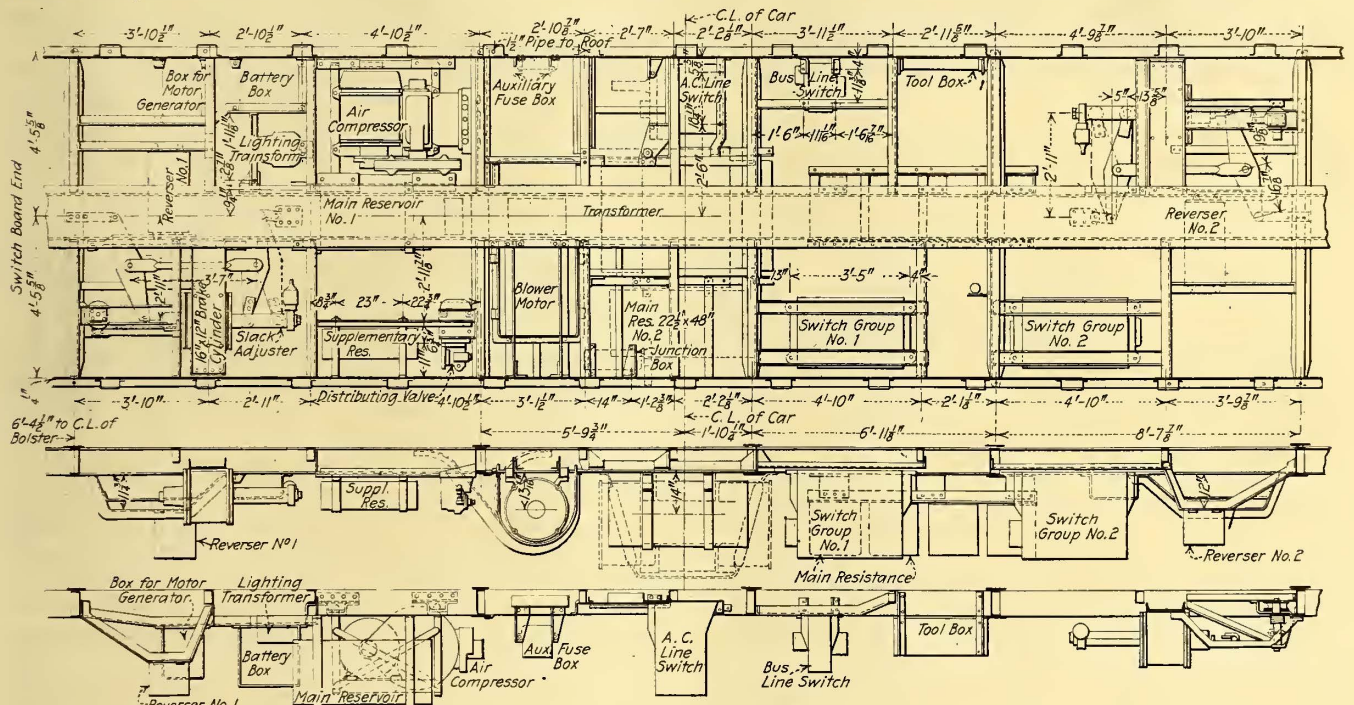
All inspection of multiple-unit motor cars is made at night. This is due partly to the fact that the electric locomotives are inspected during the day and the shop facilities are limited. Such an arrangement also permits a greater use of the multiple-unit cars, as they would ordinarily lie up at night in any case. The inspection crew is divided up so that one, two or three men confine themselves to the inspection of certain parts of the equipment. An inspection card is hung in some convenient position on the car and as the inspection of various parts of the equipment is completed the men who handle this inspection sign their names on the card.

Two men are generally assigned to the inspection of the main motors. The cover is removed and the motor is examined for an overheated armature and the commutator is examined for ridges. The motor is blown out with an air hose to remove all carbon and other dust. In this connection it has been found that ventilated motors keep themselves much cleaner than do those of

switch unit can be changed in from ten minutes to a half hour and a cylinder can be changed in a few minutes. Storage batteries are checked up and flushed and operating relays are examined. Finally, a break-down test is made with a testing transformer to see that the switch groups and main resistance are "O.K."

One man and a helper take care of the third rail shoes and pantograph, changing the wearing parts when necessary and checking up the operation of the mechanism. An additional man inspects the compressors and blowers, cleaning the motors in the manner already described for the main motors. Valves of the compressor are examined and the crank case is filled up to line with oil.

A truckman and helper handle the inspection and running repairs on the trucks and brake rigging. Axle bearings are changed if necessary and worn brake shoes are replaced. An additional man specializes on the air brake equipment. Feed valves are inspected and leakage tests made, and all air brake apparatus is checked up. Controllers, relays, push-button apparatus, and everything connected with the control equipment



TYPICAL INSTALLATION OF ELECTRICAL EQUIPMENT ON A.C.-D.C. MULTIPLE-UNIT MOTOR CAR OF N. Y., N. H. & H. R.R.

the non-ventilated type. If the inside of the motor appears oily, it is wiped out, and wood alcohol is used to clean the brushholder insulators and string bands. The motor is checked up for broken brushholder shunts or frayed insulation and for box wear. Brushes are renewed when so worn that they will not run to the next inspection. The insulation is touched up if necessary with shellac or armature varnish. Oiling of the motor bearings is done at this time and never between inspections.

Inspection of the switch-group and other electrical apparatus is generally done by two men. The arc chutes are cleaned up, burnt copper is brushed from the switch tips and any tips which need it are changed. If a switch is found defective this unit is changed. The switch cylinders are checked up for possible leaks or slow action and all dirt and dust are blown out of the switch group with an air hose. The insulation is touched up when necessary with armature varnish. A

switch unit can be changed in from ten minutes to a half hour and a cylinder can be changed in a few minutes. Storage batteries are checked up and flushed and operating relays are examined. Finally, a break-down test is made with a testing transformer to see that the switch groups and main resistance are "O.K."

If during the inspection any heavy repair work is found necessary, such as commutator turning, armature or field repairs, wheel turning, etc., the cars are sent to the Van Nest shop. Cars are painted on a basis of every eighteen months of operation. This depends, however, upon when this date arrives, as an attempt is made to handle the painting at some time when the car is at the shop for general repairs.

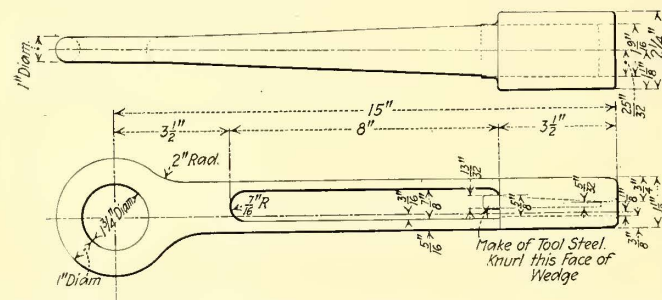
Trailer cars are inspected in the yards at Stamford. On this inspection an electrical repair man looks over the electrical apparatus and lighting systems, batteries, relays, lighting change-over switches and heating apparatus and control. A truckman inspects the trucks and brake rigging, bearings, etc.

It has already been stated that the first multiple-unit cars were placed in service in 1910. These were changed

over from automatic to hand control in 1914 and given a complete overhaul. Since that time no overhaul has taken place on these cars until the present time, indicating that this may occur approximately every six years. This inspection and overhaul, which is now being given to all motor cars, follows the lines of the general inspection already described, except that it is more thorough and all equipment, in addition to being inspected, is completely overhauled.

All auxiliary apparatus is removed and overhauled, all switch cylinders, switches and blowers, compressors and air brake apparatus are overhauled. The body of the car is removed from the trucks and placed on shop trucks and the main motors are removed from the trucks. All loose rivets, nuts and bolts are tightened on the trucks and the trucks are cleaned with wire brushes and painted. The main motors are dismantled, armatures are tested and commutators turned if necessary. The field winding is checked up and given an insulation test and if necessary the armature is wound. The inside of the motor housing is sprayed with armature varnish before the motor is again assembled. All control apparatus is also completely overhauled.

A definite improvement over the original design has been made in the third rail contact shoe equipment. An



DETAILS OF CONSTRUCTION OF BAR PULLING "NIPPER"

extra piston has been inserted in the cylinder and by the use of extra links the shoe can be dropped away from the rail. This has two advantages. In case of emergency, when it becomes necessary to work on a car in service, the shoe is placed in the emergency position and blocked away from the rail. Formerly this had to be pushed down and a third rail shoe paddle inserted between rail and shoe, which operation was more or less dangerous, as a slip might throw the worker against the third rail. The emergency down position also comes into play in breaking an arc which does not cause the main d.c. fuses to blow. The result of dropping the shoe gives the effect of a magnetic blow-out and quickly breaks an arc which may reach as high a current as 2,000 to 5,000 amp.

ARMATURE WINDING PRACTICE

When an armature comes into the shop to be re-wound the coils are stripped and the commutator is cleaned. The Monel metal coils are then reinsulated, put into the bottom of the slot and soldered into the commutator. A layer of mica insulation is placed over the front and back ends of these and the bottom copper coils are placed in position. A layer of mica insulation is placed over this at the front and back ends and the top copper coils are placed. Clips are then put on the front and back ends and the armature is placed in the oven under a temperature of about 200 deg. F. and remains there over night.

The following morning the armature is removed from

the oven and temporarily banded, and fiber wedges are inserted on the coils. Clips are wedged for soldering and the end coils cut off even with the clips and soldered. Wedges are removed, mica U-pieces are placed in the front end and treated asbestos tape is woven into the back end. The armature is then permanently banded. Bakelite, in the form of a paste, is applied to both front and back ends and the armature is replaced in the oven at the same temperature and again remains overnight. The following day the armature is dipped and is then baked for 100 hours at a temperature of about 200 deg. F. An accompanying illustration shows the method of handling the armatures by crane through doors in the top of the baking oven.

When the Van Nest shops were first opened armatures were dipped in a tank in the floor of the shop adjacent to the bakeoven. Due to the fire hazard of having this inflammable material inside the shop a separate building entirely fireproof has now been constructed for a diphouse. This building is located on the north side of the shop and measures about 30 ft. x 36 ft. The base is concrete, with brick walls, a tile roof and wire glass windows, and all doors and shutters are of steel fire-proof construction.

Inside the building is a large tank containing 2,300 gal. of dipping varnish. Material to be dipped is handled by an overhead air-operated crane with both a 10-ton and 5-ton hoist. The tank is also provided with an air inlet at the bottom so that before material is dipped the varnish can be thoroughly stirred up. In case of fire a lever operated from outside the building opens a valve which permits the contents of the tank to flow by gravity into a tank some distance from the building. Should no one, however, be on duty to perform this operation, two fusible links in the chain which holds this valve closed by a spring will melt and the same result is obtained as though the lever had been operated by hand.

The cover of the tank is raised and lowered by a hand winch on the inside wall of the building. In case of fire, however, a chain pulled from outside the building disengages the winch mechanism by raising a weight, and the cover automatically drops into position. A fusible link in the chain which holds the cover up will also allow it to drop in case of fire, and a fusible link in the chain operating the door will close this in case of fire. There is no electricity or other lighting apparatus inside the building. Electric lights are provided between the shutters and the windows, but when the tank is being used the shutters are opened and there is ordinarily sufficient light. A pipe line across the ceiling, with two large nozzles, is operated by means of a valve located on the outside of the building and the interior can be quickly drenched to smother a fire.

It will be noted from an accompanying illustration that ventilation is provided by means of louvers at the base of the building and ventilators in the roof. Inside the building a radiator is placed in front of each louver. For any material which needs to drain for any length of time after having been immersed in the varnish a rack is provided at the side of the tank and the surplus varnish drains back into the tank.

During the past year only five multiple-unit armatures have been rewound. About six commutators are turned per month. For undercutting after turning the commutator a device originally purchased has been greatly improved upon. This is shown in an accompanying illustration. In making these improvements S. K. F.

ball bearings have been used in the head of the machine to eliminate vibration. The device is also equipped to use two saws simultaneously. A screw at the front provides for vertical adjustment and a clamp at one side holds the saw in the desired position. The practice is to undercut  $\frac{1}{8}$  in.

In addition to the improvement in the undercutting device, an exhaust tube has been provided to carry away the mica dust. This exhaust tube is connected with the air line from the carpenter shop and the mica dust is drawn away by means of a blower motor located near the roof of the shop.

An interesting device is in use for pulling the bars of the auxiliary motor field. This device is clearly illustrated in an accompanying drawing and is also shown in service. The "nipper," attached to a hoist, is placed over the end of a bar and the wedge dropped into position. It will be noted that the face of the wedge is knurled. The pull of the hoist serves to tighten the grip on the bar and the entire complement of 144 bars can be pulled in half an hour. These bars were formerly driven out by hand and it often took a day to drive out two or three.

It has already been stated that cars are painted on a schedule of about every eighteen months of operation.

varnish and then leaded and given two coats of finishing varnish. The ceiling of the car, if badly cracked by frost or cold, is scraped down to the steel and sandpapered, after which one coat of primer is applied, this consisting of white lead, finishing varnish and boiled oil, and it is allowed to stand for forty-eight hours, following which one coat of enamel is applied. This gives an excellent white ceiling. To the deck and side walls is applied one coat of buff enamel. The curtains and cushions are Pantasote renovated and the base, floors and seat irons receive one coat of green enamel. This class of painting does not have to be performed more often than every eight to ten years.

Other work which is performed at the shop includes the babbitting of the armature and axle bearings, the repair and manufacture of pantographs, the making of all shunts, contactors and brushholders, the building up of switches, welding of various pieces of apparatus, etc. In the repair of axle and armature bearings no brass liners are used. When the flange of the bearing has worn down about  $\frac{1}{4}$  in. it is dovetailed and tinned and babbitt applied to take up the wear. The inside wearing surface of the bearing is also rebabbitted, about  $\frac{3}{8}$  in. of babbitt being deposited and later turned down to about  $\frac{1}{8}$  in. The method of dovetailing the bearing

TABLE I—MAINTENANCE COSTS ON MULTIPLE-UNIT CARS, N. Y., N. H. & H. R.R., 1919  
Inspection, Repairs and Replacements

| Month          | Mechanical  |             | Electrical  |             | Total        | Total Car-Miles | Cost Cents per Car-Mile |
|----------------|-------------|-------------|-------------|-------------|--------------|-----------------|-------------------------|
|                | Labor       | Material    | Labor       | Material    |              |                 |                         |
| January.....   | \$4,327.08  | \$2,226.53  | \$6,681.57  | \$4,431.11  | \$17,666.29  | 163,544         | 10.8                    |
| February.....  | 4,190.87    | 2,397.26    | 7,415.41    | 2,980.11    | 16,983.65    | 144,601         | 11.8                    |
| March.....     | 4,144.85    | 3,644.60    | 5,911.02    | 7,243.19    | 20,943.66    | 156,527         | 12.8                    |
| April.....     | 3,554.93    | 3,728.81    | 8,158.45    | 7,449.42    | 22,891.61    | 155,037         | 14.7                    |
| May.....       | 3,031.48    | 2,437.30    | 7,958.33    | 5,183.55    | 18,610.66    | 169,107         | 11.0                    |
| June.....      | 2,921.46    | 2,716.66    | 6,451.01    | 1,726.14    | 13,815.27    | 170,751         | 08.1                    |
| July.....      | 1,952.16    | 2,582.84    | 5,514.69    | 2,609.21    | 12,658.90    | 187,212         | 06.8                    |
| August.....    | 2,052.16    | 95.81       | 4,794.07    | 3,844.64    | 10,786.68    | 158,851         | 06.8                    |
| September..... | 2,999.17    | 3,686.95    | 5,496.80    | 1,637.19    | 13,820.11    | 154,221         | 08.9                    |
| October.....   | 3,350.59    | 1,874.53    | 6,610.43    | 1,252.35    | 13,087.90    | 168,370         | 07.8                    |
| November.....  | 3,058.78    | 2,368.11    | 6,204.72    | 4,123.52    | 15,755.13    | 160,264         | 09.8                    |
| December.....  | 3,438.59    | 992.59      | 8,630.35    | 4,179.47    | 17,241.00    | 144,750         | 11.9                    |
| Total.....     | \$39,022.12 | \$28,751.99 | \$79,826.85 | \$46,659.90 | \$194,260.86 | 1,933,235       | 10.03                   |

This work is all done at Van Nest on one track of the inspection shed. According to the program, painting is divided into two classes, "Class A" and "Class B."

In "Class B" painting, which is done approximately every eighteen months, the car is first scrubbed with soap and water and the inside is renovated. Where the paint is marred or cracked on the outside of the car the spots are touched up with a primer. The second day a putty coat is applied, and the third day the outside of the car is sandpapered and touched up with a flat paint. On the afternoon of the third day one coat of Pullman color enamel is applied. On the fifth day the letterboard is varnished and the gold numbers are applied. Meantime, the roof, deck, trucks and platforms have been painted black, the seat frames and floors painted and the seats and curtains renovated with Pantasote renovator.

"Class A" painting is done only when the paint is in bad condition. In this case the paint is first removed with a varnish remover and the car is washed with turpentine, scraped with a wire brush and sanded. A coat of primer is then applied and in forty-eight hours a second or leveling coat applied. The car is then allowed to stand for twenty-four hours and then either "rough-stuffed" with two or three coats a day or puttied and knifed in and sanded. If rough-stuffed the steel is first rubbed with pumice stone and oil. Sandpaper is then applied, followed by one coat of flat color and one of

flange and applying the babbitt is shown in an accompanying illustration.

Pantograph frames are made up from Shelby seamless tubing, 1 in. in outside diameter and  $\frac{3}{8}$  in. in thickness. Into the ends of this tubing are driven 3-in. maple plugs,  $\frac{3}{8}$  in. in diameter. The jigs shown in one of the illustrations are used to square up the frames. The top frame is the same on both the multiple-unit equipment and the locomotives, while the bottom frame is 1 in. longer on the multiple-unit cars. All pantograph insulators are the same for all equipment. About 120 pantograph frames a month are made up for all multiple-unit equipment and locomotives.

WELDING WORK MOST CONVENIENTLY ACCOMPLISHED

The Van Nest shop equipment includes facilities for electric welding, but this is not as extensively used as is the oxyacetylene method. This work is greatly facilitated by the location on the premises of an oxyacetylene generating plant. Pipes conveying both the oxygen and the acetylene are carried throughout the shop and outlets are provided at numerous points. An illustration shows the piping arrangement on one of the upright supports which divides the erecting bay from the heavy machine tool bay and provides support for the overhead crane. The pipe at the extreme left is an outlet to prevent back pressure. The one beside it conveys acetylene and the pipe at the extreme right conveys oxygen.

TABLE II—CAR DEFECT REPORT, N. Y., N. H. & H. R.R., 1919

|                             | Motor Cars |          |       |       |     |      |      |        |           |         |          |          | Total<br>Trailer<br>Cars | Total |
|-----------------------------|------------|----------|-------|-------|-----|------|------|--------|-----------|---------|----------|----------|--------------------------|-------|
|                             | January    | February | March | April | May | June | July | August | September | October | November | December |                          |       |
| Compressors                 | 0          | 0        | 0     | 1     | 0   | 0    | 1    | 1      | 0         | 0       | 0        | 1        | 5                        | ..    |
| Compressors canopy switches | 0          | 2        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 2                        | ..    |
| Governors                   | 0          | 1        | 0     | 0     | 1   | 0    | 0    | 0      | 0         | 1       | 1        | 2        | 6                        | ..    |
| Control valves              | 0          | 0        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 0                        | ..    |
| Stuck brakes                | 0          | 0        | 0     | 1     | 0   | 0    | 2    | 0      | 1         | 3       | 0        | 3        | 10                       | 1     |
| Feed valves                 | 3          | 2        | 1     | 3     | 1   | 5    | 2    | 2      | 1         | 0       | 0        | 0        | 21                       | ..    |
| Brake valves                | 1          | 0        | 3     | 3     | 1   | 0    | 1    | 1      | 1         | 6       | 1        | 0        | 18                       | ..    |
| Distribution valves         | 0          | 1        | 2     | 1     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 7        | 11                       | ..    |
| Brakes release slow         | 0          | 1        | 2     | 1     | 0   | 0    | 1    | 0      | 0         | 0       | 0        | 1        | 6                        | 1     |
| Poor brakes                 | 0          | 1        | 0     | 0     | 0   | 0    | 0    | 0      | 1         | 1       | 1        | 0        | 4                        | ..    |
| Emergency valves            | 0          | 0        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 0                        | ..    |
| Whistles                    | 0          | 0        | 0     | 0     | 1   | 0    | 1    | 0      | 0         | 0       | 0        | 1        | 3                        | ..    |
| Signal whistles             | 1          | 0        | 4     | 0     | 1   | 1    | 1    | 0      | 1         | 0       | 1        | 0        | 9                        | ..    |
| Air pipes                   | 0          | 0        | 0     | 1     | 0   | 1    | 0    | 1      | 1         | 1       | 0        | 0        | 5                        | ..    |
| Angle cocks and hose        | 0          | 0        | 0     | 0     | 1   | 0    | 0    | 1      | 1         | 0       | 1        | 0        | 4                        | ..    |
| D.c. circ. breakers         | 1          | 0        | 0     | 0     | 0   | 1    | 0    | 0      | 0         | 0       | 0        | 1        | 3                        | ..    |
| A.c. circ. breakers         | 1          | 0        | 0     | 0     | 0   | 0    | 0    | 2      | 2         | 0       | 0        | 0        | 5                        | ..    |
| Line switches               | 0          | 0        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 0                        | ..    |
| A.c. wiring                 | 0          | 0        | 0     | 0     | 1   | 0    | 0    | 0      | 0         | 1       | 0        | 0        | 2                        | ..    |
| D.c. wiring                 | 0          | 0        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 0                        | ..    |
| Transformers                | 0          | 0        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 0                        | ..    |
| Control wiring              | 0          | 0        | 0     | 0     | 0   | 0    | 0    | 0      | 1         | 3       | 1        | 4        | 9                        | ..    |
| Current relay               | 0          | 0        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 0                        | ..    |
| Line relay                  | 0          | 0        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 0                        | ..    |
| Overspeed relay             | 0          | 0        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 0                        | ..    |
| Jumpers and sockets         | 1          | 1        | 0     | 0     | 2   | 0    | 1    | 0      | 0         | 0       | 0        | 0        | 5                        | ..    |
| Switch groups               | 0          | 0        | 0     | 0     | 0   | 1    | 0    | 0      | 0         | 0       | 0        | 0        | 1                        | ..    |
| Switches                    | 0          | 0        | 1     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 1                        | ..    |
| Lights                      | 3          | 1        | 0     | 4     | 2   | 1    | 0    | 3      | 1         | 1       | 0        | 6        | 22                       | 3     |
| Battery lights              | 1          | 0        | 0     | 0     | 0   | 1    | 1    | 0      | 0         | 0       | 0        | 0        | 3                        | ..    |
| Motor leads                 | 0          | 0        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 0                        | ..    |
| Pantographs                 | 5          | 5        | 4     | 5     | 5   | 11   | 14   | 8      | 4         | 9       | 2        | 6        | 78                       | ..    |
| Contact shoe equipment      | 0          | 0        | 0     | 0     | 0   | 1    | 0    | 1      | 0         | 1       | 0        | 3        | 6                        | ..    |
| Contact shoe fuses blown    | 1          | 0        | 2     | 0     | 0   | 0    | 0    | 0      | 1         | 0       | 0        | 0        | 4                        | ..    |
| Batteries                   | 0          | 0        | 0     | 0     | 0   | 1    | 0    | 1      | 0         | 0       | 0        | 2        | 3                        | ..    |
| Heaters                     | 2          | 1        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 3                        | 5     |
| Motor generators            | 1          | 0        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 1                        | ..    |
| Reversers                   | 1          | 1        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 2                        | ..    |
| Motors                      | 0          | 0        | 0     | 0     | 4   | 3    | 1    | 1      | 2         | 2       | 0        | 1        | 14                       | ..    |
| Blowers                     | 0          | 0        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 0                        | ..    |
| Blowers canopy switches     | 1          | 2        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 3                        | ..    |
| Flat wheels                 | 1          | 2        | 0     | 1     | 0   | 2    | 0    | 1      | 0         | 0       | 1        | 8        | 3                        | ..    |
| Hot journals                | 2          | 0        | 0     | 0     | 0   | 2    | 0    | 0      | 1         | 0       | 1        | 6        | 4                        | ..    |
| Hot armature bearings       | 0          | 2        | 1     | 0     | 0   | 1    | 0    | 0      | 0         | 0       | 0        | 0        | 4                        | ..    |
| Gears                       | 0          | 0        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 0                        | ..    |
| Gear cases                  | 1          | 0        | 2     | 0     | 1   | 0    | 0    | 0      | 1         | 0       | 0        | 0        | 5                        | ..    |
| Doors                       | 5          | 0        | 2     | 0     | 3   | 3    | 0    | 0      | 1         | 5       | 2        | 4        | 25                       | 16    |
| Glass                       | 1          | 0        | 2     | 3     | 0   | 0    | 1    | 0      | 0         | 0       | 0        | 2        | 9                        | 3     |
| Car seats                   | 0          | 0        | 1     | 0     | 0   | 0    | 1    | 0      | 0         | 2       | 1        | 0        | 5                        | 5     |
| Trucks                      | 0          | 0        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 0                        | ..    |
| Leaky roofs                 | 0          | 0        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 0                        | ..    |
| Buffers broken              | 0          | 0        | 1     | 2     | 0   | 0    | 0    | 0      | 0         | 1       | 0        | 0        | 4                        | ..    |
| Cars uncoupled              | 0          | 0        | 0     | 0     | 0   | 0    | 0    | 0      | 0         | 0       | 0        | 0        | 0                        | ..    |
| Resistance grids            | 2          | 1        | 0     | 0     | 2   | 0    | 0    | 0      | 2         | 0       | 1        | 8        | ..                       |       |

