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Getting Ready for the Atlantic City Convention

NOW that the definite announcement has been made that the convention of the American Electric Railway Association is to be held at Atlantic City, Oct. 6 to 10 inclusive, and that there will be an exhibit in connection therewith, the prospective gathering takes on more tangible form. The choice of meeting place will meet with general approval, for somehow Atlantic City furnishes a combination of attractions for a large convention that is difficult to beat.

The exhibit will be of unusual value this year because it will show, in concrete form, the ways in which manufacturers have profited in a development way during the war period. There will be a certain zest to it, furthermore, on account of the hiatus which has interrupted the series.

It is a satisfaction also to know that the somewhat anomalous status which the manufacturing members of the association have occupied since 1913, when they were admitted as full members, is on the way to be ended by the organization of an affiliated manufacturers' association. This plan is discussed more fully in the following editorial.

With regard to the convention as a whole, the industry needs a "get together" of this kind more than ever before. While some sacrifice of time may be needed on the part of the members to insure adequate attendance at Atlantic City, such sacrifice will be well worth while.

The Manufacturers Desire to Help the Association

WE HAVE already mentioned the hope of the executive committee of the association to authorize the establishment and admission of an affiliated manufacturers' association this year. The only reason for the delay of the past two years in this matter has been the war, and the accompanying cessation of all association activity except that directly connected with hostilities against the enemy. The subject is one which can properly be taken up now, however, and it is the intention of the committee in charge to push it through so that definite action on the admission of the new association to the main body can be taken in October.

In a matter in which there has been such a variety of opinions we have no idea that the plan of the committee when completed will be satisfactory in all its details to everyone. Nevertheless, the committee will make every effort to unite all ideas in a working plan and solicits constructive suggestions. The aim sought will be the good of the industry as a whole by enlisting and making effective the power which the manufacturers

can undoubtedly bring to help in the solution of electric railway problems. This assistance the American Association has recognized but should recognize still more, and the approval of a constitution giving the manufacturers an opportunity to do what they can best do for the American Association will be a step in this direction.

There is a great chance now to forget all differences of opinion that may have existed in the past, to put a firm shoulder to the wheel, and to push with might and main to get the business out of the "slough of despond," in which it has been temporarily mired, and upon firm earth again.

Rush-Hour Traffic Breaking the Industry's Back

ONE of the fathers of the electric railway industry once said that the "dividends are in the straps." It was a catchy phrase but merely a half-truth, and half-truths—like the Bolshevik doctrine that manual labor can be economically self-sufficient—are invariably vicious. That the rush-hour straphanger pays dividends has never been true. At the present time, he is a disastrous liability, although a certain acceptance of the twenty-year-old catchword in his favor has probably obscured the belief that the industry would be better off without him. In fact, the peak-load passenger is carried at a loss—a direct loss, not an indirect one—and to the extent that the electric railway can drive away traffic at the top of its peak it benefits itself.

Naturally, the public does not recognize this, yet the explanation may be made in relatively simple terms. For example, assume that a group of 100 prospective patrons appear before a railway management and request transportation from city to suburbs daily during the peak hour. Does the railway want this brand-new business? It does not! Not even if fifty of the passengers agree to strap-hang without kicking! Of course, the railway will, in the end, have to carry the new patrons but it would much prefer that they walk.

In the first place, a new car for these passengers must be purchased for, say, \$8,000, and on this there will be an annual charge of \$960 for interest and depreciation. or \$4 per day, considering the electric railways' five-day week of peak loads. As the car can make only 10 m.p.h. and will run, say 5 miles out and back, it will complete its round trip after the peak hour has passed. This will limit the period during which it is needed to carry passengers to one trip per day and will make the fixed charge for that trip \$4. In the second place, additional power facilities to the extent of 30 kw. must be provided even though used only for one hour daily, and the resulting high demand charge will bring the power cost to \$2 for the trip. Maintenance, carhouse expense,

accidents, accounting and supervision will amount to about \$1 for the 10 miles traveled. Platform labor, at the War Labor Board's intermediate rate of 45 cents per hour, would add 90 cents to the foregoing if the railway was lucky or skillful enough to make exact arrangements for a swing-run crew to handle the one-hour trip without paying for any dead time. At the other extreme, if all available crews were scheduled, and a new crew had to be hired for this trip alone, the platform expense would be the minimum day rate for the two men; perhaps \$6. The probabilities are that a figure between these extremes, or say, \$2, would represent a reasonable average, and by adding this the total direct cost for the trip would become \$9.

One hundred new peak-hour passengers, including fifty straphangers, would thus cost the company—exclusive of any indirect costs on permanent installation—9 cents each. Whether each paid 5 cents or 8 cents for his fare would make only a difference in the amount that the railway could profitably pay each one to stay off the cars until after the peak or to walk. In fine, the electric railways not only don't want peak-hour traffic but, in the present situation, can't afford to handle it.

Learning From the Experiences of Others

FOR the past seven months this paper has been publishing, in the "Mechanical and Engineering" issues under the heading "Some Mysterious Car Ailments," groups of short articles devoted to equipment defects. The intention has been to describe types of car equipment trouble whose cause is not evident without detailed investigation, and to give such information regarding methods of overcoming the difficulty as will be of assistance to both the user and the manufacturer. We have kept these articles entirely free from reference to individuals or roads affected in order that operating men might feel no hesitancy in sending in the results of their experience. The information was put in a rather unusual form to secure the widest possible reading of the articles. The plan has been primarily to answer these queries: "How did the ailment manifest itself?" "What was the real difficulty?" "What did investigation show to be the cause of the difficulty?" and "How was the ailment cured?"

A large proportion of the occurrences recorded so far have been with multiple-unit equipment. This was not because equipment of this type gives more trouble than other apparatus but rather because most of the roads from which we have received information for these articles happen to have this type in operation. Furthermore, as shop men are less familiar with its operation than with older types, any trouble occurring appears to them much more mysterious than in the case of platform-type controllers. No attempt has been made to give all the methods for overcoming the troubles listed, nor is it assumed that those given are the best for all conditions. In cases where changes in design are apparently advisable, we have endeavored to obtain the manufacturers' viewpoint and give our readers the benefit of their experience.

The articles seem to meet a real need and should be of help in reducing maintenance costs. Some manufacturers may have felt that undue prominence was being given to the troubles with their particular equipment, but as far as we know the ailments have concerned de-

tailed faults, mostly of a minor character and reflecting little discredit on the design of the equipment. In any event, the overcoming of defects in design, or in inspection and maintenance procedure, is certainly in the line of progress.

Citizen Mahon, Altruist!

ABOUT Citizen Mahon, president of the Amalgamated Association, many harsh things have been said, but none have been cruel enough to call him an altruist. Still, that is the only name that will fit him for his latest impassioned plea for the abolition of the modern one-man car. Why? Because no one knows better than he that hundreds of electric railways may have to go out of business altogether if they cannot use this means of keeping ahead of advancing costs. If these electric railways go out of business, their employees must go out of their jobs and paying dues to the Amalgamated simultaneously. Whereupon Mahon's, like Othello's, occupation would be gone. 'Tis indeed a noble sacrifice to turn Amalgamated carmen into gipsy jitneys who owe allegiance to no unions whatsoever.

Citizen Mahon may not realize that it is he, and not the operator of the new one-man car, who is "pulling old stuff" in objecting to the seeming supersession of men by mechanisms. In principle he differs not an iota from the cotton-pickers who destroyed Eli Whitney's gin (the machine, not the liquor) from the hand weavers who broke the first power looms and from the horse-car directors who ascribed their rheumatism to those new fangled electric cars. Our good comrade's attempt to befog the question with talk about accidents is exceptionally naive. In an article written in February, 1918, he sought to condemn the modern kind of one-man car by assigning to it the evils of the camouflaged junk put out here and there. This year Citizen Mahon is even more daring. His pathetic gloom about the accident possibilities of one-man cars are based upon the accident statistics of cars operated with two men!

It is hardly necessary to cite history to prove that no interests have ever proved powerful enough to stay for long the progress of labor-saving devices. What puzzles us most about Citizen Mahon, unless he really has become a 100 per cent altruist, is that he should object to the best means yet found of keeping his supporters in their jobs at higher pay for less fatiguing work, since he is thereby assured of a much steadier membership than is the case where one-half or more of the men drift on and off the car platform within a single year. Although a labor-saving device, the one-man car most emphatically does not force men out of their jobs. As we all know, the right introduction of this car generally means a big increase in service, often three cars for two. Then comes such a wave of public approval, expressed through heavier riding, that the happy manager is far more likely to augment than decrease his payroll. Of all the installations of modern one-man cars that we have had the good fortune to study, we have not run across a single instance where any man lost his job or where the one-man car operator failed to better his financial condition. As one manager said: "We have stopped firing and hiring. The men stick."

As for the accidents conjured up with such deep solicitude by Citizen Mahon, they are not only less numerous than with the old two-man cars but actually

less numerous than one would fairly expect when operators are adjusting their instincts to a faster accelerating and faster braking car. Anyway, we wonder what Citizen Mahon's alternative to the modern one-man car is, for if these new cars are to be replaced by the trackless, reckless and *dues-less* jitney, the accident record would be infinitely worse than his electric railway record of one person killed for every 13,603,500 passengers carried. And would the families of the slaughtered get \$18,176,305 from these irresponsible automobile ragamuffins? Let Citizen Mahon answer!

Can You Furnish Real Data—If Not, Why Not?

TOO much emphasis cannot be laid upon the importance of the hearings that are to be held by the Interstate Commerce Commission during June and July in regard to compensation for electric railway haulage of United States mail. There are two aspects of this matter which electric railway operators should recognize:

The first is the one which concerns merely the rates for mail carriage. The 1918 change in the postal law, whereby it is made unlawful for any electric line to refuse to perform mail service at the rates provided when required by the Postmaster General, renders it imperative that electric railways help the government to fix adequate rates. Back in 1916 the committee on compensation for carrying United States mail of the American Electric Railway Association could say with sorrow that the electric lines must either go out of the business of transporting mail or continue to carry it for less than cost. Now even the option of becoming a mourner through the forced abandonment of a losing practice is denied to the electric lines.

If the electric railways must carry the mails, therefore, it behooves them to redouble their efforts to secure adequate compensation. All the railways now under mail contracts or likely to be should attend the proper regional hearings and present the most detailed data possible in regard to the cost of operation. Full weight should be given in the case of pouch mail, in the absence of exact cost data, to increases in general operating costs and in volume of mail since old contracts were made, and in the case of independent car mail to all overhead costs. The association has prepared a commendable exhibit for companies to fill out in order that the data may be presented on a uniform basis. Have you begun to prepare your data?

The second aspect of this matter is more general. It concerns the inability of some companies to furnish real cost data instead of cost guesses. It is regrettable, but none the less true, that the number of blanks left in the association's exhibit will be an index of the railway's lack of appreciation or, worse yet, negligence of modern business practices. The same could be said of similar exhibits which might be prepared to show terminal and movement costs for passengers, freight and express costs, etc. Years ago accurate costs were not needed, but to-day government and commission officials can only regard as slipshod an industry whose managers and accountants in too many cases specialize in objections to rather than work toward such data. The electric railway industry as a whole needs costs and the determination to get them.

Automatic Control Applied to Motor-Started Converters

ANY engineer possessed of a spark of imagination, and successful engineers must have much more than a spark, cannot but be fascinated by the rapid development of automatic control for railway substations. Automatic control has proved its adaptability to a wide variety of applications, the latest being that to the old-fashioned motor-started rotary converter. R. J. Wensley tells in this issue just how the operation is performed. In this the elements that are of particular interest are the starting and cutting out of circuit of the starting motor and the act of synchronizing the rotary converter. Reading between the lines of this story the men who are familiar with the early days of the synchronous motor and the rotary converter will be reminded of some fundamental principles of which an earlier understanding would have saved much nervous energy and money. Just one of these may be cited for illustration.