The generating plant is the standard railroad equipment provided by the Oxweld Company and has a capacity of 200 cu.ft. of acetylene gas an hour. The fireproof building is about 12 ft. x 50 ft. and a portion of the generating room is shown herewith. Briefly, the operation is as follows: Carbide is placed in the top of each of the generators and is automatically fed into the water below. The tank in the center contains the stored acetylene gas. This rises and falls on the same principle as an illuminating gas storage tank. When acetylene gas is being used the tank lowers, pulling chains on the generators and allowing the passage of the carbide to the water below, thus generating gas and again raising the tank. A safety exhaust valve is provided, which prevents the tank from raising above a definite limit. The gas passes from the tank through a hair filter and

TABLE III—REPLACEMENT OF SMALL PARTS N. Y., N. H. & H. R. R. 1919

|                           | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---------------------------|---------|----------|-------|-------|-----|------|------|--------|-----------|---------|----------|----------|-------|
| Control fingers           | 11      | 5        | 0     | 21    | 8   | 14   | 37   | 2      | 6         | 12      | 3        | 12       | 131   |
| Switch group contact tips | 20      | 6        | 10    | 8     | 10  | 21   | 4    | 58     | 18        | 10      | 2        | 18       | 185   |
| Reverser fingers          | 2       | 3        | 2     | 6     | 3   | 5    | 3    | 8      | 5         | 6       | 7        | 3        | 53    |
| Resistance grids          | 1       | 0        | 7     | 0     | 5   | 6    | 9    | 4      | 5         | 1       | 4        | 1        | 43    |
| Unit switches             | 6       | 1        | 0     | 0     | 10  | 9    | 2    | 6      | 2         | 3       | 0        | 2        | 41    |
| Roller side bearings      | 0       | 1        | 0     | 0     | 0   | 1    | 0    | 0      | 0         | 2       | 1        | 0        | 5     |
| Air brake hose            | 3       | 7        | 0     | 11    | 0   | 0    | 4    | 2      | 0         | 3       | 2        | 3        | 35    |
| Line switch contacts      | 2       | 3        | 2     | 4     | 3   | 3    | 2    | 4      | 3         | 2       | 4        | 3        | 35    |
| Motor brushholders        | 19      | 6        | 2     | 20    | 14  | 29   | 13   | 16     | 23        | 22      | 13       | 24       | 201   |
| Heater coils              | 0       | 3        | 1     | 2     | 0   | 2    | 0    | 0      | 4         | 7       | 2        | 2        | 22    |
| Journal brasses           | 34      | 12       | 26    | 19    | 17  | 9    | 8    | 2      | 9         | 11      | 17       | 11       | 165   |
| Pantograph insulators     | 6       | 2        | 0     | 7     | 4   | 7    | 8    | 25     | 7         | 3       | 6        | 3        | 78    |
| Contact shoe fuses        | 20      | 6        | 6     | 15    | 5   | 11   | 15   | 6      | 28        | 2       | 8        | 8        | 130   |
| Battery lamps*            | ..      | ..       | ..    | ..    | ..  | ..   | ..   | ..     | ..        | ..      | ..       | ..       | ..    |
| Car lamps*                | ..      | ..       | ..    | ..    | ..  | ..   | ..   | ..     | ..        | ..      | ..       | ..       | ..    |
| Motor armature bearings   | 2       | 2        | 0     | 9     | 0   | 0    | 7    | 0      | 0         | 0       | 1        | 0        | 21    |
| Motor axle bearings       | 8       | 3        | 0     | 2     | 8   | 8    | 0    | 10     | 0         | 5       | 1        | 0        | 45    |

\* Accurate figures not available.

from there to the master back-pressure valve, thence to the shop line, where each outlet is also equipped with a back-pressure valve.

Adjoining the generating room is the manifold oxygen table, containing twenty 220-cu.ft. bottles, giving a pressure of 2,200 lb. to the square inch. The working pressure in the shop is 50 lb. The average consumption of oxygen per day is about ten bottles and of carbide about 200 lb.

COST OF INSPECTION AND MAINTENANCE

The several accompanying tables present figures on the cost of inspection and maintenance together with data on equipment troubles, number used and mileage of various wearing parts, car-miles operated, etc., for the New Haven multiple-unit equipment during the year 1919. This particular year is not, in some respects, a good one to select, for all costs have been exceptionally high and the poor quality of materials has decreased the obtainable mileage per wearing part. This is generally understood, however, and as the condition is the same throughout the country figures from various properties for this particular year should be more or less comparable.

Table I contains maintenance costs, including inspection, repairs and replacements, for all multiple-unit equipment. For convenience these are divided between mechanical and electrical parts of the equipment and in each case subdivided between labor and material. This gives for the year a cost of 10.03 cents per car-mile. The cost per motor car-mile would be higher, but would not be a fair basis of comparison, as the New Haven cars are equipped with four motors, while those on other properties are generally equipped with two motors. If

TABLE IV—REPLACEMENT AND MILEAGE OF BRAKE, PANTOGRAPH AND THIRD RAIL SHOES AND MAIN MOTOR BRUSHES, N. Y., N. H. & H. R. R., 1919

|                  | Jan.                  | Feb.   | March  | April  | May    | June   | July  | Aug.   | Sept.  | Oct.  | Nov.   | Dec.  | Totals | Average<br>A* | Average<br>B† |        |
|------------------|-----------------------|--------|--------|--------|--------|--------|-------|--------|--------|-------|--------|-------|--------|---------------|---------------|--------|
| Brake shoes      | { Number used         | 148    | 93     | 171    | 133    | 224    | 161   | 138    | 184    | 92    | 191    | 156   | 1,868  | 155.7         | ..            |        |
|                  | { Car-miles per shoe  | 452    | 636    | 379    | 477    | 298    | 427   | 538    | 332    | 713   | 352    | 421   | 341    | ..            | 419.0         | ..     |
| Pantograph shoes | { Number used         | 20     | 3      | 0      | 7      | 5      | 31    | 6      | 44     | 15    | 20     | 17    | 30     | 198           | 16.5          | ..     |
|                  | { Car-miles per shoe  | 3,343  | 19,724 | 64,773 | 9,134  | 13,345 | 2,220 | 12,375 | 1,387  | 4,375 | 3,361  | 3,863 | 2,009  | ..            | 3,955         | 9,775  |
| Third rail shoes | { Number used         | 23     | 2      | 1      | 4      | 6      | 11    | 8      | 6      | 19    | 2      | 7     | 8      | 97            | 8.1           | ..     |
|                  | { Car-miles per shoe  | 2,907  | 29,586 | 64,773 | 15,985 | 11,121 | 6,256 | 9,281  | 10,175 | 3,454 | 33,616 | 9,381 | 7,535  | ..            | 8,080.0       | 19,950 |
| Motor brushes    | { Number used         | 2,890‡ | 151‡   | 0‡     | 1,581  | 836    | 877   | 521    | 1,067  | 1,093 | 1,269  | 1,109 | 1,345  | 12,739        | 1,061.6       | ..     |
|                  | { Car-miles per brush | 23     | 392    | 64,773 | 40     | 80     | 79    | 143    | 57     | 60    | 53     | 59    | 45     | ..            | 61.5          | 151.7  |

\* Mileage figured on a motor car-mile basis.

† Mileage figured on a basis of total car-miles

‡ Number of motor brushes for months of January, February and March not correctly distributed, due to accurate figures not being available.

the motor equipment of the New Haven motor cars is sufficient to permit their use as a locomotive, *i.e.*, to haul two trailers each, it is fair to compare the cost of these three cars as a unit with a single car equipped with only two motors and which cannot haul trailers. This cost of 10.03 cents per car-mile seems reasonable when it is also recalled that the cars are equipped for both a.c. and d.c. operation.

One reason for the higher cost during the winter as compared with the summer months is that the general overhauling of cars takes place during the winter in order to insure that the cars will be in the best condition for the summer traffic. The cost for the entire year is made higher also by the fact that twenty-three out of twenty-seven motor cars and thirty-three out of fifty-two trailer cars were painted during 1919.

In Table II are presented some figures covering motor and trailer car defects reported during the year 1919. There is no high figure in the table. That for pantographs is the highest, but for twenty-seven motor cars, each equipped with two pantographs, seventy-eight reported defects in a year seems low when it is understood that "defects" includes all reports of slow operation, etc., as well as total failures to operate.

Replacements of small parts during 1919 are shown in Table III, covering motor cars only. Replacements and mileage of brake shoes, pantograph shoes, third rail shoes and motor brushes are shown in Table IV. Mileage is figured on a motor car-mile basis and for this reason seems high. The first column of averages is figured on a basis of motor car-miles, while the second includes also trailer mileage. The latter as explained for Table I is the correct analysis for comparison and results in a much more favorable showing.

## One-Way Versus Two-Way Trailers

### Some Considerations and Opinions on This Problem—Majority of Those Having Experience Favor One-Way Trailers

IN ORDER to bring to light some data on whether one-way or two-way trailers offer more advantages and less disadvantages, the opinions and practices of several operators who have had experience in trailer operation or who have recently made a decision on one or the other type were sought by the *ELECTRIC RAILWAY JOURNAL*. Their thoughts on the subject are briefed in what follows below. The endeavor in the study made was to bring out an answer to the question of whether one-way or two-way trailers should be adopted if a company was about to inaugurate trailer operation.

If a property already were fully equipped with single-end motor cars it was assumed that the proper trailer installation would be one-way trailers, so this set of conditions was eliminated from the problem as offering only one possible solution. But with double-end motor cars, should one-way or two-way trailers be adopted?

Among the cities using trailers, the Detroit, Cleveland, Omaha and Denver companies are entirely equipped with single-end motor cars, and therefore logically one-way trailers. New Orleans, La., and Gary, Ind., have two-way motor cars and two-way trailers. In Pittsburgh all motor cars, with few exceptions, used in hauling trailers are single-end. About one-third of the trailers are one-way and two-thirds two-way. In speaking of this, P. N. Jones, general manager Pittsburgh Railways,

said: "If the carhouse is at the end of the line, in our estimation the trailers because of their simplicity should be one-way. If the carhouse is so located that one-way trailers cannot be used without making unnecessary mileage, then the trailers should be two-way." In Boston two-way trailers were adopted for use with the two-way motor cars. The reason for this was that there are certain prepayment areas and transfer stations so located as to necessitate unloading on one side of the car and loading from the opposite side. Also other prepayment and transfer areas are so located as to necessitate loading and unloading from the left-hand or right-hand side of the car, according to the position of the area relative to the track. One-way trailers have been adopted for Akron, Ohio, on the considerations of greater safety, less cost, less complication in operating, less weight and increased seating capacity. The Public Service Railway of New Jersey has recently ordered 100 one-way trailers. The Baltimore company is using two-way trailers.

In Minneapolis and St. Paul, Minn., where the subject of train operation has been receiving considerable study, Horace Lowry, president Twin City Rapid Transit Company, has this opinion:

I believe very strongly in one-way equipment, both for motor cars and trains. In our own case we have never operated trailers, as snow and weather conditions are not suitable for this operation, but we have in service an experimental two-car train which is a one-way unit. In order to make a two-way car, train or trailer, it is impossible to make as good looking a piece of equipment or one as well adapted for the handling of the people. The various advantages of the two-way equipment are more than offset by their disadvantages.

H. A. Mullett, assistant general manager the Milwaukee Electric Railway & Light Company, describes the situation in Milwaukee as follows:

Due to poor loop facilities at terminals and elsewhere, and in view of the existence of many crossovers which permit turn-backs to be made, we are planning to make all two-car trains of the double-end type. In some cases we have motors on each car, whereas in others one car is a trailer. Many of the latter, however, have been arranged with a controller on the rear end, the necessary power cables being carried through from the motor car to the rear end of the trailer, to which point the controller from the rear end of the motor car has been transferred. It is obvious that such trains are in effect permanently coupled together. On a system laid out for double-end, single-car operation we have found it very desirable to arrange two-car trains in like manner. It follows from these arrangements that the trailer as well as the motor car must be two sided, that is, equipped with entrance and exit doors on each side.

All companies operating trailers have equipped their lines with either loops or wyes at the ends, most of them showing preference for the loop, as it avoids the dangerous practice of backing the cars into a side street—a possible source of serious accident. Even those companies making use of two-way trailers and motor cars have found it impracticable to operate without loops or wyes.

In answer to the direct question, With two-way motor cars, would there be any material advantage in two-way trailers, assuming that all lines are equipped with wyes or loops at the end? of nine companies answering, eight replied in the negative without qualification, including two companies now using two-way trailers, and one, the Denver Tramway, answered as follows:

It is true that wyes or loops make two-way trailers unnecessary, but often with two-way motor cars turn-backs can be made at crossovers instead of at loops or wyes. If one-way trailers were used the entrance would be on the wrong side of the street. In this connection a combination right-hand and left-hand crossover would be necessary.

Nelson H. Brown, general superintendent of railways New Orleans (La.) Railway & Light Company, explains the use of two-way trailers in New Orleans thus: "We are operating at present two-way trailers for the reason that they have been on the property for a great many years. We are considering the purchase of a few new trailers, and it is our plan to use the one-way type. I am sure they are going to offer many advantages over the double-end type, aside from preventing accidents and speeding up car movement."

#### WOULD NOT RUN TRAILERS WITHOUT LOOPS OR WYES

Another question asked was: Assuming two-way motor cars and no loops or wyes, would two-way trailers be preferable as against building loops or wyes and one-way trailers, in order to begin trailer operation?

The Detroit United Railway replied that it would recommend the installation of wyes or loops and the purchase of one-way trailers, even though two-way motor cars were being used. New Orleans recommended loops or wyes and one-way trailers, saying this combination offered many desirable advantages. The Pittsburgh Railways replied: "We would not attempt to run trailers unless there were loops or wyes at the ends of the lines. It is too much trouble to disconnect, since you will find it takes probably a minute and a half to make the connection and get the brakes in condition to proceed—at least if you have semi-automatic brakes with two hose connections. The companies at Cleveland, Minneapolis and Gary also replied without qualification in favor of one-way trailers and building loops or wyes.

The question was also raised as to whether the necessity to back long distances to a loop or wye point is a frequent occurrence with one-way cars or trains. Mr. Brown at New Orleans states that this depends entirely upon the territory, condition of equipment, roadway, etc., but ordinarily the necessity would not be frequent. Mr. Lowry at Minneapolis writes that it has not been of frequent occurrence in connection with his company. W. E. Cann, Detroit United Railway, says that "The amount of backing up in our city system is a negligible quantity, and long back trips to loops or wye points are not only infrequent but practically unheard of." Likewise, the Cleveland Railway finds the need for backing long distances infrequent. On the other hand Mr. Jones at Pittsburgh replied in the affirmative to this question. And Edward A. West, general superintendent Denver Tramway, has this to say:

To our mind, this is one of the greatest drawbacks to the one-way motor car and its trailer. Unless long lines were carefully studied and loops and wyes placed in them at convenient points it is often necessary to back long distances. In towns with a great deal of macadamized or dirt streets automobile traffic carries foreign matter into guard rails, which is overlooked by the motorman, and a derailment results. If such derailment is serious, then all cars following must back up. Fires also make backing up necessary and frequent. In our recent snowstorm, at the ends of outlying lines the snow had drifted so as to make it impossible for a car to reach them. In these instances it was necessary to back long distances, and the manner in which such operation interferes with traffic can be readily appreciated. The greatest inconvenience resulting to one-way motor cars and trailers comes from blockades.

Practically all operators with whom the writer has communicated or conversed on this question agree that the possibility of having to back one-way trains in case of a tie-up can be reduced to a negligible item by installing an extra curve here and there at intersecting points with other lines, to permit emergency wyeing. But Mr. West at Denver is somewhat doubtful as to

how far this plan may be followed to relieve the necessity to back one-way cars or trains. He writes:

Most assuredly extra curves would help, but in practice it is usually found that interruptions occur at places not convenient to establish turn-back points, and although such wyes may be of frequent occurrence along a line or the lines of the company's system, yet they are not frequent enough to avoid unsatisfactory operation at times. There is, of course, a decided disadvantage in having too much special work in the streets. The maintenance of such trackage is expensive and requires frequent inspection and cleaning. This requires a large force of track cleaners and maintenance men and makes a close follow-up necessary.

Edward Dana, general manager Boston Elevated Railway, is somewhat doubtful that track construction solely for emergency wyeing would be a justifiable expense. To quote him, he says: "It seems to us that the question of emergency track construction must be determined by local conditions. With double tracks and paved streets in our large cities, the installation of additional curves otherwise unnecessary would be a serious proposition."

Another question put to these various operators was as to whether two-way trailers, making it possible to switch back at a crossover in case of a tie-up, would develop any particular advantage or time saving in an emergency necessitating turning all cars back at a mid-point on a line. In such a case, with a double-end motor car and two-way trailer, to switch back would necessitate uncoupling the trailer, running the motor car over the crossover, using another motor car to shunt the trailer onto the other track, and recoupling to the opposite end of the motor car. On the other hand, with one-way trains, the emergency turn-back would bring about the necessity to back the first train or two to the nearest wyeing point and then presumably to turn all subsequent trains at this point.

In replying to this question, the Pittsburgh company reiterated its former statement that it does not believe in uncoupling trailers on the street. None of the replies indicated a feeling that the two-way trailer would simplify the handling of such a situation or lessen the delay. Mr. Dana says: "We believe it would be preferable and more economical to operate the cars to the nearest loop or wye rather than to attempt to turn the train at a crossover. We operate trailers only on our heaviest lines, where there is a three- or four-minute headway. Of course under such conditions it would be impossible to turn the train at a crossover without seriously interfering with the service on the line.

The experience of the operating officials of the Cleveland and Detroit companies in trailer operation probably dates as far back as that of any company in the country. While neither has had any experience in operating two-way trailers, both have had excellent opportunities to observe the weaknesses of one-way cars.

An official of the Detroit company says: "While we have not had experience with this type of operation," referring to two-way trailers, "our one-end operation has been so successful that we cannot conceive of the two-way trailers or motor cars being any better nor as good." A Cleveland railway official made the following similar comment: "No complication would be involved from the use of the two-way trailer or from double-end motor cars, but there would be added expense as well as weight and no good purpose would be served. Our turn-back and terminal facilities are such that double-end motor cars would add little to the flexibility of our equipment in case of a blockade, and making our trailers double-entrance, with doors on two sides, would not add to the flexibility of this equipment."

# N. E. L. A. Reports and Discussions

At the Pasadena Meeting Some of the Subjects Discussed of Special Interest to Electric Railways Were Water-Power Development, Electrical Resources of the Nation, Overhead and Underground Systems and Prime Movers

**T**WENTY-THREE hundred delegates to the National Electric Light Association last week received a hearty welcome from the West to Pasadena and proved that California, believed by some to be the playground of our country, can also be a place to accomplish real work. The annual convention was held May 18 to 22 at the Huntington Hotel. The formal opening took place on Tuesday night with singing, dancing and fireworks on the lawn of the hotel. On each day following auto trips were provided to points of interest, and on Wednesday evening a mission play was presented. Officers selected for the term 1920-1921 were: President, Martin J. Insull; first vice-president, M. R. Bump; second vice-president, F. W. Smith; third vice-president, Walter H. Johnson; fourth vice-president, F. T. Griffith; treasurer, H. C. Abell.

Development of the natural water-power resources of the nation and its financing was the principal theme of the convention. The coal and fuel oil supply, the cost of all other materials and the supply of labor were also discussed extensively. In his address, delivered on Wednesday, President R. H. Ballard emphasized the imperative need of the industry for the funds which restricted returns have made it difficult to obtain under the existing financial conditions. He said that the kind of public ownership which brings results is ownership by the public at large in the stocks and bonds of local regulated utility companies. In reference to electrification, he said that trunk-line electrification has its greatest argument in the future, for with the rapidly increasing cost of fuel and traffic the ultimate return on any amount now invested in electrification will be more than generous compared with the return on the accumulated amount which might be spent over a long period in patching up the systems. Also, aside from the greater comfort in travel and purely operating economies obtainable, enormous savings in coal are possible through electrical operation of the railroads.

The report of the committee on public policy held that not enough had been accomplished in informing the public concerning public utility operation and suggested that the public can be brought to see the necessity for the expenditure of large sums in electrical development and to realize how the development of natural resources will follow. The policy of offering stock issues to employees, consumers and the general public was commended.

## 200,000,000 POTENTIAL HORSEPOWER IN WEST

It has been roughly approximated, according to the committee on water-power development, that for the Western States something like 200,000,000 hp. would represent the possible maximum potential horsepower with maximum storage facilities developed and utilized as compared with 60,000,000 hp. when storage is not considered. At present about 75 per cent of the generated power of the West is hydro-electric and the remaining 25 per cent steam. The States of Idaho, Montana, California, Washington and Oregon represent 61 per cent of the total maximum water horsepower of

the country, with a total of 36,210,000 hp. Developments in the Eastern States include over 1,000,000 hp. in the States of Alabama, North Carolina, Georgia and Maryland. It is stated that the electrification of the trunk-line railroads of the Western section will amply justify local development.

Present capacity of generating machinery is defined as the electrical resources of the nation by the committee on that subject. The latent power of the country is taken at 54,000,000 hp. in water power and 3,000,000,000 tons of coal. The total central station operating capacity is almost 11,000,000 kw. It is estimated that 2,000,000 to 3,000,000 kw. additional capacity could be absorbed by our present needs by 1922, with almost as much more needed soon thereafter.

In his address before the general session of the convention I. E. Moulthrop, chairman of the technical and hydro-electric section, emphasized the great need for research by the association, not to parallel the research work being done by other organizations but to carry out only that which was required by the central station industry.

The danger that lies in overemphasizing the benefit of keeping power and communication lines on separate roads or highways was one of the points brought out by the report of the committee on inductive interference. With higher distribution and lower transmission voltages this is becoming increasingly difficult and expensive. Among the requirements to improve the situation is general recognition of the principle that adequate power and communication service economically supplied are both essential to the public interest.

## SINGLE CONDUCTOR VS. THREE CONDUCTOR

After a careful study of the single-conductor vs. the three-conductor cable for high voltages, the committee on underground systems has concluded that with tensions up to 25,000 volts and loads up to 10,000 kva. the three-conductor cable is more economical than the single-conductor cable. The possibilities and the advantages of the single-conductor design for higher voltages and greater loads are pointed out. The subject of current-carrying capacity of underground cables as affected by dielectric and copper losses and temperature of duct lines is discussed in this report and the variations of the characteristics of the different cables are brought out. The committee recommends that careful consideration be given to the prevention of extended trouble with direct-current networks. Low-tension distribution cables should be bonded in each manhole to prevent a rapid spread of trouble in case of a cable burning in two. Another method of protection suggested is the covering of cables with  $\frac{1}{2}$  in. of concrete.

The principal activities of the committee on overhead systems have been in the direction of improving the maintenance of suspension-type insulators, pointing out the advantages of preservative treatment of poles and crossarms and undertaking a study of overhead line construction in co-operation with the Bureau of Standards. In answer to a questionnaire, operating engineers

ascribed the following reasons, in the order of their importance, for insulator deterioration: (1) Porosity, (2) minute cracks permitting absorption of moisture, (3) troubles from expansion resulting from dissimilarity in co-efficients of temperature expansion of porcelain, cement and hardware. Few operators believe that the ground wire protects lines from severe direct strokes of lightning, but there is a considerable difference of opinion regarding the protection obtained from induced lightning charges.