When the alternating current generator was first developed it did not, in general, give satisfaction as a motor. It had to be brought up to synchronous speed by outside means and when synchronized showed a lamentable tendency to "fall out of step." Two among other important facts were then noted: (1) That inductance in the armature circuit stabilized operation, and (2) that eddy currents generated in the pole pieces (or in damper bars placed therein when laminated poles were used) could be used to bring the motors to speed and to prevent "hunting" when at speed. These simple but fundamental "discoveries" played an important part in the development of the rotary converter. Without them the automatic synchronizing described by Mr. Wensley would be very difficult, if not impossible.

In the plan described, the safeguards surrounding the converter are of prime importance. The induction starting motor is brought into action by low direct-current voltage, and it is cut out when the converter attains synchronous speed. This cutting out can be done electrically because the current falls to a low value as the starting motor approaches its own synchronous speed. It could, of course, be done mechanically also. The converter armature is then thrown in with reactors in circuit which not only limit the current but insure the proper phase relation of current and field flux to produce good torque. When the direct-current circuit goes on it contains resistors which also serve to limit the current. Hence the converter itself is between two sets of electrical "cushions" which serve to protect it from abnormal conditions. This cushioning action is supplemented, of course, by several protective relays. The safeguarding thus appears to be complete.

The automatic control of electrical machinery is for all the world like the "reflex" operation of the human nervous system. A sudden apparition before the eye causes a closing of the lid long before the brain has time to come into action. The blast of a Klaxon horn similarly arrests the step, bringing into instant sequence a complicated train of nerve signals and muscular contractions. So with carefully adjusted relays a drop in voltage or in load current, or a rise in temperature of apparatus or speed of rotary armature, sets in motion the devices for making the necessary changes in control circuit connection and the circuit breakers do the rest.

Adapting Automatic Control to Motor-Started Converters

The Author Presents Details of Relay and Switch Connections for Utilizing with Older-Type Converters the Principles Which Have Proved So Satisfactory in Automatically Controlling Self-Starting Machines

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WHILE at present no motor-started rotary converters are being built in this country many old-style machines of this type are in service. These machines, in many cases, are still good for a long service period and it is quite possible that traction lines operating such machines may desire to provide them with automatic control. Such a control has been developed by the Westinghouse Electric & Manufacturing Company.

The control of motor-driven rotaries presents several problems not present with self-starting machines. The former must be synchronized with the line after having been brought up to speed by means of its starting motor. It also builds up with a definite polarity before reaching synchronous speed. These facts make necessary a slightly more complicated control scheme than need be used with the self-starting rotary.

Obviously any synchronizing scheme involving automatic speed control and the closing of the main switch at the point of synchronism is too complicated for practical use. Hence, reactance synchronizing was adopted for the automatic control on account of its relative simplicity. In reactance synchronizing the machine is brought up to approximately synchronous speed, the motor is then cut off, and the machine is thrown onto its transformer through reactance of sufficient magnitude to limit the flow of current to less than full-load value. The machine is then allowed to settle and to pull into

step through the reactance. When it is in step the reactance is short-circuited, thus connecting the transformer directly to the converter rings. The direct-current switches may then be closed and the load put upon the machine.

Experience covering approximately a year with apparatus of the type described herein indicates that practically every contingency met with in actual operation has been anticipated and provided for. The equipment as described brings up a 300-kw. converter to speed, synchronizes it and picks up a load in from thirty to fifty seconds, obviously very much more rapidly than can be done in the old-fashioned hand operation.

The circuit diagrams for the new control as reproduced in Figs. 2 and 3 show the plan of connections and sequence of operations. To permit comparison with the same matters in connection with automatic control of self-starting converters, Fig. 1 is given.

STARTING THE ROTARY CONVERTER AUTOMATICALLY

Let us first take up the steps in preparing the converter for connection to the line and the devices provided for doing this with proper safeguarding of the machine. As the rotary is to be started by under-voltage, a relay (No. 1, Fig. 3) is provided to close its contacts when the trolley voltage falls below, say, 450, the relay being connected between trolley and rail. Means of changing the adjustment are a feature of this

Automatic Control of Motor-Started Synchronous Converter

The Primary Functions of the Control Are:

1. Inaugurate the starting process when the voltage falls below a set value.
2. Bring the starting motor up to speed.
3. Cut out the starting motor.
4. Connect the converter armature to the power transformer secondaries at approximate synchronism, with reactance in circuit.
5. Force the rotor to "slip a pole" if "reversed."
6. Short-circuit the converter starting reactors.
7. Connect the machine to the direct-current line through cushioning resistors.
8. Cut out the station if the current falls below a set limit for a definite time.

The Control Must Also:

1. Fail to bring the station in if the alternating current voltage is too low or if the phase rotation is in the wrong direction.
2. Cut out the station if the alternating-current supply becomes defective.
3. Cut out the station if the alternating-current circuit is overloaded.
4. Cut out the station if direct-current power flow is reversed.
5. Cut out the station if a direct-current overload occurs.
6. Cut out the station if the machine overspeeds.
7. Cut out the station if the bearings overheat.

relay, permitting the closing point to be varied to suit local conditions. There is also an induction-type voltage relay (No. 2), to insure the presence of sufficient line potential to start the converter and satisfactorily to operate the control. If this relay fails to open its contacts, due to insufficient voltage, no other switches can close and the station will not start.

The master control switch (No. 3) is a contactor through the contacts of which all alternating-current control circuits pass, with the exception of the main closing circuit of the oil circuit breaker which is relayed by a separate magnet switch (No. 22). By means of No. 22, the oil circuit-breaker (No. 20) is closed immediately after the closing of No. 3. A dash-pot relay (No. 21) serves to open the closing-coil circuit after the breaker is closed.

Assuming now that the trolley voltage has been low enough to close No. 1 and high enough to open No. 2, No. 3 will have been closed and power is available for starting the starting motor. We come next to the contactor (No. 4) in the main starting control circuit. This will not close unless a polyphase relay (No. 18) indicates the presence of sufficient voltage on all phases and the proper phase rotation. This relay is connected to the transformer secondaries, so that even if poly-

which the main starting contactor (No. 6) is closed. No. 6 connects the converter rings to the transformers through three single-phase reactance coils and the converter pulls into step with the line.

THE CONVERTER SOMETIMES COMES IN WITH REVERSED POLARITY

The rush of current at the moment of closing No. 6 occasionally reverses the polarity of the machine, which builds up some direct-current potential while on the

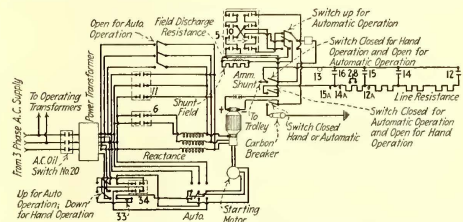
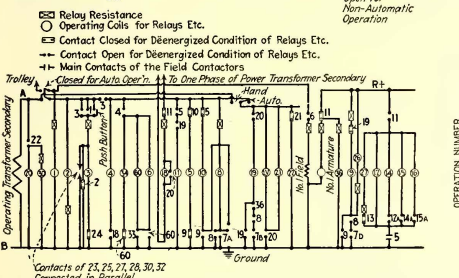
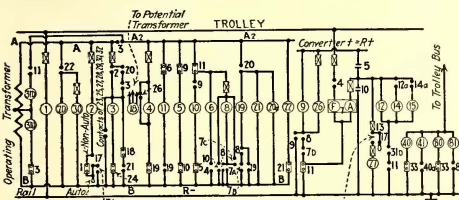


FIG. 2—SIMPLIFIED CIRCUIT DIAGRAM FOR SUBSTATION WITH AUTOMATIC CONTROL OF MOTOR-STARTED ROTARY CONVERTER



AT TOP, FIG. 1—SCHEMATIC DIAGRAM AND SEQUENCE CHART FOR AUTOMATIC CONTROL OF SELF-STARTING ROTARY CONVERTER; AT BOTTOM, FIG. 3—SCHEMATIC DIAGRAM AND SEQUENCE CHART FOR AUTOMATIC CONTROL OF MOTOR-STARTED ROTARY CONVERTER

(Fig. 1 is reproduced for comparison with Fig. 3)

| | | DEVICE NUMBERS | | | | | | | | | | | | | REMARKS | | | | | | | | | | | |
|------------------|----|----------------|---|---|---|---|---|---|---|---|----|----|----|----|---------|----|----|----|----|----|----|----|----|----|----|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 31 | |
| OPERATION NUMBER | 1 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| | 2 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| | 3 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| | 4 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| | 5 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| | 6 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| | 7 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| | 8 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | 9 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
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| 15 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| 16 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| 17 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| 18 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| 19 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| 20 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| 21 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| 22 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| 23 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| 31 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |

| | | CORRECT POLARITY | | | | | | | | | | | | | REVERSED POLARITY | | | | | | | | | | | | |
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| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 31 | | |
| OPERATION NUMBER | 1 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | |
| | 2 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | |
| | 3 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | |
| | 4 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | |
| | 5 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | |
| | 6 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | |
| | 7 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | |
| | 8 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | |
| | 9 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | |
| | 10 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | |
| | 11 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | |
| | 12 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | |
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| 16 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | |
| 17 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | |
| 18 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | |
| 19 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | |
| 20 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | |
| 21 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | |
| 22 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | |
| 23 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | |
| 31 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | |

phase voltage is available on the supply line the station will not start if, through some fault of the oil circuit-breaker or the connections, polyphase voltage is not present at the converter slip rings.

Immediately following the closing of No. 3, a two-pole contactor (No. 34) in the starting motor circuit closes and the motor brings the converter up to speed in the usual manner. A current relay (No. 33) opens as the induction motor passes through synchronous speed, opening No. 34 and closing relay switch No. 60 through

starting motor. This condition is taken care of by a polarized motor relay (No. 7), the design and operation of which are as follows:

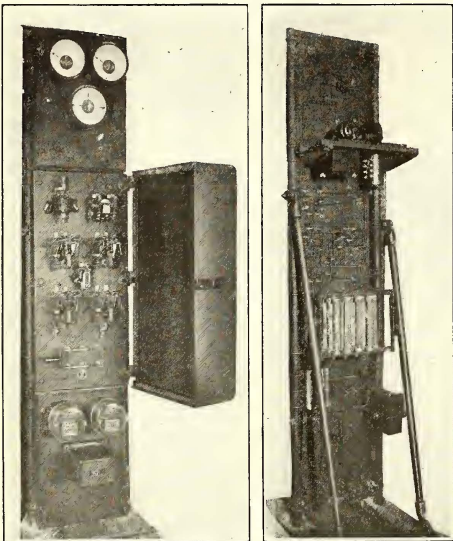
No. 7 relay consists of a tiny motor with a permanent magnetic field. Its armature is geared to a small skeleton drum switch having four positions (see illustration). The contacts made in the several positions are designated by 7A, 7B, 7C, and 7D in the diagram. The armature of this motor is supplied from the converter direct-current brushes during the starting pe-

riod. Since the motor has a fixed field, the direction of rotation is dependent upon the polarity of the converter brushes. If the converter is "upset" and locked into step inverted the relay revolves backwards, closing contacts *A* and *D*. Point *A* closes interlocking relay No. 8, which locks in through its own contacts when closed. Point *D* energizes field-reversing relay No. 9, which opens main field switch No. 5 and closes reverse field

The master relay panel is shown in one of the illustrations; the mounting of the motor relays on brackets behind the panel are shown in another. The alternating-current switches are mounted on a third panel which may be located in the position most economical with respect to use of cable.