In the discussion of the above report insulator testing and maintenance, pole reinforcement, and treatment and joint usage of poles were the principal subjects touched upon. To determine the relative values of "megger" tests, high-potential and high-frequency tests, insulators have been subjected first to the megger test and then to the other tests. Of the total number of faulty insulators detected in all three tests the megger located 50 per cent. Of the insulators tested the greatest number of faulty ones were taken from lines near the coast, the next from mountain districts and the smallest number from dry valleys.

The various papers which comprised the report of the committee on electrification of steam railroads were abstracted in the issues of the ELECTRIC RAILWAY JOURNAL for May 22 and 29. In discussing this report the success of actual electrifications was confirmed by several companies which handle railroad loads. W. C. L. Eglin testified to the success of the electrified divisions in the Philadelphia district, as did also F. W. Smith of New York. The viewpoint of railroad men was presented by A. H. Babcock of the Southern Pacific Railroad, who pointed out the importance of disillusioning company officials who believe that money can be better spent in double-tracking systems or along other lines with which they are familiar.

#### PRESENT STATUS OF ELECTRICAL APPARATUS

A feature of the report of the electrical apparatus committee is that the use of automatic substations for light and power, as well as for electric railway service, is rapidly increasing. It is stated as unlikely that the automatic substation will entirely supplant the substation with attendants, and it is suggested that careful thought be given to making all additional substations of the automatic type and to installing automatic and semi-automatically controlled features on equipment in existing stations where attendants are employed. Additional evidence of the value of balanced-relay protection has been obtained in the case of a 12,000-kw. unit which failed owing to a field breakdown which caused a short circuit in the armature winding. The balanced-relay promptly operated and the damage was limited to slight burning of the armature and field windings.

The general subject of excitation is said to be receiving considerable attention at present, the trend in large and medium size generating stations being unmistakably toward a practice in which each generator is provided with an individual source of excitation. On several large systems employing individual excitation, particularly in metropolitan districts, storage batteries have been provided for emergency excitation in addition to spare exciter capacity. Regarding current-limiting reactors, the committee states that too much stress cannot be placed upon the importance of careful design and construction, which will give the utmost reliability. The committee also reports that grounding of the neutral of three-phase systems solidly or through resistance

has rapidly become standard practice throughout the country for both 25 cycles and 60 cycles. A noteworthy improvement has been made during the past year in the design of all circuit-breaker contacts. These designs utilize the mechanical stresses to force the contacts more firmly together, whereas in the past some breakers have been so designed that the mechanical stresses of heavy currents tended to force the contacts apart.

In discussing the report of the electrical apparatus committee, it was recommended that instead of using high voltage for the railway contact systems, 25-cycle or 60-cycle automatic substations and low-voltage trolley systems be used. It was contended that this arrangement should make trunk-line electrification more feasible from an investment standpoint. Trouble with rotary converters has been practically eliminated by increasing the speed, increasing the separation of poles and using high-reluctance commutating poles having non-magnetic material between them and the frame. Barriers between brushes are thus almost unnecessary.

There was considerable discussion on switches, during which it was suggested that one remedy for the situation is to simplify switch construction and make the switches large enough. The standardization of transformer oils was recommended, but was declared by manufacturing representatives to be impracticable because in most apparatus the kind of oil required depends upon the internal construction and materials used in the transformer.

#### INCREASING ECONOMY IN PRIME-MOVER PRACTICE

Progress in burning low-grade fuel is reported by the committee on prime movers, and it was said that Diesel oil engines have been perfected to such a degree that they may be profitably considered for installation in generating plants. The manufacturing companies are correcting difficulties in steam turbines and boilers which were manufactured during the war period. Problems arising from the interconnection of steam and hydraulic stations are being scrutinized for the purpose of obtaining maximum economy in the whole system.

Operating records of single-shaft turbines, according to the report, have not been entirely satisfactory and several additional turbine failures have occurred during the year. An analysis of the data indicates trouble due to vibration of the wheel structure causing fatigue cracks. Trouble has been accentuated at points in the disk where sharp tool marks or rough surfaces are present or where holes in the wheel are drilled for balancing purposes. Considerable investigation is still necessary on the subject of vibration of wheels before the designs can be completely guarded against this trouble. Records of units manufactured since the last report of the committee indicate that 30,000 kw., 1,800 r.p.m., 60 cycle and 35,000 kw., 1,500 r.p.m., 25 cycle are the present maximum standard sizes of single-shaft, single-barrel units for large installations.

Static and dynamic balancing of large turbine units is receiving increasing attention in the effort to guard against the effects of vibration and resulting injurious effects. Careful selection of oil for turbine use is pointed out as a necessity. In connection with condensers and auxiliary air-removal devices, it is reported that there has been no radical change in apparatus of this type. The possibilities and advantages of high vacuum are becoming more and more realized and the faults of both the prime-mover and condenser equipment are being corrected to this end.



The tendency toward large sizes of boiler units has continued during the past year. Units of 1,000 hp. to 1,500 hp. and over are quite common. One of the most important facts brought out by a questionnaire on superheaters was that, considering their difficult location and the delicate nature of their work, superheaters are causing a surprisingly small amount of annoyance and concern to the operators.

Statements by manufacturers indicate that there have been no radical changes in stoker design, but that efforts have been made along the lines of the perfecting of new devices and the refinement of operating details. There is a tendency to lay out the stoker and the furnace so it will be readily possible to change over from coal to oil, using one or the other, depending upon the fuel-price differential. In mechanically stokered plants, and especially with forced-draft stokers, much higher boiler ratings are obtainable than with hand firing. With coals of the sub-bituminous character boiler output up to 300 per cent of normal ratings may be realized and with lignites it is possible to force boiler output up to 250 per cent of rating.

The past year has witnessed an increased number of plants installed to burn powdered coal and a rapidly growing interest in this development. The handling of powdered coal in large quantities has been successfully carried on in steel plants and cement mills, the coal being transmitted for distances as great as 2,000 ft. from the powdering plant. Several companies are now placing unit pulverizing equipment on the market, one or two units being installed for each boiler. In general, the overload capacity of boilers equipped with powdered-coal-burning devices is not as high as the figures that can be obtained when using underfeed stokers. The report states that this question will undoubtedly be worked out, as it is simply a matter of proportioning furnace volume to boiler heating surface. Properly designed furnaces for burning powdered coal are also well adapted for burning oil. The powdered-fuel equipment also makes available certain low-grade fuels, which cannot as a rule be burned economically on stokers. It is said that one of the questions which has been passed over too lightly by both manufacturers and users of this equipment is that of the ultimate disposal of the fine ashes which now pass out of the stack.

A more careful study of the shape of storage piles of coal is urged with a view to increasing the amount which can be crowded into a given space. Circular piles, for instance, in a row would contain less coal than one rectangular pile of the same length. The plea that small piles reduce the probable fire losses should not be taken seriously, it is said, as at the first sign of heating of the rectangular pile the hot spot can at once be easily and effectively removed by cutting the pile at right angles.

#### DIESEL ENGINES AND WATERWHEELS DESERVE FURTHER ATTENTION

It appeared to the committee that the stationary Diesel engine has now reached a point of development where no radical changes in design may be expected in the near future. Its regulation, either when operating alone or in parallel with other units (steam or Diesel), is perfectly satisfactory. The fuel consumption of a Diesel engine is practically uniform, regardless of size, in contrast with steam plants. Its advantage in fuel cost is therefore greatest in small sizes. The fuel consumption of the Diesel engine is now guaranteed at 0.4

lb. to 0.5 lb. per horsepower-hour at full load and 0.5 lb. to 0.6 lb. per horsepower-hour at half load. This represents a thermal efficiency of 34 per cent and is about one-third the fuel consumption of an oil-fired steam plant of equal size. Fuel atomizers have been perfected to use the heavy asphalt-base oils of Texas, California and Mexico, but the committee recommends the use of better grades of oil even if it is necessary to pay slightly more for them.

The increased size of waterwheels together with the larger number installed is a most important feature of the past year's development. Single wheels of approximately 40,000 hp. capacity have been installed and much larger ones are contemplated. Automatic hydro-electric plants are receiving considerable attention. Several plants of this type have been built and are working very satisfactorily, the gate openings and output being regulated, according to the water supply available, by means of a float control from pond level. The combined operation of hydro-electric and steam-electric generating stations has become a subject of vital interest, the committee states. Maximum hydraulic output will be obtained if the hydro plant generates the entire load during the off-peak hours and operates at maximum capacity during the peak hours. When a steam plant first takes energy from a hydro-electric plant there is usually a certain distrust of the reliability of the hydro service and various measures have been adopted to enable the steam plants, acting as standby plants, to pick up a large portion of the load in the shortest possible time. It has been proved, however, that the individual hydraulic prime mover is more reliable than the individual steam turbine. The question, therefore, is chiefly one of reliability of transmission lines.

#### Swiss Railway Electrification Progress

ACCORDING to a report to the United States Department of Commerce by Trade Commissioner H. Lawrence Groves, the work on the Gotthard line is progressing rapidly, and it was expected that the stretch of about 16 miles through tunnel from Göschenen to Airolo would be operating in May, followed by the stretch north of the tunnel from Göschenen to Erstfeld, about 29 miles, in June and the line south of the tunnel from Airolo to Biasca, 45 miles, in September. Probably later in the year the stretch of 12 miles from Biasca to Bellinzona will be finished. The first trials with electrical equipment have been carried out through the tunnel and are stated to have been satisfactory to all concerned.

As rapidly as conditions will permit, the federal authorities now plan to electrify practically all of the government-owned main-line roads in the Confederation. It is planned to spread the work over about twenty years. Within the next ten years it is proposed to transform the line from Zurich, via Olden, Bern, Fribourg and Lausanne, to Geneva. According to the program the line from Zurich to Bern will be started in 1922 and completed in 1924, and in the following two years it is thought that the section from Bern to Lausanne can be completed.

The locomotives for the Erstfeld-Bellinzona line are being built by Brown, Boveri & Company of Baden. Details of the locomotives for this electrification will be found in the issues of the *ELECTRIC RAILWAY JOURNAL* for Sept. 7, 1918, page 411, and June 14, 1919, page 1,141.

# Philadelphia Commission Reports

**Among the Recommendations of Mayor's Committee Are Valuation of Existing Property to Permit Fair Return, Organization of New Operating Company to Own Outright as Well as Operate Transportation System and an Increased Fare**

**T**HE committee representing the business and civic interests of Philadelphia appointed last April by Mayor Moore of that city to investigate its transportation system has made its report. The chairman of the committee is Alba B. Johnson, of the Baldwin Locomotive Works. The other members are W. P. Barba, Thomas Conway, Jr., C. C. Davis, J. C. Jones, F. A. Lewis, John McDevitt, W. J. Nash, W. H. Wilson and G. S. Webster. A short note about the report appeared on page 1112 of last week's issue. A more extended abstract follows:

## Abstract of Report

In making the study of the problems presented to it the commission has had a strong desire to give due recognition to the private rights as well as to the public rights involved and to provide for their due appraisal and just reconciliation. The commission has no sympathy with the point of view that the various transit companies and their security holders ought to be held responsible for the existing inadequacies of service, and that therefore an otherwise unjust attack on their rights can be justified. Nevertheless, the commission recognizes that there are public rights as well as private rights involved, and accepts the principle that where irreconcilable conflict arises the public right must prevail and that any sacrifice of the public right by its guardians for the mere purpose of being generous to the private right is morally vicious, to be condoned only because of the difficulty of vividly perceiving the existence of the public right—a right without definite ownership.

The commission is convinced of the impossibility of laying down at this time any definite program for the removal of the existing transit inadequacies, but it is of the opinion that substantial progress can be made by a comprehensive analysis of the situation, with suggestions for such action as must be taken in order to carry the problem in the direction of solution, and this has been its effort.

The present transit service in the city of Philadelphia is so grossly inadequate as to threaten the proper development of the city. The cars operated in the central business district are greatly overcrowded, especially during the rush hours in the morning and evening.

The president of the present operating company estimates that it will be necessary to furnish transportation for 1,000,000,000 riders during the next twelve months, representing an increase of 15 per cent over the passengers carried in 1919. It is obvious that the addition of these riders must seriously aggravate present conditions unless commensurate relief is at once given.

Although the population and built-up area of the city have substantially increased since 1910, only 29 miles of track have been constructed during this period.

A study of the existing situation made by those members of this commission who are intimately acquainted with the facts discloses that in their opinion there is

need for the immediate construction of at least 50 miles of track to serve the present requirements of the city, with substantial additional construction to follow in the near future.

With an increase in passengers from 1913 to 1919 of 48 per cent, the car mileage has been increased but 3 per cent.

With the exception of some 200 cars purchased by the United States Government and leased to the company in 1918, no additional equipment has been provided since 1913. Over 500 cars in the possession of the company were reported to this commission as not available for operation on March 31, 1920.

Much of the existing surface track of the transit system is worn out and requires replacement, for which the company has not heretofore created sufficient reserves.

The company is handicapped by inadequate and antiquated car shops and other facilities necessary to furnish satisfactory service at minimum cost.

## REASONS FOR INADEQUACY OF EQUIPMENT

There are two fundamental causes for this inadequacy of present service:

1. The city is without the requisite high-speed lines. The city is many years too late in making reasonable provision for such lines. The only consolation to be derived from the delay is that it will be possible to lay out these lines in the light of the tendencies now manifesting themselves in the development of the city.

2. The present operating company is without adequate financial resources to furnish the additional surface facilities reasonably required of it and is unable to procure the necessary additional capital therefor. The minimum financial requirements of the company to provide necessary additional facilities will be at least \$3,000,000 a year for the next three years, to meet which the company's credit resources are totally inadequate.

The company is without financial credit because of the following facts:

(a) It has and can have no marketable securities constituting a lien on the facilities and franchises controlled by it because these facilities and franchises are owned by some fifty underlying companies whose rentals must be given priority to any charge that can be created by the operating company.

(b) Its fixed charges do not have the requisite ratio to the total net earnings from operation. The net earnings from operation in 1919 were \$11,645,690.02. The fixed charges of the company, prior to any charge which can be created by it, *viz.*: interest on outstanding indebtedness, rentals paid to the underlying companies and sinking-fund payments under the contract of 1907, aggregated in 1919, \$9,929,813.22, or over 85 per cent of the total net earnings from operation. The conservative investor ordinarily requires that the net earnings of a public utility shall be not less than double the interest upon its outstanding indebtedness.

(c) There has been no official valuation by the Public

Service Commission of the property devoted to the public service to justify the company's present net earnings from operation.

(d) The operating revenue of the company has been imperiled by the menace of the independent operation of the city's high-speed lines threatening destructive competition.

#### PRESENT CORPORATE ORGANIZATION INIMICAL TO BEST INTERESTS OF CITY

The present corporate and ownership organization of the surface transit system is inimical to the best interests of the city for the following reasons:

1. The corporation at present in control of the system and possessing a practical monopoly of the city's streets for surface transit purposes is a mere operating company, without any commensurate enforceable public duty to make extensions as required by the city's development.

2. The operating company possesses substantially no property in its own right, unencumbered by its fixed charges, and the size and priority of these charges effectually excludes a proper basis for extended credit.

3. The multiplicity of companies results in federal excess profits taxation, which the underlying companies have succeeded in imposing upon the operating company to the injury of its resources for service.

4. The separate interests of the several companies prevent a unification of operation based solely on the convenience of the public.

A contributing cause of great importance to the difficulties of the transit situation is the narrowness of the city's streets.

There can be no really satisfactory solution of the transit problems of the city of Philadelphia until:

1. The necessary additional high-speed lines have been constructed.

2. The existing surface system has been improved and extended to meet present requirements.

3. A strong operating company has been established.

4. All of the transit facilities of the city are operated as a unit.

5. Suitable provision has been made for the proper maintenance, development, improvement and extension of the transit facilities of the city as occasion may require.

6. Suitable provision has been made for lessening the difficulties to traffic due to the narrowness of the streets.

Notwithstanding the urgency of the demand for relief from the present situation, the city should suspend the execution of its program for the construction of transit facilities excepting the completion of the Frankford Elevated line to Bridge Street and possibly the elevated line from Front and York Streets to Broad Street and Erie Avenue, because: (1) The present high costs should be avoided if possible; (2) a substantial doubt has arisen as to whether the present layout is the best one for the ultimate development of the city, and (3) a plan for the operation of each unit to be constructed should be provided in advance of the construction of such unit.

A study should at once be made by competent experts to be selected by the city to determine: (1) What, if any, modifications should be made in the present layout of the lines, and (2) the order in which the construction of the several units of the program should be proceeded

with. If modifications are determined upon, the requisite permissive legislation should be obtained at the next session of the Legislature.

#### WHY UNDERLYING COMPANIES DON'T ASSIST

The present operating company cannot hope to receive from any of the underlying companies the financial assistance it requires for the due performance of its public duties. The position of these companies is not unnaturally that, if the operating company is overtaken by financial disaster by reason of its inability to find the capital requisite for the performance of its public duties, it must face the consequences of the obligation of its contract with its lessor company and drop the property values it has created into the lap of that company. Their leases having been made under legislative authority, they recognize no duty of service to the public until, by the gradual disintegration of the structure they have co-operated to erect, they in turn become an operating company. They recognize no duty to protect the public against the inconvenience of this process of disintegration. Their representatives argue with great force that their present owners to a very considerable extent hold their securities on a very conservative basis of return on the capital invested by them, and they therefore owe to the public no moral duty that might otherwise arise from the receipt of large profits accruing from trafficking in public rights.

The requisite financial strength of the operating company ought not to be secured by having the city again come to its assistance by releasing charges and other rights and practically assuming the burden of making extensions, as was done in 1907.

#### VALUATION INDISPENSABLE—RECONSTRUCTION OF FINANCES

A valuation by the Public Service Commission of the existing transit system is indispensable to any progress in the solution of the transit problem.

The public has a paramount right, superior to all contractual rights, that any company undertaking to operate the surface transit system shall furnish adequate service at a rate of charge which will yield not more than a fair return on the reasonable value of the facilities used and useful in the public service. Until this public right has been measured and the permissible operating revenue available for fixed charges, reserves and dividends definitely ascertained there can be no definite plan for the financial development of the company in control of the system or for the combination of that system with the high-speed lines of the city.

Pending the contemplated valuation of the surface transit system, the city should consider the practicability of a plan to bring about the following results after the completion of the valuation:

1. The organization of a new company owning outright as well as operating all of the facilities of the present separate companies.

2. The exchange on an equitable basis, measured by the value of the contributions of each constituent company to the new company, of the securities of the new company for the securities of the constituent company.

3. The imposition upon the new company of the duty of extending its tracks as public necessity demands upon all streets in which it possesses the right to operate.

4. The creation of a financial plan providing for the proper development of the new company.

5. The operation by the new company of the city's high-speed lines in conjunction with the surface system.

Considering the number and character of the conflicting interests in the present surface transit system, it is not likely that such a plan can be carried through without the help of the power of eminent domain. It is probably legally impossible to make the new company competent to exercise the power as required under the circumstances of the case. The city should therefore seek to get at the next session of the Legislature such an extension of its present power of eminent domain as will enable it to meet the situation. This power is concededly superior to all private rights, and the necessity of providing for reasonable compensation as a condition to its exercise must be relied upon to do justice to irreconcilable interests. The compensation having been paid or secured, the enterprise need not wait upon its distribution among those entitled to receive it. It is hoped that the completion of the contemplated valuation will establish such a basis for fair dealing that for the most part the mere existence of the power of eminent domain without its exercise will be enough to bring about the requisite co-operation of the separate interests involved.

The difficulties inherent in such an enterprise are doubtless very great: (1) The city must obtain the necessary extension of its power of eminent domain; (2) notwithstanding the possession by the city of the power to condemn, the conflicting interests must nevertheless for the most part be reconciled by voluntary action, otherwise there will result substantial city ownership, and (3) the requisite financial support must be found. But the situation should be thoroughly canvassed before the plan is abandoned as impracticable.

#### PRIVATE CONTRACT VS. PUBLIC SERVICE

An attempt has been made to have the Public Service Commission review the reasonableness of the rentals payable to the underlying companies. It is believed that such an attempt will prove ineffective because of the absence of the necessary jurisdiction of that commission. It may be well, however, for the city to endeavor to get the next Legislature to confer the requisite jurisdiction upon the Public Service Commission. Whether such a jurisdiction, if conferred, could be sustained is a serious constitutional question. On the one side is the sanctity of contract and on the other side is the fact that all of the contracts in question relate to a public right, to wit, a right to occupy public highways, a right in its very essence subject to governmental regulation, and it is a fundamental proposition of constitutional law that this power to regulate an essentially regulatory right cannot be destroyed by the fact that the person in whom the right is vested has made a contract about it.

After all parties have been protected by the completion of the contemplated valuation, it may be that such a jurisdiction might be invoked to the satisfaction of everybody in lieu of the power of eminent domain.

In no event should municipal operation of the transit system be contemplated. It would not only be inefficient but it would open the way to political conditions that would be intolerable.

If the acquisition of the surface system by such a company as is hereinbefore recommended or its acquisition by the city itself to be operated by an operating company in conjunction with the city's high-speed lines

both prove impracticable, then the only course left to the city, short of compromising the public right, is that of aggressively, persistently and relentlessly pressing for the service to which the public is entitled by the use of all available legal remedies, so that adequate response to this demand will be the only justification for the continued existence of the company in control of the surface system. But in view of the constructive achievements of the present operating company, not the least of which is its far-sighted solution of its labor problem, as well as in view of the confusion and turmoil which are the necessary concomitants of such a policy as shown by the experience of other cities, its adoption may well be delayed until it promises to be the only solution of the problem.

#### IMMEDIATE STEPS ADVISABLE

The fact cannot be too strongly emphasized that at best it must be several years before the surface transit problem can be permanently solved, and in the meantime the city must obtain every possible improvement in the existing service by:

1. The replacement of wornout facilities now in use by the operating company.
2. The surface track extensions that are imperatively demanded.
3. A reasonable increase in the number of cars operated on the surface tracks.
4. Relief from traffic congestion in the heart of the city.

The immediate problem is to determine how this relief can be accomplished.

It is possible to help the situation financially by any or all of the following plans: (1) The construction by the city of the most needed surface extensions: (2) the purchase by the city of surface cars to be rented to the operating company, and (3) the increase of the fares of the operating company.

It is unwise for the city to relieve the operating company of its proper public obligations by the construction of the needed surface extensions or the purchase of new surface cars. The company has no adequate financial resources of its own. An increase of all or some of the rates of fares and charges, pending the completion of the proposed valuation, is probably the only practicable method of securing the immediate provision for any considerable part of the needed facilities. The decision as to what charges should be increased devolves upon the present operating company, subject to the right of review by the Public Service Commission.

#### CONDITIONS FOR PERMIT TO INCREASE FARES

The consent of the city to an equitable increase of fares should be conditioned upon the making of an agreement between it and the company whereby it shall be agreed that:

1. During the continuance in force of such increased charges, pending the completion of the valuation, the present operating company will forego dividends upon its stock.
2. Pending the completion of the valuation the city will recognize the existing rentals and interest obligations of the company, which shall constitute a first charge against net revenues.
3. From the surplus income remaining after the present rentals and fixed charges, including the interest on the proposed \$6,000,000 loan, have been paid the

company will pay to the city, by way of rental for the Frankford Elevated and other facilities to be leased by the city to the company, a sum at least equal to the interest upon the city's investment in such facilities.

4. The entire surplus income above existing rentals and interest obligations, including the interest on the proposed new \$6,000,000 loan, and the rental payment for the use of the facilities to be leased from the city, shall be especially dedicated to the extension of facilities and the improvement of service.

5. The property, representing the investment of any part of the said surplus income, shall be excluded from the contemplated valuation of the company's property, thereby avoiding the objection that the car rider would be forced to pay a return upon property constructed out of the higher fares paid by him. The company will account to the city at intervals of six months for all facilities so constructed.

6. The city's consent to the increase in fare shall terminate with the completion of the proposed valuation, or earlier in the event that the present operating company or the underlying companies do not give full co-operation in bringing about the speedy completion of such valuation. Thereafter the company's net income should represent a fair return upon the fair value of the property, to be fixed by the Public Service Commission.