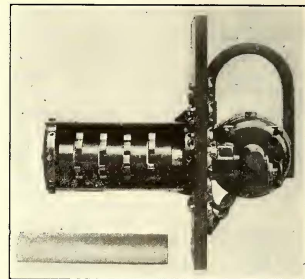
THE DIRECT-CURRENT CONTROL IS VERY SIMPLE

The converter is connected to the line through a series of cushioning resistors which are short-circuited in three sets. The closing of the main contactors is governed by current-limit relays which prevent the cutting out of the resistors in case the current demand is in excess of the current rating. The assembly of contact-



FRONT AND REAR VIEWS OF MASTER CONTROL PANEL

ors and current-limit relays is shown in still another illustration. The station is held on the line by means of a current relay (No. 13) which is set to operate at about 15 per cent of normal full load. In its de-energized position this relay closes a circuit through the time relay No. 27. No. 27 consists of a small shunt-wound direct current motor with a magnetic clutch driven through reduction gearing having a ratio of 19,800 to 1. The clutch drives an arm which closes the contact at the end of the stroke, short-circuiting the coil of No. 3 and thus shutting down the station.



THE POLARIZED MOTOR RELAY
(NO. 7)

If the load demand comes on while the time relay is operating then No. 13 picks up, opening the circuit to the time relay and de-energizing the clutch. Thus the moving arm is allowed to return to its back stop. This clutch action provides an instantaneous reset which prevents the time relay from having a cumulative characteristic.

switch No. 10. The field-reversing relay is operated from the direct-current converter brushes and locks itself in after having been closed.

The reversal of the field causes the direct-current potential to die away, and when it has reached a point close to zero the field-reversing relay will no longer be held in and will open. This will open the reverse field switch and close the main field switch. This reversal of the field will cause the machine to slip a pole and come up with correct polarity. The polarized motor relay will then run in the opposite direction, closing contacts *7A* and *7B*. Contact *7A* closes No. 8, which was opened by one of the contacts on No. 9. Contact *7B* will close the circuits to No. 19, the running switch relay. In this circuit is the contact of No. 36, a direct-current voltage relay which is connected to the direct-current brushes. This is set to pull in at a point near the maximum direct-current voltage obtainable while reactance is in circuit. Thus the reactance will not be short-circuited until the machine has settled into step and has pulled up as near to exact synchronism as possible.

The motor relay will continue to revolve if No. 36 is not closed. Contact *7C* will drop out No. 8; contact *7D* will not cause any action because interlocking relay No. 8 is open. After No. 36 closes, the next time that contacts *7A* and *7B* are made No. 19 will close which in turn will close the running switch No. 11.

SAFEGUARDING THE SUBSTATION APPARATUS

An automatic substation must necessarily be better protected than an ordinary manually-operated station because the automatic control is required to take care of all operating contingencies that may arise. The protective features which have been provided in the control equipment under discussion are described below.

Protection against Low Voltage at Starting.—Relay No. 2, an induction type relay operating on single-phase potential, is calibrated to open its contact at 80 per cent of normal line potential. In case there is insufficient potential to start the converter this relay will not open.

Protection against Reversed Phase and Phase Failure.—Relay No. 18, a standard type "CP" induction relay having polyphase potential coils, is operated directly from the power transformer secondaries, so that if for

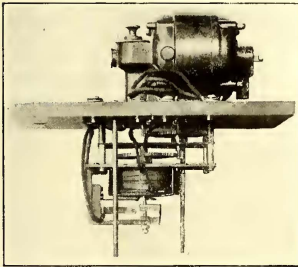
any reason polyphase potential of adequate amount for operation of the converter is not present this relay will not close its contact. Thus the starting switch circuit relay will be opened and the station will be disconnected from the line.

Protection against Alternating-Current Overload.—

The overload protection is normally set for 200 per cent of normal full-load current and with a sufficient time interval to allow the direct-current overload relay to operate in advance of the alternating-current relay. On equipment with primary voltage of 17,000 or less, current transformers and type "CO" relays are used, these being standard induction overload relays. For potentials above 17,000 volts a series high-tension induction relay is used which obviates the necessity for

using current transformers insulated for the full line voltage.

Direct - Current Reversed - Current Protection.—Protection against reversal of energy flow in direct-current circuits is guarded against by the use of a dynamometer-type reverse current



THE UNDERLOAD DELAY RELAY

relay of standard design. This relay has a very heavy shunt field and a light moving element with the winding energized from an ammeter shunt. If the station is tripped out by the reverse-current relay it will immediately attempt to start providing the demand exists and the alternating-current supply is adequate.

Direct-Current Overload Protection.—The current-limit relays 12A, 14A and 15A, are set for instantaneous action at approximately 175 per cent of normal full load current. This permits the utilization of the ability of the converter to withstand momentary swings, but does not protect the converter against continued overloads of less than 175 per cent of full-load current.

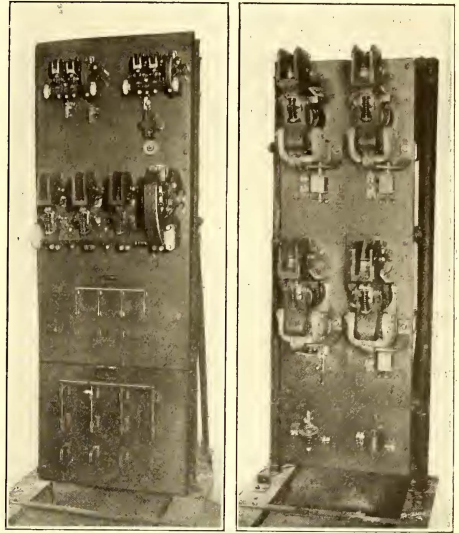
To guard against such a contingency a "Replica" relay is provided which is responsive to the effective heating value of the current passing through it. This relay is composed of a series coil connected in the converter circuit and a copper bellows filled with volatile fluid. When the series coil has heated sufficiently, due to continued overload, the volatile fluid is vaporized and the bellows expands thus closing the relay contacts and shutting down the station. The station will remain shut down until the series coil has cooled off enough to indicate that it is again safe to start.

When the series relays operate and open the contactors, thus putting the main resistors in circuit, the grids will become very hot if the short circuit or the extreme overload persists. A thermostat is mounted over the resistance grids and when a dangerous temperature has been attained this shuts down the station until the grids cool down.

Overspeed Protection.—The usual centrifugal overspeed device is used on the machine and this is non-resetting. In case of overspeeds sufficient to trip the de-

vice automatically the station must be visited by an inspector to reset the trigger and permit further operations.

Bearing Protection.—The machine bearings are protected against overheating by thermostats consisting of copper bulbs inserted in holes drilled through the side of the pedestal into the bearing housing, the bulb connecting with the copper bellows by copper tubing. The



AT LEFT, THE ALTERNATING-CURRENT PANEL; AT RIGHT, THE DIRECT-CURRENT CONTACTOR GROUP

contact device is so arranged that when the heat of the bearing boils the fluid in the bulb the bellows expands and causes the substation to shut down. After once being shut down by this device it will not again restart until the thermostat is reset by hand.

Steam Conveyor Versus Manual Labor for Ash Handling

AN AMERICAN steam ash conveyor was installed to replace the use of men and horses in a boiler plant containing a battery of one 500-hp. and five 150-hp. boilers operating continuously. The cost of ash disposal previous to the installation of the conveyor was as follows: Two ash wheelers, \$10.88; one teamster, \$4.08; one horse and feed, \$1.50; making a total of \$16.46 per day of twenty-four hours. The cost of ash disposal after installation of the conveyor was \$4.08 for one laborer working nine hours per day. Between fire cleanings this laborer acted as assistant fireman and boiler-room helper.

The method of operation consists in raking the ashes onto the boiler-room floor in front of the boiler, leaving them there until the cleaning is completed, and then scraping them into the conveyor. The complete cleaning requires about seven minutes. The boilers are cleaned every two hours.

A Survey of Electric Railway Bridge Maintenance

Bridges Require Systematic Inspection and Prompt Attention to Needed Protection and Repair, Both to Maintain Them in Safe Condition and to Insure Reasonable Structure Life

By R. C. CRAM

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IN THE discussion of a paper on "Bridge Inspection and Reports," read by Herbert C. Keith before the Brooklyn Engineers' Club, and abstracted in the issue of this paper for Feb. 24, 1917, page 357, J. D. French said in part:

"A knowledge of the conditions concerning structures in service, the forces of wear and exposure to the elements, and the available means of resisting such forces by proper maintenance is manifestly of great value in the design of bridges and similar structures; but it is not always practicable for the designer to obtain knowledge of this kind when needed."

For the above reason, among others, Mr. French considers a knowledge of maintenance methods of very great value to designers. Such knowledge is obviously essential for the engineer responsible for maintenance, but it frequently happens that good maintenance is interfered with on account of failure of designers to work with the idea of economical maintenance in mind. The purpose of the present article is to suggest ways in which this condition can be bettered by discussing some of the matters which arise from time to time in connection with the maintenance of electric railway bridges. It is not the intent to discuss the broad subject of design of bridges, as that is a matter almost entirely foreign to maintenance although it is realized that design and details thereof play an important part in the creation of factors which may cause excessive maintenance expense. Sometimes a rather insignificant detail will prove to be the source of very costly repairs.

HOW BRIDGES ARE CLASSIFIED

A bridge has been defined as any structure erected above the normal surface of the earth used for the passage of traffic of any kind. It is normally thought of as a structure forming a roadway over a water-course or ravine. One classification of bridges is based on the position of connection of the floor system to the trusses and depth of trusses, when they are called "through," "half-through" or "pony truss" and "deck." The trusses of a through bridge are connected at the top by a system of lateral bracing and at the bottom by the floor system. A half-through truss has no top lateral bracing, while a deck bridge has its trusses connected at their tops by the floor system.

A truss may be defined as a combination of timbers, steel or other materials forming an unyielding frame for support of a floor or a roof.

When considered on the basis of design or construction method, bridges are classified as truss, girder, lattice, trestle, arch, cantilever, suspension, pontoon, etc. When classified by operation method they are called draw, swing, lift, bascule, etc. A non-movable bridge forming an approach to a drawbridge (draw-span) is often

spoken of as a "fixed span," to distinguish it from the draw span. They are also often spoken of according to the materials entering into their construction, as wooden or timber, steel, concrete, reinforced concrete, etc.

Bridges are designed for dead load, live load and impact. The dead load is the entire weight of the suspended structure. The live load is the load of the cars or trains which will use the structure. This is now based as a rule on some one of Cooper's loading series or classifications which are based on certain locomotive axle loads as produced when two locomotives are coupled together. The formula for impact is receiving considerable attention at the hands of bridge engineers but a

common formula largely used in the past is $I = S \frac{300}{L+300}$

where I equals impact stress to be added to live load stress, S equals computed maximum live load stress for each member, and L equals loaded length of track in feet producing the maximum stress in the member. Bridges having more than one track require that the aggregate length of all tracks producing the maximum stress shall be used. In the design of combination highway and electric railway bridges, the live load assumed must consider the heaviest traffic which can come on the bridge floor in addition to the load produced by electric cars. When footwalks are present, the load which these may produce gives another loading factor for consideration.