#### BUS LINES CONDEMNED

Much can be done to relieve the present congestion in the heart of the city by the rerouting of cars, the better control of vehicular traffic, especially during the rush hours in the morning and evening, limitations upon parking privileges for vehicles and the creation of traffic thoroughfares. The operation of competitive bus lines, while affording slight relief in traffic conditions, will constitute a menace to the revenues of the company operating the transit system. To the extent that such competition results in a diminution of the company's net income, it will prevent improvements in service otherwise attainable under the plan hereinbefore outlined. The question of the proper sphere of bus operation should be studied by the experts whom it is recommended the city shall select to consider what, if any, modifications should be made in the present layout of the high-speed lines to be constructed by the city.

The problems involved in the formulation of a detailed agreement between the city and the present operating company for the operation of the Frankford Elevated do not constitute a part of the work of this commission. It is manifest that the city and the company should co-operate to bring about the operation of the Frankford Elevated at the earliest practicable date. In view of the plan heretofore suggested for providing additional revenues through increased fares and charges, the city has a right to demand that the company shall assume the obligation of paying, in the form of rental, a sum at least equal to the interest on the city's investment in the Frankford Elevated and other facilities leased to the company, this charge to be junior to the present interest charges and rentals of the company, including the interest on the proposed \$6,000,000 loan hereinbefore referred to.

(NOTE: For an abstract of the proposals of the company for a discontinuance of all free transfers in favor of 3-cent "exchange" tickets, see page 1175 of this issue.—EDS.)

## Pennsylvania Association Meets

President J. H. Pardee of the American Association Addresses Annual Meeting of the Pennsylvania Street Railway Association at Harrisburg

WITH an attendance of approximately 100, the Pennsylvania Street Railway Association held its annual meeting at the Penn-Harris Hotel, Harrisburg, Pa., on Thursday and Friday of last week, May 27 and 28. There were two regular business sessions, at which papers were presented; there was a preliminary business session, at which President Gordon Campbell, York Railways, gave the president's address, and there was an informal dinner on Thursday evening, at which President J. H. Pardee of the American association addressed the members and guests.

A resolution of sympathy to his family and appreciation of his qualities was adopted on the death of R. D. Stetson, general manager Chambersburg, Greencastle & Waynesboro Street Railway, who was killed in an accident on his own road last week.

Some of the regular papers which were presented at the meeting were abstracted in last week's issue of the JOURNAL, and the others, with the discussion of the meeting, will appear in a later issue.

In his presidential address Mr. Campbell mentioned that while the steam railroads were fathered by the government in the times of unprecedented financial stress, the electric railways were forced to meet the situation as best they could. The need for higher fares became evident after the financial stress was generally recognized, but in most cases relief was deferred until the losses were only too evident and the average increase was in no way proportionate to the increased cost. As a consequence maintenance fell behind, and the end of the war found the electric railways presented with the urgent need of new capital. Unfortunately, the past year has not apparently advanced the problem much nearer a solution. He mentioned the extraordinary activity with which the country has turned to manufacturing as an element making it difficult for public utilities, which are unable at best to offer more than a fair return on investments, to obtain the necessary capital. He argued for a better understanding in the communities served and the establishment of a prerequisite in obtaining new capital to the end that the return on the investment will be ample and reasonably assured.

He repeated his statement of a year ago that if 5 cents were a logical rate ten years ago, 10 cents is equally logical under the present conditions, and, further, experience has shown that the riding public realizes that a satisfactory service is worth what it costs.

Another element is the severe hardship upon the railways when they are asked to reconstruct tracks and provide paving never contemplated, and this is doubly difficult at this time of scarcity of labor and material. Electric railways are still performing the function of tax gatherer with no appreciation on the part of the public.

But the situation is not without promise of a brighter future. Public regulatory bodies have generally recognized the necessities of electric railways. At least the one-time popular notion of one fare for all conditions has been exploded. It is reasonable to expect that the pendulum has nearly reached the end of its swing

and that with a gradual return to normal conditions electric railways will again be regarded as a conservative investment.

#### PRESIDENT PARDEE SUMS UP WASHINGTON HEARINGS

At the evening dinner there were between eighty-five and ninety guests. The principal speaker of the evening was President Pardee of the American Electric Railway Association. C. L. S. Tingley, vice-president American Railways, acted as toastmaster. Mayor George A. Hoverter of Harrisburg, Pa., welcomed the association to Harrisburg and paid a tribute to Frank B. Musser, president of the Harrisburg Railways. This was particularly in connection with labor trouble in Harrisburg and the manner in which Mr. Musser and the Harrisburg Railway officials handled the problem. Mayor Hoverter emphasized the fact that he believed friendly relations should exist between public utilities and municipalities for mutual benefit.

Mr. Pardee opened by saying that such meetings of state associations and other regional associations are excellent in that they give a personal touch not otherwise possible. They also make possible co-operation of the best sort. Mr. Pardee took this opportunity to review the Washington hearings and to explain what he thought will be their ultimate outcome, although nothing tangible has yet resulted. He analyzed the testimony at Washington briefly and said that the commission staff is understood to have in preparation a digest of the testimony and a report thereon, and that some sort of an announcement regarding these is expected within the next few weeks. An abstract of Mr. Pardee's remarks will be given in a later issue.

#### LIEUT.-GOV. BEIDLEMAN WANTS COURAGEOUS MEN— PUBLIC AND RAILWAY

Following Mr. Pardee, Lieut.-Gov. Edward E. Beidleman addressed the dinner guests. Mr. Beidleman was instrumental in the framing of the present Pennsylvania commission law. He said that men in public life who have the courage to stand up for right and just laws, irrespective of temporary popular feeling, are much needed, but that they have a hard time, and, further, that they are not supported publicly and openly by the people who will benefit by these laws, such as railway men themselves. Plain talk and laws are a duty to the public as well as to the railways and other utilities.

He said that, judging from his experience, electric railway men haven't had the courage to stand up in public and show the inequalities of tax distribution, to say that the tax really belongs on the other fellow. There isn't enough plain talk all through our public life, and street railway men, who meet the public so intimately, must join in the education of the public to see that burdens are equitably distributed and must encourage honest criticism on all sides.

Other speakers were Dr. Conley, State Commissioner of Labor, who urged safety campaigns and encouraged efforts to educate the foreign population through the children; H. F. Snow, chief engineer of the Pennsylvania commission, who urged that corporations should not take too many good men away from the commission, but that support be given to commissions to enable them to retain a competent engineering force, and who explained that the Pennsylvania commission gave its engineering force the widest latitude, urging it to get at the facts with a true interpretation; Prof. H. C.

Ehlers, assistant engineer to the commission, and Arthur Hull, a local attorney.

At the first session the following officers were elected for the ensuing year: President, T. B. Donnelly, West Penn Railways; vice-president, C. B. Fairchild, Jr., Philadelphia Rapid Transit Company; secretary and treasurer, Henry M. Stine, Harrisburg, Pa.; executive committee, T. B. Donnelly, C. B. Fairchild, Jr., C. L. S. Tingley, American Railways; Gordon Campbell, York Railways; F. B. Musser, Harrisburg Railways, and Thomas Cooper, Westinghouse Electric & Manufacturing Company.

## London Railway's Latest Cars

### To Reduce the Passenger Interchange Period Three Sets of Doors Are Provided Along the Side of the Car

AS WAS mentioned in the issue of the ELECTRIC RAILWAY JOURNAL for March 5, 1920, the Metropolitan District Railway, London, has placed an order for 100 new cars. Of these forty will be motor cars and sixty trailers. Delivery is to begin in August. These cars show some differences from the rolling stock already in service on this railway. Perhaps the most interesting change is in the matter of motor equipment. It is intended to use five-car trains for service during off-peak periods and eight cars during rush hours. The station platforms in the tunnel portion of the railway will not allow a train longer than one of eight cars. Five-car trains will be made up of two motor cars and three trailer cars and eight-car trains will have three motors and five trailers. Each motor car will be equipped with four GE-260 motors of 180 hp. each. The present equipment of motor cars now in service is GE-69 motors of 200 hp. each. At present four-car trains are running during the quiet hours and eight-car trains during the busy hours. The four-car train has two motor cars, each with two motors, and cars are added in two-car units, consisting each of a motor car and a trailer.

The motors of the existing trains have given trouble frequently due to overloading, and it is expected that this will be obviated by the new arrangement.

The present cars have longitudinal seats at the ends and transverse seats in the center. In the new cars this scheme will be reversed, the transverse seats being toward the end and the longitudinal seats in the center. This has been made possible by a different arrangement of doors, and it will permit freer passenger movement.

Instead of the end doors, as in the existing cars, a set of double sliding doors is provided about a third of a car length along the sides, while center doors like those at present in use are also provided. The number of doors per side remains at three. Each has an opening of 3 ft. 10 in. The motor cars have an additional door at each end, but these are for the use of the motor-man and the conductor only.

An endeavor has been made to make the car bodies as roomy inside as possible. The new cars will have no step board outside and the walls have been extended as far out as the edges of the step board on the old cars. As a result of this there is a step construction at the side of the car so that the lower part of the body may clear the station platform. The upper part of the body just overhangs the edge of the platform. The new cars are being built by the Metropolitan Carriage, Wagon & Finance Company, Birmingham, England.

## Recent Happenings in Great Britain

### National Wage Settlement Repudiated in Some Instances—Glasgow Finally Abolishes the Halfpenny Fare

*From Our Regular Correspondent*

There has been a great deal of trouble during April over the question of British tramway men's wages. The national settlement arrived at by the Joint Industrial Council for the industry was repudiated by the employees in several important centers, including Manchester, Oldham, Huddersfield, Cardiff and Swansea. The men in these towns went out on strike for the full 10s. a week increase of wages originally demanded, instead of the 6s. awarded by the council.

THE strikes took place against the advice of the trade union leaders and they spread over the Easter holidays. The strikers after a few days were induced to return to work, pending reconsideration of the matter by the Joint Industrial Council. This reconsideration struggled along during the latter half of April, a new point under discussion being an increase in the basic rate of wages as distinguished from war bonuses, the 6s. increase on which stands. This was referred to the nine District Industrial Councils into which the country is divided. When the Joint National Council met again on April 22 and 23 it was reported that seven out of nine district councils had been unable to arrive at any definite recommendation, and they were asked to try to arrive at an agreement within a month in regard to the basic rates to be paid in their areas. Definite recommendations were submitted by the South Wales and Midland District Councils and these were ratified. They involved increases on the pre-war rates which, taken along with the bonus increase already granted, gave increases of 9s. a week.

#### NATIONAL SETTLEMENT ON EQUAL BASIS

The point to be noted is that the contention of the Transport Workers' Federation for a national settlement on an equal basis for all tramway workers has not been attained, and local or sectional settlements, influenced by local conditions, are being made. The district councils affiliated with the national council were early in May still working with the object of bringing about district settlements.

The railway men of the country (as distinguished from the tramway men) are far from content with the recent national settlement. In the beginning of May the National Union of Railway Men lodged an application for a further increase of wages of £1 a week, and the Associated Society of Locomotive Engineers and Firemen sought increases of 27s. for drivers, 21s. for firemen, and 15s. for cleaners per week. The Central Wages Board, set up under the recent settlement, failed to come to an agreement, and the question was accordingly referred to the National Wages Board. The latter body has a wider constitution than the former, as besides representatives of employers and employed it includes representatives of the public as railway users. If the national board cannot agree a strike may take place.

The bill promised by the government to enable tramway undertakings to

raise fares above the present permissible limit so that the undertakings may be able to meet their heavily increased working expenses was, after some discussion, read a second time in the House of Commons on April 12. It is called the tramways (temporary increase of charges) bill. Under it the Minister of Transport is empowered to make orders authorizing the undertakings to raise fares. In the case of municipal tramways the increase is not to be more than sufficient to enable the undertaking to be carried on without loss, while in the case of company tramways the increase is not to be more than sufficient to provide for interest on loan capital and for a reasonable return on share capital. Except in cases of urgency, the Minister, before making an order, is to refer the matter to an advisory committee which is constituted under the bill. The measure was passed rapidly through the committee stage on March 27, when Mr. Neal, parliamentary secretary to the Ministry of Transport, expressed the opinion that some increase of fares for workmen and school children would have to come. The undertakings must, he said, be made self-supporting. He also mentioned that it would be for the advisory committee, constituted by the bill, to determine what was a reasonable return on capital. The third reading of the bill was taken on May 5, and it only remains now to be passed by the House of Lords.

The new electricity supply bill is now before Parliament. Its object is to provide the compulsory powers which were deleted from the act passed last year in consequence of strong opposition in the House of Lords. The bill, to which much opposition is again threatened, provides for the setting up of district electricity boards wherever joint electricity authorities are not voluntarily established and for the acquisition of power stations and main transmission lines for purposes of proposed national supply.

After many attempts the Glasgow Town Council has at last agreed to abolish the halfpenny fare. The resolution was reached at a meeting held on April 29 and it was carried by seventy-two votes to seventeen. Even then there was a certain amount of compromise. The recommendation which came from the tramways committee was that all fares should be increased by a halfpenny. For the longer distances this means only a small ratio of increase. The objection was raised that for the short distances the increase from a halfpenny to a penny

was an advance of 100 per cent. This was overcome by the adoption of an arrangement whereby penny tickets or tokens can be bought a dozen at a time for 9d. This brings about a 3d. fare instead of the 1d. one.

Of course, if a short-distance passenger on the Glasgow road pays only for the ride he is taking at the time it will cost him 1d. There was much discussion and some opposition, although the chairman of the tramways committee quoted numerous figures to show that owing to the increased cost of labor and materials the financial position of the undertaking was hopeless unless fares were increased. Among other things he pointed out that unless the revenues were increased the funds would be exhausted in four months and it would be necessary to borrow money to pay wages. Glasgow is the last place in the country to abolish halfpenny fares. That city has repaid the whole capital of the undertaking, so that there are no interest or sinking fund charges. Whether the present increase in fares will be sufficient remains to be seen.

#### LEGISLATIVE CURTAILMENT FAILS

The attempt made by the London County Council to get rid of the power of veto of the London borough councils against proposals for the construction of new tramways has failed. A motion was made in the House of Commons on March 22 that the standing order of the House which confers the power of veto should be suspended so as to allow a bill seeking to authorize the County Council to construct additional tramways to be considered on its merits by a committee which would hear all parties. There was much discussion, and the motion was rejected by 120 votes to 60. The opponents represented the automobile interests as well as the borough councils. The latter, it was urged, would, if the veto were removed, be deprived of control. The Ministry of Transport recommended the suspension of the standing order, but the House decided otherwise. The standing order has been in existence for nearly fifty years. It has killed countless tramway schemes.

The English Electric Company has paid a dividend of 8 per cent on the ordinary shares for the past year. This is the company's first year. It is a combination of several important British companies.

In the abstract of British electrification proposals, published on page 717 of the issue of April 3, a misconception may have been caused by the reference to the plans of the London & South-western Railway. This company owns the Waterloo & City underground railway in London, about one mile in length, on which new equipment is to be installed, and is also considering electrifying all of its lines for a distance of 30 miles out of London. The estimate of £750,000 mentioned in the article is for the whole work, not merely for the improvements proposed on the Waterloo & City underground line.

# News of the Electric Railways

FINANCIAL AND CORPORATE • TRAFFIC AND TRANSPORTATION

PERSONAL MENTION

## Service at Cost Proposed

Outline of Provisions of New Grant Presented to Committee of Council of Akron

A tentative service-at-cost franchise plan has been presented to the public utility committee of the City Council of Akron, Ohio, by the Northern Ohio Traction & Light Company. By the terms of the contract the City Council would have the right to order all extensions. The value of the company's property within the city of Akron would be fixed by an arbitration board and the city would have the right to purchase or lease the property at the end of any five-year period.

### SLIDING FARES SUGGESTED

Under the proposal from the company the city would have the right to prescribe the form and manner in which records and accounts would be kept by the railway and to establish the standard of service. The company would be permitted to operate interurban cars over city tracks and would not be required to issue or accept transfers to the city lines, the city system to be credited monthly with the actual cost of operating interurban cars.

The suggestion is made for a sliding scale of fares and rate of return, with a stabilizing fund of \$250,000. When this fund fell below \$150,000 the fares would be increased automatically, and when it exceeded \$350,000 fares would be decreased automatically. Both a minimum and maximum rate of fare would be specified. The minimum suggested is 4 cents and the maximum 8 cents, with ten tickets for 75 cents. According to the proposed scheme the contract would become effective with an initial rate of 5 cents, which would be continued for at least three months. The rate of fare would progress from the minimum to the maximum through eight specified stages, as follows: 4 cents cash; 5 cents cash, ten tickets for 45 cents; 5 cents cash; 6 cents cash, ten tickets for 55 cents; 6 cents cash; 7 cents cash, ten tickets for 55 cents; 7 cents cash; 8 cents cash, ten tickets for 75 cents.

### 10 PER CENT RETURN SUGGESTED

The company would be allowed an initial rate of return on the agreed value of the property of 10 per cent per annum. For each step upward in the rate of fare the rate of return would be reduced one-quarter of 1 per cent and vice versa.

The contract would provide for a depreciation account of 3 per cent. It is specified that all matters of dispute shall be arbitrated and that the con-

tract be forfeited for any violation by the company. The term of the contract would be twenty-five years.

The proposals of the company are being studied by the Council committee and negotiations are going forward looking toward a settlement of the present difficulties whereby the company finds itself unable to provide for any further extensions or betterments.

## Improvement Program Suspended

Officials of the Portland Railway, Light & Power Company, Portland, Ore., have definitely refused to authorize any improvement work on the streets of the city, in which they are interested, until the financial condition of the company is relieved. This move has stopped completion of the East Seventy-second Street project, estimated to cost \$50,000. It places in jeopardy the completion of fourteen other important projects in the city.

The city is undetermined as to what steps it can take in regard to securing completion of the projects. It has been suggested in the case of the Seventy-second Street project that the city complete the work required of the railway and withhold payment of the city's light and power bills as they become due to the company, and thus collect the costs. The belief is expressed that if the company refuses to comply with the franchise provisions the city will have to take the matter into court.

## Power Employees Strike

Power house and substation employees of the Brooklyn (N. Y.) Rapid Transit Company went on strike on May 29, evidently hoping to tie up operation over the Decoration Day holiday. In this they were unsuccessful, for unofficial reports indicate that the system had the largest passenger-carrying period in its history. The demands of the men were as follows:

A six-day week instead of the seven days now worked by most of them.

Forty-eight hours a week for those—such as the construction wiremen and helpers—who now work fifty-two.

Two men on all watches instead of the one man now on duty at most of the substations from midnight to 8 a.m.

Recognition of the International Brotherhood of Electrical Workers.

Twenty per cent increase over the seven-day pay for the six days' work being sought.

In the substations rotary tenders now receive 40 to 59 cents an hour, station operators 54 to 73 cents, and foremen operators \$36.25 to \$43.75 a week, with no overtime and no allowance for necessary absence.

## Construction Urged

Detroit Street Railway Commission Called Upon by Council to Speed Up Its Program

A resolution has been introduced in the Council of Detroit, Mich., calling upon the Corporation Counsel to inform that body in writing whether the city could not legally take over the West Warren and St. Jean lines after they had been completed by the Detroit United Railway in the same manner as it expected it will be able to take over the other lines heretofore built in accordance with the day-to-day agreements, when it is financially in position to do so.

### IMMEDIATE ACTION ESSENTIAL

The Board of Street Railway Commissioners is also requested to inform the Council when it proposes to start construction of the West Warren and St. Jean lines and when it is expected these lines will be completed. The fact that the Detroit United Railway has been requested to discontinue the construction of these lines, in spite of their immediate and urgent necessity, is alluded to and also the fact that the railway has expressed itself as anxious and willing to act in accordance with the consent, permission and authority which it received in 1919.

In commenting on this resolution, President Lodge of the Council expressed the opinion that Detroit's dire need for additional railway facilities at this time demanded immediate action on the part of the Street Railway Commission and the formulation of some plan by that body whereby the delay can be avoided. The present demands for extensions and service, he stated, arise out of sheer necessity and must be met. It is the duty of the commission to work out a plan at once.

The city, it is pointed out, has laid out its plan of campaign and the company, with its back to the wall, will fight, while the people wait.

### CITY PREPARING TO ADVERTISE

Although the plans for financing the municipal railway have not been made public and no bonds have yet been sold, the Street Railway Commission is preparing to advertise immediately for bids for constructing about 20 miles of railway. According to William C. Markham, engineer for the commission, specifications for the construction now planned are practically complete and cover the St. Jean, the Harper, the West Warren and the Charlevoix-Buchanan lines, thus including two of the three vital links proposed by Mayor Couzens for relieving congestion.



## Mr. Doherty and Toledo Commission Disagree Railway Still Has Available Referendum Petition Providing for Settlement Along Lines of Tayler Grant

Toledo's cost-of-service ordinance for the settlement of its railway difficulties is apparently doomed to failure. Members of the commission appointed by Federal Judge Killits and Henry L. Doherty are unable to agree on many of the most vital points. The sanction of Mr. Doherty is necessary before favorable action by the electorate can put the contract into effect. The commission which has been drafting an ordinance providing for public ownership of a transportation system has agreed to send its measure on its way to Council regardless of the action of the cost-of-service commission. This would indicate that the cost-of-service measure is considered practically dead.

**M**R. DOHERTY indicated that he would probably press his suit in the federal court aimed at a 10-cent fare and in which procedure he seeks to have a valuation fixed and the railway company's rights defined more definitely.

### COURT'S AID MAY BE INVOKED

Judge Killits may be called upon to patch up some of the difficulties which have caused the deadlock. He said recently that he would take no part in changing the work of the commissioners when it is submitted to the Council.

The railway, however, has agreed to give the city thirty days' notice before actively pressing the suit for 10-cent fares. The city has an appropriation of \$20,000 to protest the matter in the courts.

The municipal ownership commission has not announced the details of its plan, but it is understood that its ordinance will be brief and merely provide for a bond issue for the acquirement of an adequate transportation system. This measure, it is intended, shall allow the city to have bus lines as well as street railway lines. It has been the thought of the commissioners to buy through condemnation proceedings only parts of the existing system of electric railways and use buses for an auxiliary service.

The plan may be applied to a bus system without touching the present status of the street railway, it was indicated, when Councilmen offered to introduce a measure providing for a \$2,000,000 bond issue for securing a bus system as protection against the withdrawal of railway service in the coming winter.

### REFERENDUM AN ALTERNATIVE

The railway has an alternative for a settlement provided any measure now before Council or the people fails. Last winter when the cars were ousted into Michigan an ordinance prepared by company lawyers and patterned very closely after the Cleveland-Tayler plan was sent out in the form of an initiative petition under the provision of the city charter. Enough names were easily secured to put the proposition before the voters, but when other arrangements were being made for a settlement of the whole question the company did not submit the document to Council or the people.

These petitions are still being held and it may happen that the ordinance will be put before the people if no

other agreement can be reached. It provides for improvements in the lines, cost-of-service regulation of fares, municipal ownership or renewal of grant features of the amortization clause, and practically all of the well-known features of the Cleveland plan.

The city officials are attempting to get some definite form of a settlement before the voters at the August primaries. If a measure can be put through in time for the election in August no special election will have to be called.

### COURT HEARING IN SEPTEMBER

It is doubtful whether Mr. Doherty can get a hearing before September for the company on the amended cross-bill which asks for 10-cent fares. The present status of the cost-of-service plan may, however, help to bring the case up because it would settle several of the points at issue in open court.

## Service Dividend on Utah Interurban

Julian Bamberger, president and general manager of the Bamberger Electric Railroad, Salt Lake City, Utah, announced on the tenth anniversary of the electrification of the road that the company will pay a service dividend or bonus to all employees who have been with the company more than one year. A number of employees have been in service for ten years and they will receive the maximum service dividend of 10 per cent. The minimum dividend will be 1 per cent for those in service one year, to increase 1 per cent for each year and retroactive to Jan. 1, 1920. Dividends will be paid March 25, June 25, Sept. 25 and Dec. 24 of each year excepting the first, which will be given on May 28.

The dividends will be computed from the regular payroll of each three months' period and will be in addition to prevailing wages. In computing the number of years in service, no deduction will be made for the period of the great war when some employees were engaged in government work and in the army and navy.

The bulletin posted by the company, in addition to the details as to the plan, makes the following general announcement:

In celebration of the tenth anniversary of the electrification of the Bamberger Electric Railroad (formerly Salt Lake & Ogden Railway) and in order to realize an idea of the founder of this railroad,

Gov. Simon Bamberger, that recognition should be given, not only to the intrinsic value of an employee's services, but also the added value which long and efficient service brings, it has been determined that a service dividend will be paid quarterly to all employees of this company who have been in the service for one year or more.