Since many electric railways cross highway bridges, the following information as to loads used for designing and for a standard of comparison with existing structures should be of interest as the Massachusetts specifications are widely used:

Specifications of Massachusetts Public Service Commission for Electric Railway Bridges

For the track load these specifications use a 50-ton car with wheel spacing of 5 ft., 15 ft., 5 ft. and a total length of 40 ft. over all. For roadway and sidewalks loads of 100 lb. per square foot are used for city bridges and 80 lb. per square foot for country bridges 100 ft. or less in length. These uniform loads are assumed to cover the full area of the roadway and sidewalks except a width of 9 ft. at each track. For longer spans these uniform loads are reduced 1 lb. per square foot for every 5 ft. additional length up to 200 ft., and for all greater lengths 80 and 60 lb. per square foot respectively are used. For suburban bridges the floor is designed for the same loads as the city bridges, while trusses and girders are designed as for country loads. For highway bridges in city, town or country the specifications require provision for an alternative roadway load of a single 20-ton auto truck on two axles 12 ft. on centers and wheels at 6-ft. gage; the weight assumed to be distributed 6 tons on one and 14 tons on the other axle; the truck assumed to occupy a floor space of 32 ft. long and 10 ft. wide, the overhang being equal at front and back and at the sides. With track and

| Division _____ | | | | | | | | | | Line _____ |
|----------------------|---------|---------|-----------|------|--------|----------------|----------------------|--|-------------------|------------|
| Date Inspected _____ | | | | | | | | | | |
| Bridge No. | Erected | DATE | | KIND | Length | Size or Height | Fire Proof Deck Kind | Condition of Bridge and Description of Work to be Done | MATERIAL REQUIRED | |
| | | Present | Inspected | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

SPECIMEN PAGE OF BRIDGE INSPECTION BOOK USED ON BAY STATE STREET RAILWAY

uniform roadway and sidewalk loads impact of 25 per cent is added for floor beams and stringers, while for girders and members of main trusses the impact used varies from 25 per cent to 10 per cent according to the loaded length producing maximum live-load stresses, except that 40 per cent is used for counters and floor-beam hangers. With the auto-truck load 50 per cent impact is used for steel members which receive their full load from one panel point only and no impact is used for wood floor or stringers. Tension stress allowed by these specifications is 16,000 lb. per square inch of "structural steel." Other allowed unit stresses in general correspond with those given in other specifications using the same tensile stress, except that in direct compression these specifications allow only 12,000 lb. per square inch of steel, reduced by the Gordon formula.

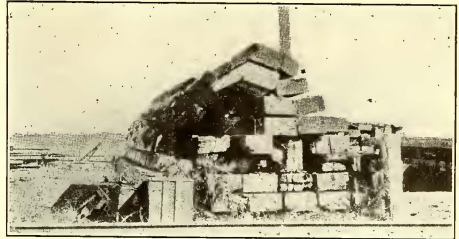
Modifications of Massachusetts Public Service Commission Specifications for Use in the Consideration of Existing Structures.—Although the specifications are eminently satisfactory for the design of new bridges or for the strengthening of old ones, as well as for use as a basis in investigating the capacity of existing structures which carry electric railways, there are many bridges for which certain features of these specifications would be unduly severe for determining fitness for further service. In other words, the specifications are considered for purposes of design but require modification for use in the consideration of existing structures and the desirability of continuing them longer in service.

The carrying capacity of a bridge is the heaviest live load which it may receive in regular service without subjecting the bridge to such stresses as will impair its strength. The capacity decreases slowly under ordinary conditions as the age of the structure increases, due to the deterioration of the materials. On the other hand, the capacity may decrease rapidly if the structure is continually overstrained by loads greater than those for which it was designed. Hence it is essential that any change in car equipment which affects the wheel spacing or axle loads should be the cause for a careful examination of all bridges (particularly the details of the floor system) over which the new equipment is to operate. It may be added that as a rule highway bridges deteriorate, according to excellent authority, more in one year than do railway bridges in two years if independent of the highway.

Electric railways generally do not maintain separate bridge departments to look after the upkeep of their bridges. This is partly due to the comparatively small size, in mileage, of the average road, which cannot

afford the luxury even if the number of bridges might otherwise warrant. In many cases practically all of the bridges are highway bridges which are maintained primarily by the various civic officials in charge. Even on roads of considerable mileage with several hundred bridges, the engineer of maintenance of way is in direct charge of the bridges and he usually calls in a consulting bridge engineer when confronted with unusual bridge problems such as strengthening for heavier loads, rebuilding for double tracking and periodic expert inspection, the latter being required by law in several states.

The first requirement in connection with well-ordered bridge maintenance is an adequate record of the number and type of structures over which the maintenance engineer has charge. The simplest way to obtain this, if not on hand, is to start afresh and have a comprehensive examination of all bridges made by an engineer



UNTREATED SOUTHERN YELLOW PINE BRIDGE TIMBERS AFTER TWELVE YEARS IN SERVICE

who makes a specialty of such work. Too much dependence cannot be placed in such plans as may be available in the office unless every detail has been carefully checked up, and as a rule the detailed plans of highway bridges crossed by electric railways are not to be found in the railway company's files. Some consulting engineer, during the construction period of the road, may have had them but he generally has kept them, too. The importance of having them is best

| Gateway Line | | | | Western Division | | | | 49 Sheets | | | | | | | | | | |
|--|------|-----|-----|--|-----------------|------|-------|-------------|---------------------------|---------------|-----|-----|--------|-----|-----|-----------------|------|----------|
| Statement of Work to be done on Bridges & Culverts During 1914 | | | | | | | | Sheet No. 2 | | | | | | | | | | |
| Bridge & Culvert Numbers | Kind | Lg. | Ht. | Work to be done | Approx. Cu. Yd. | | | | Lin. Ft. of Pipe Required | | | | Number | | | Date Com-pleted | | |
| | | | | | Exc. | Fill | Clas. | Sip. | rap | Kind | 12" | 18" | 24" | 30" | 36" | | Tim. | A. F. E. |
| 25 | Pile | 11½ | 3¾ | Piles and deck poor. Replace with 36 in. concrete pipe 32 ft. long, fill and place one metal number plate. | 30 | | | 8 | 12 | Concrete Pipe | | | | 32 | | | | 21 |

SAMPLE WORK SHEET WITH AN ITEM INDICATING NEEDED REPAIRS

appreciated when controversies arise with civic authorities over strengthening matters. In any event many details of bridges are changed in the shop and in the field during erection so that available plans may not be correct in rather important details.