## 100 Per Cent Wage Increase Asked

Employees of the Aurora, Elgin & Chicago Railroad, Aurora, Ill., have asked for a flat increase in wages for all employees who are members of the union of approximately 50 cents an hour, in a proposed new contract between the Amalgamated Association and the company. The scale of wages for trainmen now in force ranges from 43 cents to 55 cents an hour plus a service bonus. The increase if allowed would mean an addition of approximately \$1,250,000, or nearly 100 per cent, to the annual payroll. Adding to this the cost of changes in working conditions demanded by the men, the additional cost to the company would be approximately \$1,500,000 annually.

Edwin C. Faber, general manager for the receiver, says that in the preparation of these demands the men could not have given much consideration to the question of what their demands would cost the company, since to grant them would require an expenditure for labor in excess of the entire gross receipts of the company.

The company is now collecting on the third rail and Fox River divisions a rate of fare equal to the maximum charge for regular fares made by the competing steam lines, and it is doubtful whether a further advance to 10 cents in the city line fares in Aurora and Elgin would produce any increase in revenue.

## \$4,000,000 Construction Loan Approved

The ordinance to create a loan of \$4,000,000 for the completion and equipment of the Frankford elevated railroad was passed on June 1 by the Council of Philadelphia, Pa., upon the expiration of the two weeks' period required for the advertising of a councilmanic loan previous to final action.

The loan was passed without debate or a dissenting vote. After the meeting of Council Francis F. Burch, chairman of the finance committee, said the proposed new loan for general purposes would probably provide for a further appropriation of \$1,500,000 for the Frankford road, the outside sum William S. Twining, director of city transit, estimated would be necessary to repair the road for operation in addition to present available funds and the \$4,000,000 loan.

Council postponed action for another week upon the question of the election of the city's two representatives in addition to the Mayor on the board of directors of the Philadelphia Rapid Transit Company to succeed Col. Sheldon Potter and William Hancock, whose terms have expired.

## Preparing for Louisville Report

### Trial Period of Three Months Has Expired—Constructive Publicity Campaign Under Way

In anticipation of a report that is to be made shortly relative to operations of the Louisville (Ky.) Railway during a three months' period, by a special committee or operation board, the company is preparing the public for its announcement by carrying a poster reading "Know the Truth" over the front fender of each car. There was no explanation of the sign. It had the public talking and asking questions freely as to what the sign meant. Then the company placed cards in the cars. In the two upper corners were small circles in which "Know the Truth" was found.

**U**NDER the heading "Ready to Report" the company said:

Facts about the Louisville Railway learned by our practical operation of the property soon will be made public.

These facts will be told plainly, fully, frankly and honestly.

We want the public to know the truth. When the public understands our mutual problems the solution will be simplified.

The success of the Louisville Railway means Louisville's success.

Watch the newspapers. Read the car signs. "Know the Truth."

#### NEWSPAPERS USED LIBERALLY

The executive committee is also using newspaper space in acquainting the public with its work, and what it has in mind. One of these statements in advertising form was as follows:

"Know the Truth" is a slogan under which the executive committee of the Louisville Railway will report to the public the result of its several months' study and operation of the local street railway system.

This slogan was chosen because it expresses the attitude that the committee believes the public—whether it be car rider, employee, official or stockholder—should have toward this big vital public utility.

The truth about the Louisville Railway as it has been learned by intensive study by the committee will be told frankly, plainly, fully and honestly.

Nothing will be glossed over. Nothing will be covered up.

The story of every vital problem of the lines, the reasons for them and possible suggested solutions of them will be set forth fearlessly.

What the solution of these problems is the committee does not attempt to say at this time. For the present, at least, this is to be a campaign of information aimed solely at establishing understanding of the facts through truth.

With understanding arrived at through truth will come valuable suggestions from the vital elements to the successful operation of our street railway—the public, city officials, employees and stockholders—that certainly will re-establish the service on the firm foundation that it justly deserves and must have if it is to continue to operate.

Our sincere wish is that the riding public will watch the car signs, read our newspaper advertisements and statements, ask us questions and—Know the Truth.

The teaser advertising used for a solid week on the front end of the cars attracted much attention. The answer to the mystery has the public on its toes, so to speak.

The executive management committee held a conference with Mayor Smith recently and told of its publicity campaign, which is being supervised by Labert St. Clair and Robert Dougan, Washington, D. C.

#### NEW PRESIDENT NOT ANNOUNCED

Messrs. Dougan and St. Clair accompanied W. S. Speed, John W. Barr and W. H. Kaye, forming the management committee. The publicity experts were introduced to the Mayor and outlined the campaign to educate the public.

The three months' test operations ex-

pired on May 18. The report will be made as soon as the details can be figured out and the matter placed in comprehensive form. The committee of directors continues in charge. No successor to T. J. Minary, as president, has been appointed. Mr. Minary is now chairman of the board.

Mr. Barr stated that the question of a new president would be covered in the report of the three months' operations. Mayor Smith states that his "mind is still open on the subject." A number of the members of the City Council, however, are bitterly opposed to a fare increase over the franchise agreement.

## Texas Interurban Assured

Announcement Made at Dallas on June 1 That 135-Mile Interurban Has Been Financed

Construction of the 135-mile interurban railway from Dallas to Wichita Falls, Tex., is assured and cars will be in operation over the entire line by the summer of 1922, according to J. F. Strickland, president of the Texas Electric Railway, and others behind the project. Building of the line was assured when citizens of Dallas made advance stock subscriptions of \$1,016,000 and citizens of Wichita Falls subscribed \$500,000. George T. Bishop, Cleveland, Ohio, now guarantees to sell \$4,500,000 of first mortgage bonds. The General Electric Company will complete the financing of the line. Kemp & Kell, Wichita Falls, will construct the line, exclusive of power stations and transmission lines, for \$7,500,000. The latter will be built by the General Electric Company. They will cost \$2,000,000 to \$2,500,000.

#### FINANCIAL PLAN REVIEWED

In announcing the results of the conferences held in Dallas recently at which the entire matter was considered Wiley Blair, chairman of the committee that promoted the line, issued the following statement:

A financial plan for the building of the Dallas-Wichita Falls interurban has been agreed to between the local interests and the General Electric interests. Under this plan, \$4,500,000 is to be provided on first mortgage bonds, and George T. Bishop, Cleveland, has undertaken to see if that sum can be obtained from bankers. The remainder of the money needed for the construction of the line will be furnished by the local interests in Dallas, Wichita Falls and all the territory between, and by the General Electric interests, the local and General Electric interests each contributing one-half.

The details of the plan will be announced

after they have been worked out by the lawyers. It, therefore, seems clear that the Dallas-Wichita Falls interurban can be built if the people in Dallas, Wichita Falls and intervening territory subscribe their share, and if Mr. Bishop is able to obtain from investment bankers \$4,500,000 on the first mortgage bonds.

It remains for the citizens of Dallas to do their part in buying their portion of the preferred stock necessary to construct the line. The committee that has been working on this for the last fifteen or sixteen months feels optimistic. The members have met with every encouragement, both at home and elsewhere. Especially do they want to attest to the interest shown and the help given by the General Electric interests. Owen D. Young, vice-president of the General Electric Company, has given a great deal of his time and attention to the matter, and through his efforts responsible people, with George T. Bishop at their head, became interested.

The construction of this line means so much to Dallas, Wichita Falls and all points between that it behooves every citizen to put his shoulder to the wheel and help put this proposition over.

This statement was made by Mr. Blair before the successful completion of the details was announced at Dallas on June 1.

## Hollanders Visit U. S. Companies

P. M. Montijn, technical manager of the Hague Street Railway, The Hague, Holland, and T. Egbert van Putten, general manager of the Municipal Street Railways & Ferries, Amsterdam, Holland, are making a tour of investigation of the electric railway industry in the United States. They are paying particular attention to a study of the safety car. The visitors have inspected several railway properties in the East, and have looked over the plants of the J. G. Brill Company, Philadelphia; the American Car Company, St. Louis, and several railway properties in the Middle West. Mr. Montijn will pay a special visit to Terre Haute, Ind., to study safety-car operation there. Later he will look into the automatic substation installations at Des Moines, Iowa. Mr. van Putten expected to return to Holland early this month, but Mr. Montijn will extend his trip to the Pacific Coast, making it a joint pleasure and business trip, visiting the Grand Canyon and other scenic spots and several railway properties on the coast. He will probably sail for Holland on July 8.

The Hague Street Railway serves a population of 400,000 and carries about 35,000,000 passengers a year. The Amsterdam property serves a population of 775,000. Mr. Montijn was surprised to learn, when in Terre Haute, that the company there in serving a population of only 66,000 carries 16,000,000 passengers a year. In other words, The Hague, with six times the population, does only a little more than twice as much riding as Terre Haute.

## Co-operative Plan of M. I. T. a Success

For the past year an interesting experiment in co-operative engineering education has been conducted by the Massachusetts Institute of Technology and the General Electric Company. While the co-operative scheme in itself is not new, several departures from the usual plan were introduced, which have produced decided results.

The class was limited to thirty students, who were chosen entirely upon the records which they had made in the equivalent of the first two years' work of the electrical engineering course.

Included in this group were graduates from Yale, Harvard and other universities, besides men who had completed their first and second years solely at Technology. The year (twelve months) is divided into four three-month periods, the students spending alternately thirteen weeks at the Lynn works of the General Electric Company and eleven weeks at the institute, followed by a two weeks' vacation.

The result of this year's work has been gratifying to the originators of the plan as well as to the students and the co-operating company, and the latter has now arranged to increase the number of men who can be enrolled in this year's class to sixty. The new class, which has already nearly completed its quota of members, will enter upon the work on July 6.

### Utility Plank to Be Suggested in National Platform

A platform plank to be suggested to the Republicans in national convention in Chicago will urge national and state regulatory bodies to take such appropriate and prompt action as will insure the continued functioning of the public utilities pending a final solution of the problems involved.

Randal Morgan, president of the United Gas Improvement Company, Philadelphia; Philip H. Gadsden, chairman of the emergency committee of the American Gas Association, New York City, and chairman of the American Electric Railway War Board and of the committee on national relations of the American Electric Railway Association, and Thomas N. McCarter, president of the Public Service Corporation of New Jersey, have gone to Chicago. There they will appear before the proper committees of the convention, in an effort to have a plank helpful to the public utilities of the country included in the Republican party platform.

The gentlemen named will point out that all public utilities are faced with a serious crisis arising from the shortage of essential materials and the great increase in the cost of labor and material. They contend that the continued efficient operation of the railroads and other public utilities is essential to the welfare of the nation, and that any interruption to their service or impairment of their ability to attract new capital would be a national calamity.

The recent railroad act passed by Congress, Mr. Morgan asserts, is based upon the recognition of the fundamental principle that labor and capital engaged in service to the public must receive such compensation as will insure the continued flow of new funds and of workers into the industry. It will be pointed out that this principle should be extended to all public utilities.

## Court Prevents Service Suspension

### Davenport Saved from Heavy Loss and Public Inconvenience by City Merchants Acting Through Court

To prevent a tie-up of electric railway service at Davenport, Ia., on June 1, twenty-two of the leading merchants of that city, through their Retail Merchants' Association, stepped into the breach and secured an injunction from District Judge A. J. House restraining the city from putting the old 5-cent fare back into force. This injunction, a temporary one, also restrained the company from suspending service. The Tri-City Railway, however, while it has been losing money at the present 7-cent fare and 60-cent wage scale, has shown no disposition to stop operation if it could be assured a continuance of the 7-cent fare.

**M**ERCHANTS took this action at the eleventh hour when it appeared there was no way to prevent a tie-up. Immediately following service of injunction papers the company made an agreement with its trainmen to continue the 60-cent wage scale in force pending a settlement by arbitration. The men are asking a new scale with a \$1-an-hour maximum.

#### COMPANY ASKED FARE EXTENSION

The company went before the Council a month ago and asked a ninety-day extension of the 7-cent fare in order to insure car operation until a wage settlement with the trainmen and shopmen could be effected. This the Socialist majority in the Council turned down, insisting the company go back to the 5-cent fare on June 1 as provided in its original franchise.

Trainmen were notified by the traction lines that a pre-war fare meant a pre-war wage scale, 33 cents an hour. The men stated they would not work for this fare. With this crisis confronting the city the retail merchants got together, retained attorneys, and drew up a petition to the court for a temporary injunction restraining the city from enforcing the old franchise and its 5-cent fare.

This action has had general public approval. The public has been anxious for a continuance of street car transportation, remembering last year when a five-day cessation of service due to the trainmen's strike caused heavy monetary loss and untold inconvenience.

The city has not yet answered the merchants' action. The company immediately stated it would obey the injunction. The trainmen are also co-operating in solving the question.

#### ONE RADICAL SEES THE LIGHT

It is regarded as probable that the Socialist majority in the City Council will instruct the city attorney to fight the injunction. Dissension in the Socialist ranks, however, has broken out. The Mayor, Dr. C. L. Barewald, a Socialist, has come out for the 7-cent fare. He is backed in his action by Harold Metcalf, police magistrate and one of the powers in the party here.

It is planned to keep the injunction proceedings tied up in the courts until the company and the men have come to an agreement on wages and a new franchise can be prepared for submission to a popular vote.

It is understood that Tri-City Rail-

way officials are now preparing a new franchise along general service-at-cost lines. This measure will include an important provision for a flexible curtailment or expansion of mileage operated as well as a flexible scale of fares.

The temporary injunction secured by members of the Retail Merchants' Association is worded as follows:

Now on this 28th day of May, 1920, the foregoing petition being presented to the court in chambers at Maquoketa, Iowa, the plaintiffs appearing by W. M. Chamberlin, Charles Grillk and Henry Thuenen, it is now ordered that the clerk of this court shall issue a temporary injunction restraining the defendant Mayor and Aldermen of the city of Davenport from in any manner interfering with the continued operation of the street railways in the city of Davenport by the Tri-City Railway, as the same are now being operated under and by virtue of an ordinance passed and approved Oct. 1, 1919, and from collecting and charging the fares now being charged and collected as provided by the certain city ordinance of the city of Davenport, passed and approved Oct. 1, 1919.

And also enjoining and restraining the defendant Tri-City Railway from discontinuing the operation of its railway lines in the city of Davenport, or charging fares in excess of the fares now provided in the said ordinance of Oct. 1, 1919, set forth and attached to the petition filed herein. Plaintiffs to file bonds in the sum of \$1,000, to be approved by the clerk. These injunctive orders should continue in effect subject to the further orders of this court.

### Electrification Cost Prohibitive

Steam railroads entering Buffalo, N. Y., will not be compelled to electrify their lines as demanded in a resolution introduced in the City Council. The Council feels that the cost would be too great for the railway. Experts testifying before the City Council on behalf of the steam roads said that it would cost the New York Central alone \$65,000,000 to electrify the lines and tracks in Buffalo and \$105,000,000 if the tracks in the suburbs were included.

Approximate calculations of the cost of electrifying 82 miles of track owned by the New York Central in the Buffalo district as submitted by Edwin B. Katte, chief electrical engineer for the New York Central, showed electric locomotives alone would cost \$32,000,000. Other figures were: power station, \$5,000,000; contact system, \$11,000,000; transmission and feed system, \$3,300,000; duct line system, \$2,000,000; locomotive repair shop, \$1,100,000; circuit breaker houses, \$200,000; track bonding, \$750,000; telephone system, \$75,000; engineering cost 10 per cent, or a total of \$65,000,000. To this was added \$1,500,000 for electrification of short connecting lines.

## Settlement by Conference Indicated

### Pittsburgh Mayor and Council Bow Themselves Out of Wage Controversy—New Turn in Events

The controversy between the receivers of the Pittsburgh (Pa.) Railways and the trainmen has assumed a most peculiar aspect. On June 3 it seemed that a strike would be averted. It will be recalled that Mayor Babcock and members of the City Council had sought to act as a Board of Arbitration to decide whether the men should accept the receivers' proffer of 59, 63 and 65 cents an hour or be awarded more pay than this. The receivers of the railway appear to have out-generated the Mayor and members of the City Council in their attempt to make political capital of the controversy. This development has, perhaps, commanded the most attention lately.

The wage controversy in Pittsburgh had its incipency back in April. The men at that time demanded a 75 per cent wage increase, or a maximum hourly pay of 91 cents. When the receivers made their offer of 59, 63 and 65 cents an hour, they demanded that in case of the rejection of this proposal arbitration be resorted to as a means of settling the questions in dispute. At the same time the receivers named S. E. Duff, a consulting engineer of Pittsburgh, to represent them on the board of arbitration. The men rejected the wage proffer and also ignored the receivers' proposal for arbitration. In consequence a strike seemed inevitable.

William B. Fitzgerald, international vice-president of the Amalgamated Association, was at this juncture brought to Pittsburgh by the local trainmen's union. At about the same time, Mayor Babcock and the City Council, who, it seemed, had lost interest in the matter, again projected themselves into the affair. They asked the receivers and the trainmen's wage scale committee to meet with them in the Mayor's office on May 27.

The trainmen had previously called a meeting for May 27 to vote on the matter of a strike, but they agreed to postpone action a couple of hours to await the outcome of the meeting in the Mayor's office.

At the meeting in the Mayor's office the Council passed a resolution as follows:

Resolved, That it is the sense of the Mayor and the Council that the men and receivers be urged to adjust their controversy by arbitration, that the arrangement with the wage committee shall be 59, 63 and 65 cents an hour from May 1, 1920, until finally fixed by the arbitrators.

The receivers supplemented this with the following statement:

If the proposed plan is accepted by the men and brought to us by the Mayor with his recommendation and that of the Council, it will be accepted by us.

The men at their meeting, a session which lasted into the early hours of the following day, voted two to one to accept arbitration. The following day they proposed that Mayor Babcock and members of City Council constitute the board of arbitration to decide the questions in dispute.

The Mayor addressed a communication to the receivers, informing them of the men's proposal.

When Receiver Charles A. Fagan learned unofficially that the Mayor had addressed such a communication to the receivers, he made a statement to the newspapers. Upon receipt of the

Mayor's official letter, the receivers jointly replied that the letter of the wage committee to the Mayor, of which the latter sent a copy to the receivers was not in any sense an acceptance of the terms stated in the resolution adopted by the Mayor and the Council, nor did the Mayor's letter indicate any recommendations of the receivers.

When the Mayor and the Council read this communication from the receivers, they began, as they admit, to "see things differently," and immediately called the receivers and the trainmen's committee together again. At this meeting, the Mayor and the Council told the men they could not act as arbitrators. They indicated that they could not regard the proposal of the men as in any sense an acceptance of the resolution adopted by the Mayor and the Council on May 27. This resolution plainly provided that all matters involved in the present controversy should be submitted to arbitration. They said that this would include all questions in dispute both on the part of the men and on the part of the receivers.

Mayor Babcock then admitted to newspapermen that the series of conferences which he started some time ago looking to the adjustment of the controversy had been for naught and that the controversy would likely have to seek new channels for solution. He admitted that the city officials were "eliminated."

There has since been nothing done. The receivers say that in view of the fact that they named their arbitrator in the first place, it is now up to the men to name their man just as soon as possible. What the men intend to do, they will not say.

In quarters usually well informed, however, there is a feeling that the receivers and the men will yet get together and settle their differences amicably without arbitration.

### Wage Matter Adjusted

The danger of a strike on June 1 was averted in Jackson, Battle Creek, Kalamazoo and Lansing on the Michigan Railway's lines. The men will work temporarily on a wage scale granted by the arbitration board.

The Jackson City Commission late on May 28 adopted a resolution fixing the rate of fare on city lines at five tickets for 35 cents, 5 cents for school children and 10 cents for single cash fares. This is not as much as was asked by the

company and it is maintained that it will not meet the present wage demands of the men. The Commission, however, informed the company that in the event any other city on its lines was granted a lower fare, a like fare was to be established in Jackson. The Councils of Battle Creek, Kalamazoo and Lansing are considering the matter and it is expected that an agreement will be reached whereby the company can charge a rate of fare sufficient to pay the higher wages to the men in these cities.

## Detroit Strike Averted

### Railway Withdraws Transfer So As to Increase Revenues When Men Threatened to Vote on Strike

Following the refusal of the Council of Detroit, Mich., to authorize a 6-cent fare on the ground that it was without authority to pass such an ordinance, the trainmen of the Detroit United Railway sent notice to President Frank W. Brooks in response to his request for more time in which to negotiate with the city, that they would meet on May 31 to vote on a strike. They said this action would be taken unless they were granted 70, 73 and 75 cents and regardless of whether or not the company collected higher fares.

The Mayor cast further doubt on the figures presented by the company accompanying its fare petition, and stated that the company assumed the unheard of position that it was never at any moment to operate at a loss. The company's proposition to be allowed the fare increase and have the audit of the books follow was branded by the Mayor as the most insulting holdup in his experience. It was his opinion that an independent analysis of the accounts with the proper credit to revenue for terminal revenue for interurban line terminals would show that the company could pay the increase demanded without any raise in fare.

A strike was averted temporarily at least by withdrawing transfer privileges on all lines as a means of gaining increased revenue claimed to be necessary to meet the men's wage demands. This agreement conceding the demands of the men is to be retroactive to May 16 and effective until June 15. In the meantime if an agreement can be reached with the city as to a rate of fare sufficient to "meet the financial obligation involved" the company will sign a wage contract for one year.

All transfer privileges were withdrawn effective at midnight on May 31. In a communication to the Council the company explained the move and offered to have its books examined by a committee of citizens.

The Corporation Counsel led a request for an injunction seeking to have the court compel the company to issue transfers on the Pingree and day-to-day lines. In addition the court is asked to order the railway to sell tickets on the Pingree lines at the rate of eight for 25 cents as required by the franchises.

## News Notes

**Inquiry by Local Body Into Rates.**—The question of an increase in the rates for the Sioux City (Iowa) Service Company is in the hands of a committee appointed by the Chamber of Commerce. The wage question is held up pending the presentation of the rate finding.

**Men at New Orleans Want More.**—Trainmen in New Orleans, La., have presented demands to the New Orleans Railway & Light Company for a flat scale of 75 cents an hour. The men are now receiving a sliding scale of 38 cents, 40 cents and 42 cents an hour depending on length of service.

**Reading Transit Increases Pay.**—The Reading Transit & Light Company, Reading, Pa., on May 20 announced an increase of 4 cents an hour, from 50 to 54 cents, in the wages of the motormen and conductors of its entire system, comprising Reading, Lebanon, Norristown and Roxborough.

**Tri-City Linemen Strike.**—The linemen of the Tri-City Railway & Light Company, Davenport, Ia., have struck for higher wages. The rates demanded are so exorbitant that if they were put in force the line foreman on the city lines would draw more than \$5,000 a year, including the overtime which is normally put in.

**Increase Asked by Cincinnati Men.**—On May 15 the platform men of the Cincinnati (Ohio) Traction Company presented a demand for an increase of wages from 50 cents an hour to 90 cents an hour. Officials of the company say that if the demands are granted the rate of fare under the service-at-cost grant will have to be raised to 10 cents.

**Wage Matter Regarded Closed.**—While no definite acceptance of the 10 per cent wage increase has been received from the brotherhood, officials of the Interborough Rapid Transit Company, New York, N. Y., consider the matter closed. It is understood 90 per cent of the locals have agreed to the proposal replacing the original demand for a 25 per cent increase.

**Linemen on Strike in Omaha.**—The linemen of the Omaha & Council Bluffs Street Railway, Omaha, Neb., are on strike because of failure of the company to meet demands relative to the allowance of time for getting from headquarters to the job and from the job back to headquarters. The demands were considered so unreasonable that no negotiations are being held with the men.

**Four-Cent Wage Advance.**—The Northern Texas Traction Company, which operates in Fort Worth and

runs the Dallas-Fort Worth interurban line, announces a flat increase of 4 cents an hour for all trainmen on both the city and the interurban lines. The trainmen have been receiving wages ranging from 42 cents to 50 cents an hour. Under the new scale the wages will range from 46 cents to 54 cents an hour. The new wage advance will add \$75,000 a year to the company's payroll for the city lines alone. Wages on both city lines and interurban have been increased by \$652,991.08 since 1915.

**Wage Increase in Springfield.**—Motormen, conductors, dispatchers, car-house workers, trackmen and other employees of the Springfield (Ill.) Consolidated Railway will receive wage increases during the coming year totaling \$30,000 as the result of the new wage agreement signed by representatives of the Brotherhood and A. D. Mackie, general manager of the railway. Under the new scale trainmen will receive increases amounting to 5 cents each on the hour, making their wages vary from 46 to 50 cents an hour, instead of from 41 to 45 cents. The new agreement will be effective until May 15, 1921.

**Accident on Electrified Line.**—When a stone retaining wall on the main line of the Chicago, Milwaukee & St. Paul Railroad, near Ragner Station, a few miles west of the divide in the Cascades, gave way without warning recently, two of the line's electric locomotives hurtled over a steep rocky embankment 300 ft. to a position near the Sunset Highway. Five trainmen were injured, two of them seriously. Damage to the locomotives was estimated at between \$50,000 and \$75,000. The stone wall reached a height of 30 to 40 ft. at the lower end. Its failure was attributed by officials of the company to recent rains, which had weakened the roadbed. The accident is the first that has occurred to the Milwaukee's electric equipment.

**Wage Hearings Started.**—The Mayors of Rochester, Syracuse and Utica, N. Y., were invited to attend the first session of the arbitration board held in Rochester on June 3. The board will hold hearings on the question of rates of wages for the electric railway employees in the cities mentioned. Arthur E. Sutherland, a Rochester attorney, is chairman of the board. Mayors unable to attend the hearing will send representatives so that the public interests may be conserved in so far as they are involved in the dispute. The place of the second hearing, or third, if necessary, has not been discussed by the arbitration board. The railways and the labor unions will be represented at the first hearing.

**Wage Hearing on June 11.**—The Railroad Commission of Wisconsin will hold a hearing in Milwaukee on June 11, 1920, to consider the increase in wages recently recommended to be granted the railway employees of the

Milwaukee Electric Railway & Light Company by the State Board of Conciliation. Under chapter 530 of the laws of 1919 of Wisconsin, the Railroad Commission must determine the ability of the company to pay the increased wages. If necessary the commission can order an increase in fare to provide the revenue needed. City Attorney Clifton Williams of Milwaukee has announced that the city will oppose a further increase in fare, even to the extent of appealing to the courts if necessary.

**Port Stanley Line Tied Up.**—Extensive damage to the property of the London & Port Stanley Railway, London, Ont., has accompanied the strike of the employees. The men walked out on May 13 at midnight, and when an attempt was made on May 14 to operate trains on the line, this was found to be impossible owing to what was then said to be a break on the wires near this city. The commission asserts that the first step toward a settlement must come from the men. The men assert that they will meet the commission at any time, but that the first move must be made by the commission.

**Public Represented by Commission.**—In the review of labor matters in St. Louis, Mo., affecting the United Railways which appeared in the ELECTRIC RAILWAY JOURNAL for May 15, page 1014, the statement was made that "no provision was made in the arrangement for representation of the interests of the public, which, however, are protected in theory by the State Public Service Commission." As a matter of fact, any and all findings of the board of arbitrators which directly or indirectly affect the public, either in change in service or rates, must be laid before the Public Service Commission, which is the representative of the public, before acceptance by railway. Further, the city and public have the right to appear before the commission and file their exception to any or all of the recommendations of the board of arbitration.

**Railway Matters Go Before Voters.**—Preparations are being made at Duluth, Minn., for the special municipal election there on June 21 in connection with which the Duluth Street Railway was appraised. Two charter amendments and three proposed ordinances will be submitted. Included among the latter is a proposal to increase fares from 5 cents to 6 cents and a municipal ownership ordinance. Proposed Ordinance "A" provides for the regulation of the service to be given and fixing the fare and regulation of the fare to be charged by the Duluth Street Railway in the city of Duluth. Proposed Ordinance "D" provides for the issuance and sale of \$3,500,000 of bonds of the city of Duluth for the purpose of acquiring by purchase or condemnation the lines of the Duluth Street Railway within the city of Duluth, together with the rolling stock and equipment.

# Financial and Corporate

## Valuations Exceed Costs

Figures for Big Railroads Under I. C. C. Indicate Ultimate Valuations Will Exceed Fixed Costs

That the Interstate Commerce Commission's preliminary reports of the cost of reproducing the railroads of the United States more than sustain the aggregate property investment account of the companies was affirmed by the carriers in the advance freight hearings. This testimony was offered by Thomas W. Hulme, general real estate agent of the Pennsylvania Railroad, and also vice-chairman of the railroad presidents' Committee on Federal Valuation. This is the first official indication of what trend the valuation by the commission was taking.

TOTAL \$20,000,000,000

Mr. Hulme, in presenting an analysis of the commission's report, stated that when the inventory was completed for all the roads of the country, it would undoubtedly show a reproduction cost at 1914 prices in excess of the carriers' own investment statement, and that on the basis of present prices the total would be far in excess of this. The aggregate railroad property investment obtained by the carriers in reports presented by them to the commission is over twenty billion dollars. This figure, Mr. Hulme said, would be more than sustained at 1914 prices, while the application of 1920 prices would add billions more.

The present government preliminary reports cover fifty railroad systems, with a mileage of 51,853. Cost of reproduction at 1914 prices including the value of land is indicated as \$3,203,782,543 as compared with a property investment account as carried on the books of the company of \$3,158,278,156. They are principally small roads. At the time they were investigated or shortly thereafter many of them were in receivership.

### TEN LARGEST ROADS COMPARED

The preliminary reports, Mr. Hulme asserted, were minimum figures, and in a number of cases the carriers believed that final figures will be considerably larger. He said that wherever there was a difference of opinion between the local engineering forces of the government and the representatives of the carriers the government engineers put in the figures that they deemed to be the minimum. It is but natural that there should be many errors and differences of opinions in inventories involving such great amounts. Another point which Mr. Hulme brought out is that the land value of \$340,741,031, includes in many cases not the present value but the original cost. In case present

values of land were used, this figure would, of course, be increased.

The ten largest roads in the list of fifty covered in Mr. Hulme's statement show the following comparison between the carriers' investment account and the government estimates of the cost of reproduction as of 1914:

| Name of Road              | Property Investment | Reproduction cost and land |
|---------------------------|---------------------|----------------------------|
| Great Northern.....       | \$384,273,863       | \$418,204,335              |
| Rock Island.....          | 341,401,305         | 388,601,208                |
| N. Y., N. H. & H.....     | 195,505,844         | 319,599,023                |
| Boston & Maine.....       | 195,903,526         | 276,528,128                |
| Big Four.....             | 144,375,812         | 159,269,845                |
| Oreg.-Wash. R.R. & Nav.   | 156,642,559         | 143,347,128                |
| Mpl., St. P. & S. S. Mar. | 116,953,635         | 114,701,111                |
| Oregon Short Line.....    | 113,094,103         | 109,685,219                |
| Chic. & Eastern Illinois  | 78,990,280          | 77,751,855                 |
| Central of Georgia.....   | 62,603,324          | 73,609,448                 |

## Cleveland Interurban Increases Its Net 149 Per Cent

The financial condition of the Cleveland, Painesville & Eastern Railroad, Willoughby, Ohio, improved materially over the previous year, so much so that notwithstanding a 22 per cent increase in operating expenses and taxes, the surplus or net income for the year

## Wants People to Decide Mayor of Boston Says Extension of Credit by City Should Be Decided by Referendum

A bill is now pending before the Legislature in Massachusetts to provide for the public operation of the electric railway lines in the Hyde Park district of Boston. The bill was introduced by the committee on street railways of its own motion, after several alternative measures had been discussed.

### 6 PER CENT RENTAL

It provides in substance that the railway in Hyde Park now owned and operated by the Eastern Massachusetts Street Railway shall be turned over by them to the trustees of the Boston Elevated Railway system, to be operated in conjunction with that system. It also provides for a rental of 6 per cent on the value of the property, as estimated by the Public Utilities Department, to be paid by the Boston Elevated Railway to the Eastern Massachusetts Street Railway in pursuance of certain detailed provisions contained in the act. The rate of fare is not to exceed the unit rate of fare which the Boston Elevated Railway may charge.

There is a provision that any deficit

| Year Ended Dec. 31                | 1919      | 1918      | Per Cent Increase |
|-----------------------------------|-----------|-----------|-------------------|
| Gross earnings.....               | \$691,043 | \$551,860 | 25.30             |
| Operating expenses and taxes..... | 459,476   | 376,500   | 22.02             |
| Net operating income.....         | \$231,567 | \$175,360 | 32.02             |
| Interest charges.....             | 167,188   | 149,553   | 11.79             |
| Net income.....                   | \$64,379  | \$25,807  | 149.00            |

increased 149 per cent. This is equivalent to a return of 2.57 per cent on the \$2,500,000 capital stock outstanding. The income statement is shown in the accompanying table.

## Chicago Elevated Deficit

The report of the earnings of the Chicago Elevated Railways for the month of February, 1920, the first month under the 8-cent cash fare and the two-tickets-for-15-cent rate, showed a deficit. The report for March, 1920, also showed a deficit as follows:

|                             |             |
|-----------------------------|-------------|
| Total earnings.....         | \$1,358,521 |
| Total expenses.....         | 1,158,204   |
| Balance for interest.....   | 200,317     |
| Fixed interest charges..... | 205,409     |
| Deficit.....                | \$ 5,092    |

## Employees Urged to Save

T. E. Mitten, president of the Philadelphia (Pa.) Rapid Transit Company, has again done an unusual thing. Just when everybody seems bent on spending as much as he can Mr. Mitten has gone straight to the men and women of his company with a message to save. He urges the budget. On it the success of the Philadelphia Rapid Transit Company has been built during his incumbency. Mr. Mitten knows what it means for a company or an individual to live within its or his income.

in the operating cost is to be paid by the city and that the city shall provide such funds for the rehabilitation of the Hyde Park lines as will enable adequate service to be maintained and for this purpose may borrow not to exceed \$200,000.

It is the opinion of Mayor Peters of Boston that unless the Legislature amends the bill so that the city will not be obliged to provide money for the rehabilitation of the line a referendum should be attached. In commenting on the matter the Mayor said:

To the first of these provisions the Mayor has given his assent, feeling that the situation in Hyde Park in respect to transportation is sufficiently serious to warrant the expenditure involved. He is, however, utterly opposed to the second provision, the substantial effect of which is to take money raised by taxation and apply it to the rehabilitation of a privately owned street railway, with only a remote possibility of reimbursement.

It is true that the last section of the act provides that within ninety days of the return to the Eastern Street Railway of its property the company shall pay the city of Boston a sum equal to any increase in the value of the property as determined by the Department of Public Utilities. This, however, in view of the well-known financial condition of the line, is not regarded by the Mayor as satisfactory.

### OPPOSE CITY LENDING CREDIT

The Mayor is strongly in favor of the adoption of the amendment which strikes out that part of the bill requiring the city to provide funds to rehabilitate the road. If this amendment should not be adopted, he feels that there ought at least be a referendum to the voters of the entire city.

### 75.8 Per Cent Increase in Lake Shore Net

The Lake Shore Electric Railway System, Cleveland, Ohio, as a whole, seems to be somewhat better off than a year ago, although only an average of 3.83 per cent was earned on the total capitalization of \$7,500,000. With this surplus, however, the company

The letter states that the trustees discontinued the Essex power station and carhouse and made other savings last fall in an effort to reduce the deficit; the Gloucester power station was closed down on May 12 and power is now being purchased from the electric light company, and in a further effort to continue the operation of cars the trustees sent to Gloucester fourteen

The Appellate Court also confirmed the adverse decision of the District Court in the suit brought by Mr. Priest, counsel for the railway, to have the evidence in the Seaman suit thrown out and the case argued again.

### Tax Assessment Protested

The Houston (Tex.) Electric Company has filed before the City Commission a petition asking reduction of valuation of its properties for taxation. The city of Houston increased the company's valuation from \$2,694,000 to \$3,194,000. The city maintained that the company's property should be assessed at one-half the valuation agreed on for calculation of earnings under the new franchise. The special master in chancery fixed this value at \$6,000,000. The company contends that it might be necessary to increase fares again if the city insists on increasing assessments for taxation.

| Year Ended Jan. 31                | 1919        | 1918        | Per Cent Change<br>+ Inc. — Dec. |
|-----------------------------------|-------------|-------------|----------------------------------|
| Gross earnings.....               | \$2,611,755 | \$2,189,324 | +19.28                           |
| Operating expenses and taxes..... | 1,895,533   | 1,593,083   | +18.98                           |
| Operating income.....             | \$716,222   | \$596,241   | +20.13                           |
| Interest and fixed charges.....   | 428,504     | 432,861     | -1.01                            |
| Net corporate income.....         | \$287,718   | \$163,380   | +75.80                           |

could pay \$160,000 dividends as required on the preferred stock and still have left a 2.62 per cent return on the \$4,500,000 of common stock, provided the cumulative preferred dividends are disregarded. The combined income statement is shown in the accompanying table.

one-man cars at a total cost of \$85,000.

Mr. Loring says the trustees have taken every step possible to give the district an opportunity to put itself on a self-supporting basis and adds:

Notwithstanding these economies it is clear that the district cannot be operated without loss while depending upon car fares alone. Some other source of revenue must be obtained. The situation has reached a crisis and we would like to confer with you and others whom you may select, representing the city's interests.

### Valuation Under Way at Knoxville

Preparations are fast going forward for the conduct of the appraisal of the property of the Knoxville Railway & Light Company. It was noted previously that Albert S. Richey, Worcester, Mass., has been retained by the Railroad & Public Utilities Commission to value the property. The company will be represented by J. H. Perkins, Birmingham, Ala. Mr. Richey has just announced the retention of C. W. Stocks as his resident engineer in charge of the work of directing the valuation. For similar work Mr. Perkins has selected Charles P. Abraham. Mr. Abraham was also associated with Mr. Perkins in like capacity in the 1919 appraisal of the property on the Memphis Street Railway. Prior to this, he was engineer in the rate and statistical branch of the United Gas & Electric Engineering Corporation, New York.

### Public Service Revenue Improves

Net income of the Public Service Railway, Newark, N. J., for April, as shown by a report filed with the Public Utilities Commission, amounted to \$108,099. The net income for April, 1919, showed a deficit of \$96,496, or a gain in net income of \$204,595, as between April, 1919, and April, 1920.

Gross income for April, 1920, amounted to \$532,103, as compared with \$326,209 for April, 1919. Total income deductions for the two months compared in the report were practically the same, amounting to \$424,004 for last month and \$422,705 for April, 1919.

The total revenue from transportation in April, 1920, was \$2,232,154, as compared with \$1,741,083 for April of last year. The revenue from other railway operation amounting to \$40,522 for April, 1919, increased to \$50,599 last month, so that the total railway operating revenues for last month were \$2,282,754, as compared with \$1,781,606 for April, 1919.

The company carried a total of 37,893,656 passengers and 6,781,610 as transfer passengers. Passenger revenues from cash fares amounted to \$2,161,125 and from revenue transfers to \$67,004, which give a total passenger revenue of \$2,228,130. The average fare per revenue passenger, including transfer revenue, was .071 and the average fare for all passengers .058.

### Gloucester Lines \$128,707 Behind

In a letter to Mayor Charles D. Brown of Gloucester, Mass., Chairman Homer Loring of the Eastern Massachusetts Street Railway trustees has called attention to the fact that the Gloucester district, since the railway has been operated by the public trustees, has failed to earn the cost of service by \$128,707.

### Intercorporate Relations Under Review

The transit inquiry in New York was resumed by the city on May 20. The Deputy Commissioner of Accounts Loudoun was the principal witness. He went over much of the incorporate history of the companies included in the Brooklyn Rapid Transit System. He was examined more particularly with respect to the work of the Transit Development Company. This company was organized in April, 1902. It was incorporated for the purpose of handling real estate, manufacturing and selling power and the like. It appears that the power houses and some of the other plants of the Brooklyn Rapid Transit are leased to the Transit Development Company for operation. Dr. John Bauer, financial expert of the corporation staff, testified concerning Dual Contract No. 4. He asserted that the Public Service Commission was four years behind in checking up some of the work under the contract.

### Consolidation of Receivership Suits Denied

John W. Seaman has lost his suit against the United Railways, St. Louis, Mo. The receivership for that company has been upheld by the United States Court of Appeals in a decision rendered at St. Paul, Minn. The appeal of Samuel W. Adler for dismissal of the receivership on the ground that no cause of action was stated has been denied. The court ruled, however, against consolidating the two receivership suits of Mr. Seaman and Mr. Adler and decided that they must be tried separately. According to the decision, the receivership will stand in the Seaman case until Special Master Lamm reports to the District Court.

The appraisal was ordered in connection with the denial by the Railroad & Public Utilities Commission of Tennessee of the application of the Knoxville Railway & Light Company for an increase of fares as emergency rates. Upon the filing of the reports of the valuation engineers, the right is reserved to the parties in the case to apply for such further relief as may appear reasonable. The examination ordered by the commission will be conducted into the amounts invested in the property of the company upon which it is entitled to a reasonable return. This examination will be made by experts, one to be appointed by the commission and one by the company, with the right reserved to the municipal authorities of the city, if they see proper to exercise it, of appointing an expert to act with the experts appointed by the commission and the company.

The reports of the experts are to be filed with the commission by Sept. 20. The cost of the examination, except the expenses and charges of the expert of the city, are to be paid by the company.

## Seattle Sobering Up

### Municipal Ownership Not an Unmitigated Blessing—Inquiry Into Purchase Planned

Mayor Hugh M. Caldwell of Seattle, Wash., recently took the first step in his investigation of the transaction by which the city in 1919 purchased the railway lines of the Puget Sound Traction, Light & Power Company for \$15,000,000. Mr. Caldwell had promised in his campaign speeches about two months ago that he would conduct the inquiry. A communication was sent to Walter F. Meier, Corporation Counsel, asking for a written opinion as to whether the city of Seattle has any ground for an action against the former owners of the railway lines to recover damages for misrepresentation or to void the transaction.

The Mayor declares that it is estimated by those conversant with the deal that the price paid was \$5,000,000 to \$6,000,000 in excess of the real value of the lines.

In his letter the Mayor cites the case of the city of Tacoma against the Tacoma Light & Water Company in 1897, in which the city recovered \$800,000 for misrepresentation by the vendor in the sale of a water plant to the city. He asks the Corporation Counsel to advise whether any other course can be followed by the city in seeking relief from its contract with the traction company.

Mayor Caldwell states that if it can be shown that the company misrepresented the value of the property it offered for sale, he believes the city has cause for action and that he will take steps to bring about such action.

A. W. Leonard, president of the Puget Sound Power & Light Company, the successor to the Puget Sound Traction, Light & Power Company, said:

As I understand it, the city of Seattle offered the Puget Sound Traction, Light & Power Company a certain amount for its railway lines within the city limits. The company accepted the offer, delivered the property and both sides have thus far lived up to the contracts and agreements.

Ole Hanson, Mayor of Seattle at the time of the street railway negotiations, and active in the completion of the deal, recently returned to Seattle. He announced that he will make an early answer to Mayor Caldwell's charges that the city paid an exorbitant price for the railway.

### \$6,000,000 of Notes Offered

Formal offering was made on June 1 of \$6,000,000 of American Light & Traction Company five-year 6 per cent gold notes with common stock purchase warrants attached. These warrants entitle the holder to purchase common stock in the ratio of two-thirds of one share for each \$100 face value of the notes, at prices varying between \$142 a share and \$152 a share. The notes are being offered by Halsey, Stuart & Company, National City Company and Bankers' Trust Company, New York, at 94.75 and interest, yielding more than 7½ per cent.

## Financial News Notes

**Rehabilitation Planned.**—Business men of Greenville, Texas, since the recent sale under foreclosure of the property of the Greenville Power & Traction Company and the discontinuance of service by the railway have become interested in devising some means by which the railway may be financed and service resumed.

**Road in Douglas Quits.**—The Douglas Traction & Light Company, Douglas, Ariz., has discontinued the operation of its railway lines. There were 10 miles of track. Douglas, a city of 8,000 inhabitants, has more than 1,000 private automobiles. In addition the jitney was permitted to compete with the railway. In 1918 the railway was operated at a loss of \$12,000 and in 1919 at a loss of \$20,000.

**\$829,175 from Unused Real Estate.**—The auction sale of the unused real estate of the Interborough Rapid Transit Company, New York, N. Y., on June 25 realized good prices, some of the parcels going as high as \$7,200 for city lots and an average of \$2,540 was realized for the first thirty-five parcels auctioned. A total of \$829,175 was realized. Offerings included unoccupied land in Manhattan, the Bronx and Borough of Queens.

**Will Default in Interest.**—Judge Julius M. Mayer of the Federal District Court virtually decreed on May 26 that the Columbus Avenue line of the New York (N. Y.) Railways shall be junked. The system, with only \$696,465 cash on hand, cannot afford to pay bond interest due on that line and Job E. Hedges, receiver, was ordered to let the interest go to default rather than sacrifice other more valuable, though actually unprofitable, lines.

**Stone & Webster Incorporate.**—The firm of Stone & Webster has been incorporated under Massachusetts laws and will henceforth be known as Stone & Webster, Inc. The partnership has consisted of Charles A. Stone, Edwin S. Webster, Russell Robb, Henry G. Bradlee, Frederick P. Royce, George O. Muhlfeld, Henry B. Sawyer, Frederick S. Pratt, Harry H. Hunt and Howard L. Rogers. Stone & Webster, Inc., will continue the business with the same personnel.

**\$150,000 Profit in Boston in April.**—The total receipts of the Boston (Mass.) Elevated Railway for the month of April were \$2,845,092; the total cost of service, \$2,694,902; net profit for the month, \$150,189. The net deficit to be overcome on April 30 was \$511,076. The total revenue passengers carried in April was 28,188,564, and the receipts from fares were

\$2,780,554.49. The receipts per revenue passenger were 10.093 cents; cost of service per passenger, 9.561 cents.

**Fund for Improvements Supplies Capital.**—The Toledo Railways & Light Company, Toledo, Ohio, has received \$202,971 out of the Craig fund by order of Judge Killits to pay for betterments to the property and improvements in service recently made by the company. Trolley and rolling stock repairs, track renewals and substation improvements were listed in the itemized account. The fund is created by the court to insure improvements. Six per cent of the earnings are paid into it weekly. There is now a balance of \$6,504 in the fund.

**Tri-City Purchase Authorized.**—The Illinois Public Utilities Commission has issued an order authorizing the Tri-City Railway to purchase the Moline, Rock Island & Eastern Traction Company for \$195,000 of capital stock of the Tri-City Railway. The Tri-City Railway was also authorized to issue capital stock for the purpose of purchasing the property. The Moline, Rock Island & Eastern Traction Company operates between Moline and Silvis. This company and the Tri-City Railway operated separately until the 7-cent fare was granted by the Illinois Public Utilities Commission. One of the contingencies stipulated in the grant was that universal transfers should be issued. Two fares had been charged previously.

**Bonds of Northern Ohio Issued.**—A syndicate in which Hollister, White & Company, New York, N. Y., are participating is offering at 96 and interest to yield about 7.85 per cent \$2,000,000 of six-year 7 per cent secured gold bonds of the Northern Ohio Traction & Light Company, Akron, Ohio. The bonds are dated June 1, 1920. It is explained that the present issue of bonds will reimburse the company for the payment at maturity of an underlying bond issue and for recent capital expenditures. The \$2,000,000 of six-year 7 per cent gold bonds will be secured by the pledge with the trustee of \$2,500,000 principal amount of the company's first lien and refunding mortgage bonds. Additional six-year 7 per cent gold bonds may be issued from time to time against the deposit of cash or against the similar pledge with the trustee of first lien and refunding mortgage bonds, which are secured by a direct mortgage on all the property of the company subject to the liens of underlying mortgages. The company's seven-year 6 per cent secured gold bonds, also due June 1, 1926, are, with the exception of the coupon rate and sinking fund provision, almost identical in form and security with the present issue of six-year 7 per cent secured gold bonds. Another of the bankers participating in the offering is the National City Company. This company is advertising the issue widely. It says that the earnings of the Northern Ohio Traction & Light Company have continued to improve monthly.



# Traffic and Transportation

## Three Cents for Transfers

**P. R. T. Files Tariff Extending Exchange Tickets—No Transfers in Central District**

The report of the Mayor's transit committee, published briefly last week and at greater length in the body of the paper this week, recommended an increase in fares on the Philadelphia (Pa.) Rapid Transit system, under certain conditions. On May 29 the company made public its reasons for filing an application for more money and setting forth the advantages of making the increase by a 3-cent charge for transfers.

The company estimates that it will be called upon during 1920, if existing fares were continued, to carry 1,000,000,000 passengers. In 1910 it carried only 445,599,000 passengers. In 1919 the number was 872,000,000 passengers, of which 17 per cent rode on free transfers and 6 per cent traveled on 3-cent "exchanges" or transfers. The company estimates that about half of the 170,000,000 free transfer passengers of last year asked for transfers only because they were free, and that if there was a 3-cent charge for them only about half of this number would buy them. This would mean that the car service now supplied to 85,000,000 passengers who only partly need it could be given to the same number of passengers who actually depend on the cars for service.

The comparative results of this plan are estimated as follows:

|  | 1919 Actual | 1920 Estimated Transfers and Exchanges as Now | 1920 Estimated Universal 3-cent Transfer |
|--|-------------|---|--|
| Passengers carried.....                    | 872,000,000 | 1,000,000,000                                 | 915,000,000                              |
| Effective car capacities.....              | 2,707       | 3,061   | 3,061                                    |
| Passengers per car capacity per annum..... | 322,000     | 327,000                                       | 299,000                                  |

Seventy-six per cent of the present passengers pay the 5-cent fare. The company considers that these passengers should not be disturbed in such a way as will serve to lessen the number of short rides, "which are now the only profitable business remaining." The over-congestion of transfer passengers in the delivery district, it continues, could be reduced by the elimination of all transfers and exchanges in that district. The gain from this change and in requiring two 5-cent fares rather than one fare and a 3-cent transfer is estimated at \$500,000 per annum, while the added relief from congestion following this move would be of almost incalculable benefit to the traveling public, according to the company.

Skip-stop savings, according to the company, produced for the winter of 1919 the equivalent of seventy-four cars. The remaining economies being made effective on this account will be the

equivalent of adding eight additional cars during next winter, which, added to the forty-six car capacities made by rerouting and the 300 reconstructed cars which the company has under way, makes a total of 354 additional car capacities possible of accomplishment by the company for use during the winter of 1920.

## Relief Plan Defeated

**Portland Voters Reject Program Approved by City Council—Fare Increase Seems Certain**

At a special election on May 21 the voters of Portland, Ore., rejected three ordinances previously passed by the City Council and providing financial relief for the Portland Railway, Light & Power Company. The defeat of the measures was decisive. It leaves the company with only one course if it is to continue operation—an increase in fare.

The three ordinances proposed to relieve the company from license and franchise taxes and also from a portion of the bridge tolls. They would also have relieved the company from all charges for paving on work which would have to be done if the tracks were not at present in the streets. Finally, they proposed to relieve the company of pavement reconstruction and repair costs when such repair and reconstruction have not resulted because of the presence of the tracks.

The measures were passed by the City Council several weeks ago as of-

fering the most practicable means of averting an advance in fare. The State Public Service Commission had previously refused the company's application for a rate increase. In rejecting the application the commission urged the city to co-operate with the company in working out some plan of relief. No effort was made by either the city or by traction officials to campaign in behalf of the proposed measures. Their defeat was not unexpected.

Defeat of the measures has had the immediate result of sending the company's application back to the State Public Service Commission, which resumed hearing of the case on June 1. A final decision is likely to be forthcoming within thirty days. An increase in fare, possibly to 8 cents, is the expected action of the commission. The commission some months ago expressed the belief that increased revenue was imperative.

## Will Reroute Many Lines

**New Orleans Railway & Light Company to Make Changes Specified in New Municipal Ordinance**

A comprehensive program for the improvement of electric railway transportation in New Orleans, La., has been adopted by the City Council with the co-operation of the New Orleans Railway & Light Company. The Council has passed an ordinance which provides for the rerouting of ten lines, the tearing up of the tracks in thirteen streets, and the laying of tracks in four streets. This measure has been adopted to bring about a more equable distribution of traffic, and to relieve the congestion in the downtown business district.

The movement for the rerouting of a number of lines and for stricter regulation of vehicular traffic was started some time ago by the New Orleans Association of Commerce. The association appointed a special committee to investigate transportation conditions in the city. In accordance with recommendations made by this committee, a rerouting ordinance was passed by the Council on April 21.

### WILL SHORTEN ROUTES

Under the provisions of the measure J. D. O'Keefe, receiver of the company, was given fifteen days within which to accept or reject its terms, the ordinance further providing that, if accepted, the work upon the rerouting scheme was to begin within thirty days. The matter was referred by Mr. O'Keefe to the trustees for the bondholders in New York City, one of which is the Empire Bank & Trust Company. Although two extensions of time have since been granted by the City Council, the receiver has not yet received advices from the trustees as to his course of action. However, it is reported that Mr. O'Keefe favors the measure, and that it will ultimately be accepted.

The most noteworthy changes effected by the ordinance will be those in St. Charles Street, from Canal Street to Lee Circle. All tracks will be eliminated from St. Charles Street between these two points and the street will be used exclusively as a light vehicular driveway along its entire length from Canal Street to Carrollton Avenue, a distance of slightly more than 4 miles. Heavy vehicular traffic will then be thrown on to Tchoupitoulas Street, from Canal to Annunciation Street, and five of the uptown car lines will be routed via Magazine Street.

It is provided in the ordinance that the pavement along these streets to be torn up is to be restored at the expense of the company. Considerable paving, chiefly bitulithic, and resurfacing with bituminous paving, is also provided, although granite block pavement and cobblestone are named when called for in the original franchise of the company. It is estimated, however, that the new construction work will not exceed 1,600 feet.

## Bus Application Denied

### Pennsylvania Commission Refuses to Sanction Competition with Scranton Railway

Plans for the operation of motor buses in Scranton, Pa., in competition with the lines of the Scranton Railway, were halted on May 25 by an order of the State Public Service Commission. The commission refused to grant the Commonwealth Transportation Company a certificate of convenience for the use of streets occupied by the railway on the ground that the establishment of two competing systems of transportation would be contrary to the best interest of the public.

In denying the application the commission declared that such competition would inevitably result in the elimination of either the bus company or the railway as a carrier, with a consequent deterioration in service. It held that electric railway service was essential to the city's development, and that if the railway were forced to abandon operation through competition, the public "would be poorly compensated for by the auto car service." It further pointed out that to allow the application would be to invite injurious motor bus competition in every other city in the State.

The Commonwealth Transportation Company several months ago applied to the Scranton City Council for a franchise to operate six bus lines. The franchise ordinance subsequently enacted was vetoed by Mayor Connell. It was then passed by the Council over the Mayor's veto.

The commission said in its order:

\* \* \* It is argued that the proposed service will not come in serious competition with the street railway, but there is no disguising the fact that this will be the inevitable result. Conceding that there is merit in the contention that the street railway company does not provide adequate or convenient transportation for all who desire to make use of such service, and that this accommodation for that part of the public not adequately or conveniently served will be furnished by the operation of these auto buses, the commission is confronted with the serious question of the effect the operating of these motor vehicles will have on the service now furnished by the street railway company. The designated routes of operation practically cover the city and are coextensive with the tracks of the street railway.

It is not the case of one system of transportation supplementing another, but of two systems operating in the same territory and competing practically for the same patronage and the ultimate result is involved in the solution of the question of the survival of the fittest, with a gradual deterioration in the service of one or both until this result is reached. Unquestionably, street railway service in a city like Scranton is absolutely necessary to its development and to its social and business life and if the street railway is forced to abandon its service by competition, such as here proposed, the public will suffer a loss that will be poorly compensated for by the auto car service.

It is true that a few may be better served by a jitney operation than by the street car line service, but it is fundamental that the accommodation and convenience of the many should not be sacrificed for the benefit of the few, and individual disadvantages and inconveniences are common to all public service of a common carrier nature, and of necessity always have and always will exist. The time may come, although not now apparent, when the auto bus service will be substituted for the service now furnished by the street railways, but the commission is far from being convinced that the public is now ready to accept the change or to choose auto buses

as the better agent of the two to most efficiently and conveniently serve it. The commission is convinced, however, that the public can not for long have both services under the fact and circumstances disclosed in this case.

To approve this application would not only be a reversal of the policy which this commission has heretofore consistently pursued, namely not to grant a certificate of public convenience for a jitney service directly, or injuriously competing with the street railways, but it would also be an invitation to establish an auto bus service in every city in the commonwealth in direct and injurious competition with its street car service and this in the face of the fact within common knowledge that the street railways generally are urgently demanding increased rates to enable them to continue their service. It is easy to say let the street railways go to the wall or be forced out of business by competition, but surely that will not be the attitude of the public if called upon to decide the question for itself, and we will not decide for it until better informed than at present. \* \* \* In any event, as the question presented for decision involves every city within our jurisdiction, we are constrained to adhere to the policy heretofore adopted of protecting all public service that is reasonably adequate or that can be made so against ruinous competition, and consequently to refuse this application.

## Freight Service Will Stop

The Birmingham Railway, Light & Power Company, Birmingham, Ala., will discontinue freight service between Birmingham and Bessemer and between Birmingham and Ensley, if the Public Service Commission acts favorably upon a petition to be filed in a few days. Judge William I. Grubb, of the federal court, approved a petition of Lee C. Bradley, receiver, asking for authority to start the proceedings. The petition will ask that the company be required to handle no freight in less than carload lots between Birmingham and the points named.

Action of the receiver was due to the heavy inroads made on the freight service by trucks handling small freight. During the past three months, the petition sets out, the freight handled decreased to \$9,812, as compared with a sum of \$12,015 for the same three months of 1919. The receiver stated in his petition that the cost of operating the freight service including taxes for the first three months of this year was \$13,170.

Freight equipment, the receiver showed, is in such condition that a considerable sum will have to be spent for overhauling and reconstruction. The entire shop facilities of the company will be engaged in repairs to and rebuilding of passenger cars.

Judge Grubb authorized a loan of \$60,000 to pay preferred claims for labor, materials and machinery, which obligations were incurred within the six months preceding the receivership on Jan. 23, 1919.

## Car Speed Up in Kansas City

Traffic in the retail district of Kansas City, Mo., has been speeded up 25 per cent to 100 per cent since the introduction of improvements suggested by John A. Beeler, according to a recent announcement by Robert P. Woods, city member of the Kansas City Railways board of control. Mr. Woods declared that 100,000 persons had been

benefited twice daily by the traffic changes made by Mr. Beeler. Mr. Woods gave better loading facilities and a rearrangement of car stops as the chief causes of the improvement.

A check, according to Mr. Woods, shows these improvements: The average speed on Twelfth Street was formerly 2½ miles an hour during the rush hours. Twenty-five per cent more cars now pass through the district in the rush period. On a large part of the Eighth Street division the average rush-hour speed was 1½ miles an hour and in some places only ¾ of a mile an hour. At Eighth Street and Grand Avenues 15 per cent of cars provided for the rush period were delayed by congestion until after the need for them had passed.

The speed at some points has been increased 200 per cent and the average speed increased 50 per cent. Forty-seven and a half per cent more cars pass through during the rush hours. Mr. Woods stated that the benefits on Main Street and Grand Avenue have averaged 25 per cent to 40 per cent. He said that on these streets vehicular traffic and parking limited the results obtainable.

## Will Halt City Buses

At the close of the trial of a suit brought by the Brooklyn (N. Y.) City Railroad against the city of New York, Supreme Court Justice Callaghan in Brooklyn on May 26 announced he would direct that a permanent injunction be issued restraining Grover A. Whalen, Commissioner of Plant and Structures, from continuing the operation of municipal buses in competition with certain surface lines owned by the company. The court held that no emergency for such operation existed, as the city contended, and therefore that the city was exceeding its authority.

The permanent injunction will not be issued until the Court of Appeals has passed upon the city's appeal from the decision of the Appellate Division sustaining a temporary injunction. If the Court of Appeals reverses the Appellate Division the injunction will not issue and the buses will continue to run. Counsel for the company figured damages at about \$1,000 a day. Mr. Whalen had testified that the buses were carrying on an average of 85,600 passengers a day in Brooklyn, 55,000 on the lines competing with the Brooklyn City Company.

Justice Lydon of the Supreme Court on May 25 decided that the bus lines operated by authority of the city in competition with the Seventh Avenue-Delancey Street and the Eighth and Fourteenth Street crosstown lines of the New York Railways were running illegally and that the city was without express legal authority in the matter. An order was signed prohibiting the city officials from continuing the operation. At the same time action was stayed until the Court of Appeals has decided the suit brought by the Brooklyn City Railroad.

## Transportation News Notes

**One-Man Cars on Jersey Road.**—The Morris County Traction Company, Morristown, N. J., has announced that it will use one-man cars exclusively on its line between Summit and Elizabeth. Double-truck cars will be replaced with "safeties."

**Trailers for Wheeling Line.**—Trailers are being attached to all cars operating over the Warwood-Wheeling line of the Wheeling (W. Va.) Traction Company. The addition of trailers was made necessary by the constant increase in traffic on the line.

**Asks More in Seneca Falls.**—The Geneva, Seneca Falls & Auburn Railroad, Seneca Falls, N. Y., has filed with the Public Service Commission for the Second District an application for permission to raise the fare in each zone to 8 cents. The line operates between Geneva and Seneca Falls.

**Jitney Fares Raised in Birmingham.**—Jitney rides in Birmingham, Ala., now cost 7 cents each. The bus operators recently decided to raise their fares, and, after considerable discussion, agreed on the 7-cent charge. The Birmingham Railway, Light & Power Company charges a 6-cent fare.

**Seven Cents in Rome.**—The Public Service Commission for the Second District on May 25 issued an order authorizing the New York State Railways to charge 7-cent fares on its lines in Rome, N. Y. The fare is now 5 cents. The company is authorized to install the new rate on three days' notice.

**Fares Raised in Austin.**—The City Commission of Austin, Texas, has passed an ordinance authorizing the Austin Street Railway to install a 7-cent fare, with four tickets for 25 cents when tickets are purchased. Children under twelve years of age are given a 3-cent fare. The increased fares went into effect on June 1.

**Permission for One-Man Cars Refused.**—The Hornell (N.Y.) Traction Company has been refused permission by the Public Service Commission to operate one-man cars on its North Hornell city line. The commission holds that it would not be safe to operate one-man cars over the railroad tracks crossed by the electric railway in the north end district.

**New Divisions for Bay State System.**—Five new operating districts for the Eastern Massachusetts Street Railway, Boston, Mass., have been established by the public trustees of that system. New divisions will serve Hingham, Weymouth, Milton, Norwood and Hyde

Park. Service was recently restored on the Weymouth lines after that town had appropriated \$28,000 to meet operating costs.

**Wants More in Port Arthur.**—The Port Arthur (Tex.) Traction Company has applied to Port Arthur City Commission for an increase in fare from 5 cents to 8 cents. This is the first time the company has asked for a fare increase. In petitioning for an advance in rates, the company stated that its bonds were selling at present at 65 and that money could not be obtained for necessary repairs and extensions.

**Safety Campaign in Birmingham.**—A one-week safety campaign began in Birmingham, Ala., on May 24. The campaign, which was under the auspices of the Birmingham Automobile Club, aimed to eliminate all accidents during the week. The management of the Birmingham Railway, Light & Power Company co-operated in the safety movement. Automobile steering wheels were tagged with the slogan of the club, "Be Careful."

**Seven Cents on Schenectady Lines.**—A 7-cent fare on the lines of Schenectady (N. Y.) Railway was authorized on May 24 by the Board of Aldermen of that city. The fare is now 6 cents. The new rate is to continue until May 31, 1921. The Public Service Commission for the Second District several months ago authorized the company to collect 7 cents in communities where it operated over the tracks of the United Traction Company, Albany.

**More Trains in Operation.**—The Brooklyn (N. Y.) City Railroad on May 24 extended the use of multiple-unit train on its Brooklyn Bridge-Long Island City lines, via Graham Avenue and the Vernon Street Bridge. Trailer operation in the past had been impossible due to the lack of loops and wyes at Long Island City. More safety cars have also been put on the Nassau Avenue line and ten of these cars are now in service on that line during the rush hours.

**Postpones Galveston Hearings.**—Hearing of the petition of the Galveston (Tex.) Electric Company for a permanent injunction to restrain the city of Galveston from interfering with it in putting into effect a 7-cent fare, has been continued in the United States District Court at Houston. The city of Galveston is now having an appraisal of the company's lines in Galveston made, and postponement was asked until this work is finished. The city will contest the petition.

**New Company Magazine Christened.**—Volume 1, No. 2 issue of the monthly magazine started by E. B. Atchley, publicity manager of the Northern Ohio Traction & Light Company, Akron, Ohio, by and for the system's employees, has appeared under its new name of the *Northern Light*. A contest with a prize for the best suggestion for a name resulted in more than 150 proposed names, nine employees having

suggested the winning title. The contest was announced in the first number of the paper.

**Asks Rise in Wichita Falls.**—The Wichita Falls (Tex.) Traction Company has applied for authority to put a 7-cent fare into effect in Wichita Falls. L. L. Allbritton, general manager, has notified the City Commission that recent additions to equipment, made necessary by the rapid growth of the city, demand an increase in operating revenue which can be had only by increased fares. The company is now losing money and faces receivership unless relief can be had. The present fare is 5 cents.

**Fewer Transfers in Dallas.**—Fewer transfers are being called for by passengers on the lines of the Dallas (Tex.) Railway since the new form of transfer was put into effect on May 11, according to a statement by Richard Meriwether, vice-president and general manager of the company. Reports of trainmen show an average of 500 fewer transfers issued daily now than under the old system, Mr. Meriwether said. The new transfer gives a flat fifteen minutes to transfer from one line to another, points of transfer being definitely fixed.

**Interstate Fares Raised.**—Increased fares on the lines of the Washington Railway & Electric Company, Washington, D. C., running into Maryland, became effective on June 1. The new fares are 8 cents cash or a token in each zone on the company's lines, and were established with the consent of the Interstate Commerce Commission. There are five zones in Maryland from the District line to the terminus of the City & Suburban line running to Laurel, four zones on the Rockville line, and one zone each on the Cabin John and Forest Glen lines.

**Plan of Political Control Defeated.**—The Chamber of Commerce of Camden, N. J., has abandoned the plan of urging the operation of the Public Service Railway's lines in Camden County through a board of control. The chamber offered a number of suggestions to the company. Thomas N. McCarter, president of the company, said that such a plan would make a political football of the railway problem. The report of the Chamber of Commerce suggested that a board of control be appointed, four members to be named by the Governor and the fifth by the employees of the road.

**One-Man Cars Proposed for Salt Lake.**—One-man safety cars may be introduced in Salt Lake City, Utah, as a means of solving the financial difficulties of the Utah Light & Traction Company. Use of "safeties" was suggested at a recent conference between representatives of the company and members of the State Public Utilities Commission. The company some time ago applied for an increase in fares from 6 cents to 7 cents. It later filed an amended petition asking for an 8-cent fare. The commission held a number

of hearings on the application, but as yet has not announced its decision in the case.

**Three Cents a Mile Asked.**—The Marion & Buffton Traction Company, Marion, Ind., has filed a petition with the Indiana Public Service Commission asking for an increase in rates from 2½ cents to 3 cents a mile. The petition recites the fact that despite previous increases in fares, first to 2½ cents and later to 2¾ cents a mile, the operating expenses have increased faster than the gross revenues. Five increases in wages have been granted employees since May 1, 1918, when trainmen received a minimum of 24 cents and a maximum of 30 cents an hour, compared to 40 and 45 cents maximum today.

**Seven-Cent Fare Enjoined.**—Federal Judge Edwin Holmes has issued an injunction restraining the Meridian Light & Railway Company, Meridian, Miss., from charging a 7-cent fare on its lines. Judge Holmes overruled the recommendation of Special Master M. C. Terrell, upholding the increase. The court sustained the contention of the city that the company had no right under its franchise to raise its fare. The rate was raised from 5 cents to 7 cents some time ago. The company has announced that it will appeal the case to the higher federal courts and that pending final settlement of the matter the higher rate will remain in effect.

**Rerouting Reduces Accidents.**—A marked reduction in the number of accidents in Los Angeles, Cal., has attended the rerouting of the lines of the Los Angeles railway. The rerouting of the car lines began on May 9. Figures for the week of May 2 to 8, preceding the introduction of the new system, showed a total of 273 accidents. Of these, 187 were classed as traffic accidents, including collisions between street cars and autos and other vehicles, and eighty-six as miscellaneous, such as injuries at the step in alighting from car. The week of May 9 to 15 showed a total of 256 accidents, or a decrease of seventeen. The number of traffic accidents was reduced by six and that of the miscellaneous accidents by eleven.

**Higher Fares if Tracks Are Changed.**—The elimination of the surface tracks of the Pacific Electric Railway from Hill Street, Main Street and other thoroughfares of Los Angeles, Cal., will necessitate an increase in the fare charged by that company. H. B. Titcomb, vice-president, recently stated that while the Pacific Electric was willing to make the improvements, it could not afford to do so at the present rate of fare. Mr. Titcomb pointed out that the company's deficit in 1920 would probably total \$2,000,000. Its payroll for the present year will amount to \$6,789,000, or an increase of 90 per cent over that for 1917. The system expects to carry approximately 90,000,000 passengers in the present year as against 78,500,000 in 1919.

**Smoking Allowed on "L."**—Smoking is now permitted on certain of the lines of the Boston (Mass.) Elevated Railway, under an order recently issued by Edward Dana, general manager. On weekdays smoking is permitted during rush hours only in the rear car of southbound trains carrying Forest Hills signs, and in the forward car of northbound trains carrying Everett signs. The hours are approximately from 5:15 a.m. to 10 a.m., and from 3:30 p.m. to 6:30 p.m., when trains of six or more cars are being operated. Smoking is not permitted on trains of less than six cars at any time, nor on Atlantic Avenue trains, trains looping at Sullivan Square or Dudley Street, nor on any trains during the middle of the day or evening, or on Sundays and holidays.

**Asks Rise in Interurban Rates.**—Permission to increase the fare charged on the Cincinnati, Lawrenceburg & Aurora Electric Street Railway, Cincinnati, Ohio, to points in Ohio, is asked by C. E. Hooven and Edgar Stark, receivers of the company, in a petition filed in the Insolvency Court. Since June, 1913, the road has been operated by the receivers, and during that time, it is set forth, \$150,000 has been expended to repair damages by floods, and in 1918, under court orders, \$200,000 had to be spent for changes and necessary improvements. These sums have been paid out of salvage and earnings, except \$60,000 outstanding receivers' certificates, the receivers say. No interest has been paid on the \$750,000 bonds of the corporation since Jan. 1, 1913, and bondholders are demanding payment.

**One-Man Cars Increase Traffic.**—One-man safety cars are proving popular in Birmingham, Ala. Twenty-five of these cars are now in service on three of the lines of the Birmingham Railway, Light & Power Company. It is estimated that on the Lakeview and Highland lines, where "safeties" are being operated, traffic has increased from 25 per cent to 30 per cent. Many persons not heretofore patronizing these lines are reported to be doing so since the introduction of the one-man cars. Part of the increased travel has come from persons using other lines of the company, but much has come from those now using electric cars instead of automobiles. During the year ended March 1, 1920, the number of car riders increased by 9,850,086 over the number carried the year ended March 1, 1918. The number of riders for the former period totaled 60,398,814.

**Asks More on I. R. T.**—The Interborough Rapid Transit Company, New York, N. Y., on May 28 applied to the Public Service Commission for the First District for authority to increase subway fares. The company also declared its intention of applying for an increased fare on the elevated lines which it leases. Commissioner Nixon refused the application and at the same time denied a request for a hearing,

The company thereupon obtained from Supreme Court Justice Giegerich a writ of certiorari requiring Mr. Nixon to explain the reason for his refusal. The application, like that of the Brooklyn Rapid Transit Company, was the first step toward an appeal to the courts for a decision as to whether or not the commission has jurisdiction to consider rates of fare. It reviewed the financial condition of the company, laying special stress on the fact that to avert trouble with its employees the company had granted an increase of 10 per cent to become effective June 6. This advance in the pay of the men, it was stated, would increase operating expenses \$2,000,000 a year.

**Ten Cents Not Enough for Jacksonville.**—A 10-cent fare would be insufficient to meet the needs of the Jacksonville (Fla.) Traction Company. A statement to this effect was made by L. R. Nash, valuation engineer, representing Stone & Webster, at a hearing before the Florida Railroad Commission on May 20 on the application of the company for permission to charge a higher fare in Jacksonville. Mr. Nash declared that the average return for the entire period of the company's existence was only about 3½ per cent. From the year 1915 to date no dividends have been paid on common stock, and from 1916 to date no dividends have been declared on preferred stock. The company has outstanding more than \$1,000,000 in notes and is unable to secure credit for the payment of these. The company is not asking for a specific increase in fare, but is so placing its case before the commission that the latter will see to it that a fair return is granted. The Florida Supreme Court some time ago handed down a decision ordering the commission to take jurisdiction of the case.

**Queue Loading on D. U. R.**—A queue system of car loading has been adopted in Marysville, Mich., on the line of the Rapid Railway, one of the interurban lines of the Detroit United Railway. The Marysville Village Commission has passed an ordinance providing that the system shall be used whenever ten or more persons shall be waiting at any street intersection or at any regular stopping place to board any car. Under the terms of the ordinance those people standing in the queue formation nearest the front of the car shall board by the front entrance and those nearest the rear of the car shall board by the rear entrance. In case of a two-car train those nearest the rear shall board the second car. However, if one of the cars is filled to capacity, "then the car not so filled shall be boarded in an orderly and regular manner, just as if there were only one car." Any person violating or failing to observe any provisions of the measure shall be liable to a fine of not more than \$25 and costs or to imprisonment for not more than thirty days in the county jail, or both. Queue loading in Detroit has been described previously in the ELECTRIC RAILWAY JOURNAL.

## Personal Mention

### H. E. Weeks Elected

Davenport Executive Chosen President of the Iowa Electric Railway Association at Omaha Meeting

H. E. Weeks, vice-president of the Tri-City Railway & Light Company, Davenport, Iowa, was elected president of the Iowa Electric Railway Association at the meeting of that body in Omaha, Neb., on May 21. The naming of Mr. Weeks came as a recognition of his long and faithful service to the association. In addition to taking an active interest in committee work, he has served as secretary-treasurer of the State organization since 1913.

Mr. Weeks was born in Alton, Ill., on March 19, 1874. When twenty-one



H. E. WEEKS

years old he went to work for the Alton, Granite & St. Louis Traction Company. Shortly thereafter he became associated with J. F. Porter in the electrification of the Alton horse-car lines and the building of the new line to St. Louis. When the property was sold to the Clark interests, in 1906, Mr. Weeks went to Davenport as secretary-treasurer of the Tri-City Railway & Light Company, a reorganization of several local companies negotiated by Mr. Porter.

Mr. Weeks became vice-president of the Tri-City system early in 1919. He also holds the position of treasurer and assistant secretary of the subsidiary companies. His department has charge of the property records and valuation work of the several underlying companies.

Mr. Weeks served from 1908 to 1913 as secretary of the American Electric Railway Accountants' Association, while the work of drawing up a standard classification of accounts was being carried on with the Interstate Commerce Commission. He is now a mem-

ber of the committee of the National Electric Light Association which is working on a similar standard classification of accounts for all electric light companies.

### John I. Beggs Again Heads Milwaukee System

At a meeting of the board of directors held in New York on May 24, 1920, John I. Beggs was elected president of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis. An interview with Mr. Beggs, upon his recent assumption of the control of the company in his capacity of chairman of the board of directors, appeared in the ELECTRIC RAILWAY JOURNAL for May 8. Mr. Beggs is quoted in the Milwaukee press as having said that there would be no important changes in the organization of the company.

Alexander F. Werner, chief engineer of the Detroit power stations of the Detroit (Mich.) United Railway, has resigned.

P. V. See, superintendent of equipment of the Hudson & Manhattan Railroad, operating the Hudson River tubes between New York and New Jersey, has resigned. Mr. See has been appointed superintendent of equipment of the Northern Ohio Traction & Light Company, Akron, Ohio.

C. W. Stocks, associate editor of this paper, has received a leave of absence for a few months to become resident engineer in charge of the appraisal which Albert S. Richey will conduct of the property of the Knoxville Railway & Light Company for the Railroad & Public Utilities Commission of Tennessee.

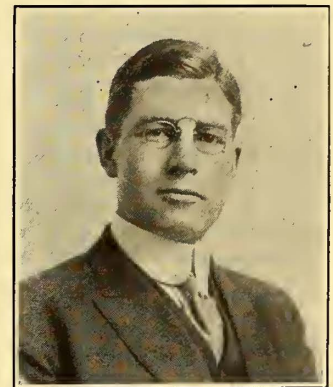
E. O. Shryock has resigned as superintendent of the Northwestern Pennsylvania Railway to accept the position of superintendent of railways of the Northwestern Ohio Railway & Power Company, with headquarters at Oak Park, Ohio. Mr. Shryock has been superintendent of the former system since 1913. In 1914 he introduced one-man safety cars on the company's lines in Meadville, Pa. Mr. Shryock entered the service of the Meadville & Cambridge Springs Street Railway as an electrician's helper in 1905. Later he was employed by the People's Incandescent Light Company, a subsidiary, as electrician. During the following years he served both railway and light company in the successive capacities of motorman, conductor, extra dispatcher, electrician, trouble man, meter reader, solicitor and business manager. He then joined the Northwestern Pennsylvania Railway as superintendent.

### New Ottawa Manager

F. D. Burpee, Superintendent Since 1912, Promoted—A Pioneer in the Canadian Traction Field

F. D. Burpee, whose appointment as manager of the Ottawa (Ont.) Electric Railway was noted briefly in the ELECTRIC RAILWAY JOURNAL for May 29, is a pioneer in the field of electric traction in Canada. Mr. Burpee became connected with the Ottawa Company soon after that system, the first electric railway in Canada, was organized. He has kept pace with the development of new ideas in the industry and is a strong advocate of the service-at-cost plan of operation. He is now forty-four years old.

Mr. Burpee began his railroad career with the Canadian Pacific Railway in 1891. Two years later he entered the employ of the Ottawa Electric Railway. For the following five years he worked in various departments and in 1898 was appointed assistant to the superintendent and secretary-treasurer. In 1912 he succeeded Col. J. E. Hutche-



F. D. BURPEE

son as superintendent. He occupied that position until February, 1916 when he enlisted for overseas duty with the Canadian Expeditionary Forces.

The vicissitudes of war finally landed him with the Railway Construction Troops in France, where he was engaged for two years on the British Front in the construction of narrow and standard gage railways. He returned to Canada in March, 1919, and retired with the rank of Major. Upon his return to civil life he resumed his former duties with the Ottawa Electric Railway, continuing as superintendent until his recent advancement to the position of manager. He is succeeded as superintendent by A. J. Tobin.

Arthur F. Allyn has been appointed chief engineer of Detroit power stations of the Detroit (Mich.) United Railway. Mr. Allyn succeeds Alexander F. Werner, resigned. Mr. Allyn was first employed by the company in 1901 as engineer at the Farmington power station. Later he was made chief engineer of that station.

# Manufactures and the Markets

DISCUSSIONS OF MARKET AND TRADE CONDITIONS FOR THE MANUFACTURER,

SALESMAN AND PURCHASING AGENT

ROLLING STOCK PURCHASES

BUSINESS ANNOUNCEMENTS

## Pole Production to Increase During 1920

### Hard Winter and Transportation Delays Responsible for Scarcity of Pole-Line Equipment

Although pole-line stocks are low in a number of places, as was noted in the May 1 issue of the *ELECTRIC RAILWAY JOURNAL*, an actual shortage of poles does not exist except at the distribution yards. Delayed shipments, rather than a shortage in the supply, is believed to be responsible for present conditions.

According to reports from the West and Northwest, a very bad winter was experienced in the territory between the Cascades and the Rockies, which resulted in stocks being low this spring. The actual production, however, it is reported, during 1920 will probably be the largest in the industry, and unless the demand is much heavier for the balance of the year than it has been during the first four months there will be plenty of poles to supply the demand and to leave a normal stock on hand next spring.

At present large interests are accepting all the business offered, subject to their ability to deliver. It is believed by large producers that all orders booked up to the present time could be shipped within the next sixty days if cars were available.

## Orders for Turbo-Units Is Falling Off

### Demand Has Been So Heavy This Spring that Factories Are Quoting Late 1921 Shipments.

During the last few weeks reports from manufacturers have indicated that the heavy volume of turbine orders which has been coming in since the first of the year has dropped off. In particular this refers to central-station buying rather than to industrial buying, and the drops vary in amount. It seems to indicate a retrenchment on the part of public utilities in view of present economic conditions and the outlook for conditions in the next twelve months.

The let-up in turbine orders is quite pronounced in the case of one prominent manufacturer of units, and varies on down through other producers to the point where the let-up is not very noticeable. A large central station which has just cut its twelve-million-dollar program about 30 per cent attributes the reduction to the difficulty of financing such projects, the inability to get the material needed and the unrest in the building trades. Vitally

necessary extensions are being pushed on to completion, however, although the more remote additions are being permitted to rest for a while.

Manufacturers are running their plants at full capacity in an endeavor to fill the orders on hand, and in some cases manufacturing capacity is rather heavily overbooked. Large units around 30,000 kw. could with difficulty be booked for shipment before late in the year 1921, so heavy has been the demand. That brings schedules up to from twelve to eighteen months on these large sizes, depending on the manufacturer, and from that time on down to eight months is being quoted for the smaller station units, say 500 kw. One large organization, it is reported, will soon have a productive capacity of 300,000 kva. per month in turbo-units.

Turbo-unit prices have been rather unstable during April and May, virtually all prices having been revised upward in that time, some almost every two weeks, and in one case a 5 per cent advance in April having been followed by two of the same amount in May. Prices in representative cases are reported about 84 per cent above pre-war prices, and production costs are declared to be above this figure.

Orders on turbine auxiliaries have kept up and are expected to continue for a time, in keeping with the time lag by which this class of apparatus always follows orders on the large units. Shipments on turbo-auxiliaries are quoted from eight weeks to four months. Some units are still to be heard from, although the large units to which they apply have been ordered for some months.

## Delivery Situation Growing Serious

### Lack of Railroad Rolling Stock Causes Anxiety—Car Control by Centralized Authority Helps

Transportation overshadows production as a prime necessity of the hour, looking at the present difficulties of the delivery situation from the standpoint of the electric railway purchasing agent. A representative of the *ELECTRIC RAILWAY JOURNAL* discussed the outlook early this week with the head of a large purchasing department whose work is now greatly handicapped by the inadequacy of railroad service. This official did not hesitate in stating that the delivery situation is the worst today that he has ever known.

So great is the congestion on the railroads handling his purchases that thirty men are at present in the field devoting their entire efforts to pushing forward shipments of material and equipment of various kinds needed by operating companies and on construction jobs in which this concern is interested.

No single class of material tops the list as most difficult to move, although steel and coal are giving probably more trouble than any other commodities at the moment. Throughout all industry strikes have cut down the efficiency of manufacturing and transportation companies. The shortage of cars and locomotives from which the railroads are suffering cannot be made up in a few weeks, but close observers of industrial conditions generally appreciate that immediate steps must be taken and efforts kept up with the utmost energy to relieve this shortage, if disastrous results are not to follow in the country's business.

A purchasing agent who buys coal for central stations in the East recently pointed out that it is an impossibility for the railroads serving his companies to furnish all the coal needed in his section of the country. The shipment of coal abroad is proceeding on a scale which threatens the continuity of industry on this side of the ocean, and drastic steps toward control of this traffic are likely to be forced soon. Buyers of coal have concentrated too much, in some sections at least, upon securing particular kinds and grades of fuel. The time is ripe for some action to withhold from foreign buyers, it is believed in some quarters, at least a portion of the shipments which are moving eastward so freely to the detriment of American industry. Unless in the height of the war, there never was a time when a careful study of the fuel problem from the combustion engineering and analytical standpoint was so desirable.

Deliveries are being extended a month at a time, according to the experience of some purchasing departments. Prices still tend to move upward in railway material. The need of maintenance is apparent on the railroads of the country, and were it not for the fact that electric railways are not now buying in large quantities, their difficulties would press still harder in view of transportation troubles caused by lack of car and locomotive repairs. However, a good deal of material is being sent by express for railway service, although weight limitations are cramping much move-

ment in this way. The motor truck is helping out the purchasing agent and the operating man within its proper field of service, but even here accidents and delays are being experienced.

Fortunately some light appears to be breaking in the working out of the centralized control of car service on the railroads; sentiment against further parsimony in the provision of rolling stock on railroads has found expression in the legislation which authorizes the Interstate Commerce Commission to direct the flow of money into channels which in time will offer some relief from the present congestion, and there is also some evidence that the days of under-production are drawing rapidly to a close.

## Traction Prices Unaffected by Retail Reduction

Review of Various Economic Factors Differentiating Commodity and Electrical Markets

While there has been a large amount of price slashing in general retail commodities there is no reason to expect an immediate or as sudden a reflection in prices of electric railway supplies. Different economic factors control these markets and they must be considered by careful buyers.

In the general retail field rapidity of turnover counts for almost everything. A large part of the stock is made up of seasonal goods and unless these move in season there is a dead investment. When for one reason or another goods are moving slowly it is far better to accept a small profit or even sell at a slight loss to keep the goods moving.

In the electric railway supply field the roads had long ago reached the low point in buying and since the beginning of the year have been buying on a more extensive scale. In this field, therefore, there is no occasion for stimulation of sales by lessening the profit. Furthermore, this is not a field that responds to such tactics as rapidly as do retail buyers. Finally it is not possible in this field to conduct bargain sales. If prices go down they must stay down, and such reductions invariably call for further slashes.

It is reasonable to expect that manufacturers will extend to the traction companies any savings that might accrue from lower costs of raw materials. Until then, however, it is doubtful if much relief can be expected.

High labor costs undoubtedly will serve to prevent any very large drop in the majority of electric railway materials and equipment for some time. This is probably the strongest factor in the current price situation.

## Railway Projects in Costa Rica

Among the public improvements projected for Costa Rica is the construction of a railroad from Alajuela to Grecia, a distance of 11 miles, and the electrification of the government-owned Pacific Railroad, with a line diverting the course by way of Esparta.

## English Electric Company, Ltd., Expands

Trade alliances are being consummated in the electrical field in Europe, according to the English *Electric Journal* for April, 1920. The English Electric Company, Ltd., Queens House, Kingsway, London, England, includes the Dick, Kerr Works, Preston; the Ordnance Works, Coventry and Scots-toun; the Phoenix Works, Bradford; the Siemens Works, Stamford, and the Willans Works, Rugby. The French and Belgian companies with which the English Electric Company is associated have been reorganized under the names of Constructions Electriques de France and of Constructions de Belgique, each with a capital of 40,000,000 francs. The former will manufacture rolling stock and equipment for electric railways, including standard motors, at a plant which is now reported nearing completion near Lyons. The company has entered into a contract with the Midi Railway of France for the construction of water turbines with a total output of 300,000 kw. to be utilized in connection with the electrification of the railway, the construction of 200 electric locomotives and an important contract for electrical machinery.

## Rolling Stock

Danbury & Bethel Street Railway Company, Danbury, Conn., has purchased through its receiver, Judge J. M. Ives, six rebuilt trolley cars from the Union Railway Company, New York City. They are the ten-bench size, open type car, to replace those burned in a recent fire. Shipment was made the last week in May. In addition, three more safety cars have been ordered by the receiver for delivery as soon as possible. Three are already in process of construction. The company is rebuilding two of its old cars into safety type.

## Track and Roadway

Boise (Idaho) Railway.—The Boise Railway will spend between \$25,000 and \$30,000 during the present year on extensions and betterments.

Interborough Rapid Transit Company, New York, N. Y.—The Interborough Rapid Transit Company on May 27 opened for operation the East Bronx extension of the Pelham Bay branch of the Lexington Avenue subway line.

Eastern Massachusetts Street Railway, Boston, Mass.—The Eastern Massachusetts Street Railway will re-lay the rails on its Squantum line. The line was discontinued and the rails taken up nearly a year and a half ago.

City Railway, Dayton, Ohio.—Arrangements are being made by the City Railway to extend its line west on Third Street, Dayton, to Crown Point, with a spur to the Soldiers' Home. Plans for

the improvements have been submitted to the City Commission.

Omaha & Council Bluffs Street Railway, Omaha, Neb.—All brick paving operations in Omaha, both for work to be done by the city and by the Omaha & Council Bluffs Street Railway, have been brought to a standstill by lack of brick. Owing to the transportation tie-up neither the city nor the company has been able to procure the necessary material.

Philadelphia, Pa.—Sealed proposals, addressed to the Director of the Department of City Transit of Philadelphia, Pa., will be received until June 22, for the following work:

Contract No. 571—Station platforms and shelters on Kensington Avenue at Huntingdon Street, Tioga Street, and Torresdale Avenue, and on Front Street at Berks Street, including steel framework and railing, reinforced concrete platform floors, etc.

Contract No. 572—Track construction in Front Street from Arch Street to Callowhill Street and in Frankford Avenue from north of Harrison Street to Bridge Street, comprising about 7,286 ft. of single track and two crossovers.

Contract No. 573—Concrete deck in Front Street from Arch Street to Callowhill Street and in Frankford Avenue from Dyre Street to Bridge Street, comprising about 2,980 ft. of structure.

Contract No. 574—Station platforms and shelter on Frankford Avenue at Pratt Street, including reinforced concrete platform, underpassage floors and stairways; wood roofs covered with asphalt and felt roofing, etc.

## Power Houses, Shops and Buildings

Georgia Railway & Power Company, Atlanta, Ga.—The Georgia Railway & Power Company will install a 50-mile transmission line between Lindale, Ga., and Gadsden, Ala., to connect with the transmission lines of the Alabama Power Company.

Pacific Electric Railway, Los Angeles, Cal.—The Railroad Commission of California has issued an order requiring the Pacific Electric Railway to install depot facilities at its Canal Avenue station at Los Angeles, at a cost of not less than \$4,000.

## Trade Notes

Frank Sutton, consulting engineer, has removed his office from 80 Broadway to 140 Cedar Street, New York.

Hunter Illuminated Car Sign Company, Linden Avenue, Brooklyn, N. Y., has completed plans for improvements to its plant, to cost about \$6,000.

Electric Storage Battery Company, Philadelphia, Pa., will move its Cleveland office about June 10 from its present location, Room 1217-1222 Citizens Building, which it has occupied since May 1, 1903, to Chester Avenue and

East Twenty-fourth Street. The new offices will occupy the entire second floor of the "Exide" battery service station, extensive alterations having been made for the purpose. H. F. Sauer is acting manager of the Cleveland office.

The Aluminum Company of America, 120 Broadway, New York City, is contemplating building an addition to its plant at Massena, N. Y., to cost about \$200,000.

The Cooper Hewitt Electric Company, Hoboken, N. J., has recently purchased property adjoining its plant which will eventually double its present floor space.

E. G. Long Company, 50 Church Street, New York, N. Y., manufacturer of electric railway supplies, has filed notice of an increase in capital stock from \$100,000 to \$250,000.

The Cleveland Welding & Manufacturing Company, West 117th Street and Berea Road, Cleveland, Ohio, contemplates building an addition, 90 ft. x 155 ft., to its factory, to cost about \$75,000.

The F. J. Klenck Company, 55 New Montgomery Street, San Francisco, is manufacturing fiber sheets, rods, tubes and washers and paper in sheets of from 0.004-in. to 0.125-in. thickness for insulation.

The Hammond Steel Company, Inc., Syracuse, N. Y., announces the election of Clyde E. Dickey as first vice-president and general manager. He is president of The Dickey Steel Company, Inc., New York City.

The King Manufacturing Company, St. Joseph, Mo., has doubled its factory space. The additional space will be used for the manufacture of ornamental lamp posts, ornamental brackets and commercial lighting units.

Frank Clark, who has been with the Rome Brass & Wire Company, Rome, N. Y., for the past twenty-six years, has resigned and will become associated with the National Conduit & Cable Company, Hastings, N. Y.

Safford K. Colby has resigned as assistant general sales manager in charge of electrical conductors of the Aluminum Company of America, New York City, to become president of the American Magnesium Corporation, Niagara Falls, N. Y.

J. N. Lapoint has been elected president of the Arnold Electric Tool Company, 902 Chapel Street, New Haven, Conn., succeeding Frederic Levere, who recently resigned. Mr. Lapoint is president of J. N. Lapoint, New London, Conn., manufacturer of broaching machines.

Dwight E. Robinson, 21 East Fortieth Street, New York, N. Y., has been placed in charge of eastern railway sales for the Du Pont Fabrikoid Company, Wilmington, Del. The selling arrangements previously existing with the Wendell & MacDuffie Company, 61 Broadway, N. Y., have been terminated.

Esterline Company, Indianapolis, Ind., has appointed Ludwig Hommel & Com-

pany, Cleveland, Ohio, as representatives for that district. Linn O. Morrow, formerly connected with the sales department of the Cutter Company, Philadelphia, will cover eastern Pennsylvania, southern New Jersey, Maryland, Delaware and the District of Columbia.

The Blaw-Knox Company, Pittsburgh, Pa., manufacturer of transmission towers, steel buildings, etc., a New Jersey corporation, has filed notice with the State Department of an increase in capital stock from \$3,000,000 to \$14,000,000 to provide for general business expansion. Arrangements have been made by the company for issuing \$2,000,000 of preferred stock.

The National Railway Appliance Company, New York City, will represent the Drew Electric & Manufacturing Company, Cleveland, Ohio, in the sale of its overhead line material, including hangers, ears, splicers, insulators, frogs, etc., as well as specialties. The territory includes all New England states, Southern New York, New Jersey, Pennsylvania east of Altoona, Delaware, District of Columbia, Maryland and North Carolina.

Edward J. Cheney, formerly of the General Electric Company and recently chief of the division of light, heat and power of the Public Service Commission, Second District, New York, announces the opening of an office June 1 at 61 Broadway, New York City, for general engineering and consulting practice, with particular attention to public utility problems, including rates, appraisals, public relations, design, construction, operation and management.

Ira Cushing has resigned from the Boston office of the General Electric Company to become sales engineer with James C. Barr, dealer in power plant, railroad and electric railway supplies, with headquarters at 84 State Street, Boston. Mr. Cushing is past chairman and secretary of the Boston Section A. I. E. E., and is widely known in New England electrical circles. For some years he has been engaged in switchboard engineering and other special work in the Boston office of the General Electric Company.

B. W. Stemmerich, formerly manager of the equipment section, railway department, Westinghouse Electric & Manufacturing Company, has been placed in charge of the safety car division of the St. Louis office of this company. For twenty-eight years Mr. Stemmerich has been in the employ of the Westinghouse company. He started as assistant stock order clerk and after several years of clerical and correspondence work was appointed assistant manager of the railway equipment section of the railway and light department; in 1917 he became manager.

E. M. Herr of Pittsburgh, Pa., president of the Westinghouse Electric & Manufacturing Company, and L. A. Osborne of New York, president of the Westinghouse Electric International Company, who have recently spent sev-

eral months in Japan studying conditions, were on May 12 decorated with the order of the Rising Sun by the Emperor of Japan. This order is the highest honor the Emperor can bestow. Mr. Herr received the third class and Mr. Osborne the fourth, the higher classes being awarded only to Japanese national heroes.

Roller-Smith Company, 233 Broadway, New York, has made an agency arrangement with the W. Montelius Price Company, 524 First Avenue South, Seattle, Wash., to handle the Roller-Smith Company's line of electrical instruments, meters and circuit breakers in the State of Washington, the State of Idaho and part of the State of Oregon. W. M. Price is the active head of the W. Montelius Price Company, and in addition to representing the Roller-Smith Company he also represents Stanley & Patterson, Inc., Northwestern Electric Company, Electric Controller & Manufacturing Company, Monitor Controller Company and Sundh Electric Company.

### New Advertising Literature

**Window Glass.**—Glass Founders Corporation, Milltown, N. J., has issued a folder on its "Ultra Glass" for car window use.

**Indexes.**—The General Electric Company, Schenectady, N. Y., has issued indexes to its descriptive bulletins and sheets and supply-part bulletins, both dated April, 1920.

**Arc-Weld Bonds.**—The Ohio Brass Company, Mansfield, Ohio, has issued a pamphlet on "O-B Electric Arc-Weld Bonds," showing specifications for every clause of welding steel to steel with steel.

**Transportation.**—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a two-color pamphlet, "Recent Notable Achievements," including illustrations and descriptions of transportation facilities on land and on sea, also of mammoth power generating units.

**Busbars, Disconnecting Switches and Choke Coils.**—The Lewis & Roth Corporation, Philadelphia, has issued a special bulletin, No. 28, covering its outdoor bus supports, combination outdoor disconnecting switch and choke coils, porcelain base choke coils (indoors), etc. Bulletin No. 29 describes and illustrates the Fisher-Chase fuse and disconnecting switch.

**Transmission Equipment.**—Bates Expanded Steel Truss Company, Chicago, Ill., has issued a compact engineering handbook containing information pertaining to the construction of modern transmission lines, electric railway lines and outdoor substations. It includes a discussion of the engineering principles governing the design, selection and installation of all types of poles and engineering tables.