The question arises as to what minimum length of span or width of opening may be classed as a bridge. Here it may be noted that the Public Service Commission of Massachusetts does not require reports from railroads upon openings of less than 10 ft. clear span. However, it is advisable to have general information available as to details of construction of all openings which interfere with the continuity of the ballast, excepting very small sluices for drainage between side ditches. Box and arch culverts and pipes are not

state the frequency of painting which may be advisable as climate, location, type of structure and several other factors create wide variations.

Certain points on steel bridges show failures in paint skin greatly in advance of the rest of the structure, namely, the upper horizontal surfaces such as top flanges of stringers, floor beams and upper chords. By watching these points an experienced inspector can quickly reach conclusions as to the time when the structure will need repainting. By cleaning and painting such places and by "spot painting" minor rust spots, the painting of the whole structure may often be deferred for a season.

Painting may be done by contract or by the company's own forces. The latter is preferable as it is

TABLE I—WORKING UNIT STRESSES FOR STRUCTURAL TIMBER EXPRESSED IN POUNDS PER SQUARE INCH*

| KIND OF TIMBER. | BENDING. | | | SHEARING. | | | | COMPRESSION. | | | | | | Ratio of Length of Struts to Depth. |
|-----------------|-----------------------|----------------|------------------------|------------------------|----------------|------------------------------|----------------|-----------------------------|----------------|------------------------|----------------|---|--|-------------------------------------|
| | Extreme Fiber Stress. | | Modulus of Elasticity. | Parallel to the Grain. | | Longitudinal Shear in Beams. | | Perpendicular to the Grain. | | Parallel to the Grain. | | For Columns under Load, Working Stress. | Formula for Working Columns over 15 Diameters. | |
| | Average Ultimate | Working Stress | | Average Ultimate | Working Stress | Average Ultimate | Working Stress | Elastic Limit | Working Stress | Average Ultimate | Working Stress | | | |
| Douglas Fir | 6100 | 1200 | 1 510 000 | 690 | 170 | 270 | 110 | 630 | 310 | 3600 | 1200 | 900 | 1200(1-1/60d) | 10 |
| Longleaf Pine | 6500 | 1300 | 1 610 000 | 720 | 180 | 300 | 120 | 520 | 260 | 3800 | 1300 | 980 | 1300(1-1/60d) | 10 |
| Shortleaf Pine | 5600 | 1100 | 1 480 000 | 710 | 170 | 330 | 130 | 340 | 170 | 3400 | 1100 | 830 | 1100(1-1/60d) | 10 |
| White Pine | 4400 | 900 | 1 130 000 | 400 | 100 | 180 | 70 | 290 | 150 | 3000 | 1000 | 750 | 1000(1-1/60d) | 10 |
| Spruce | 4800 | 1000 | 1 310 000 | 600 | 150 | 170 | 70 | 370 | 180 | 3200 | 1100 | 830 | 1100(1-1/60d) | 10 |
| Norway Pine | 4200 | 800 | 1 190 000 | 530* | 130 | 250 | 100 | — | 150 | 2600* | 800 | 600 | 800(1-1/60d) | 10 |
| Tamarack | 4600 | 900 | 1 220 000 | 670 | 170 | 260 | 100 | — | 220 | 3200* | 1000 | 750 | 1000(1-1/60d) | 10 |
| Western Hemlock | 5800 | 1100 | 1 480 000 | 630 | 160 | 270* | 100 | 440 | 220 | 3500 | 1200 | 900 | 1200(1-1/60d) | 10 |
| Redwood | 5000 | 900 | 800 000 | 300 | 80 | — | — | 400 | 150 | 3300 | 900 | 680 | 900(1-1/60d) | 10 |
| Bald Cypress | 4800 | 900 | 1 150 000 | 500 | 120 | — | — | 340 | 170 | 3300 | 1100 | 830 | 1100(1-1/60d) | 10 |
| Red Cedar | 4200 | 800 | 800 000 | — | — | — | — | 470 | 230 | 2800 | 900 | 680 | 900(1-1/60d) | 10 |
| White Oak | 5700 | 1100 | 1 150 000 | 840 | 210 | 270 | 110 | 920 | 450 | 3500 | 1300 | 980 | 1300(1-1/60d) | 12 |

*These unit-stresses are for a green condition of timber and are to be used without increasing the live load stresses for impact.

*Partially air-dry.

d = Length in inches. L = Least side in inches.

NOTE—The working unit-stresses given in this table are intended for railroad bridges and trestles. For highway bridges and trestles the unit-stresses may be increased twenty-five (25) per cent. For buildings and similar structures, in which the timber is protected from the weather and practically free from impact, the unit-stresses may be increased fifty (50) per cent. To compute the deflection of a beam under long-continued loading instead of that when the load is first applied, only fifty (50) per cent of the corresponding modulus of elasticity given in the table is to be employed.

*From 1915 edition of Manual, American Railway Engineering Association. Adopted, see Vol. 10, 1909 pp. 537, 564, 609-611.

usually classed as bridges, nor are they included in reports by special inspecting engineers unless their span is greater than 10 ft. and some special condition is observed which requires attention.

PAINTING IS ESSENTIAL FOR PRESERVATION OF IRON AND STEEL BRIDGES

There is no question as to the fact that paint properly applied and renewed is the most essential factor in protecting and preserving iron and steel bridges. Given two identical steel bridges, and other conditions being equal, that one which has had careful attention in the matter of painting will have the longer life with less cost for repairs. The purpose of the paint is to protect the metal from rusting by excluding moisture. It must be borne in mind that the steel should be thoroughly cleaned of all rust, scale and dirt before new paint is applied. The paint should only be put upon dry surfaces and painting work should not be undertaken in wet or freezing weather. By thinning the paint with turpentine, however, an experienced man can do good work in cold weather. The date of painting should be plainly indicated on the structure where it cannot be disturbed. It is hardly practicable to

more certain that the proper paints will be used and that the painters will be more likely to adhere to the rule for cleaning before painting. Only skilled painters, familiar with the painting of structural steel, should be employed. Contract painting presents difficulties in setting up a measure for payment unless the company has records in sufficient detail to apply as a check on the contractor's estimates. Furthermore, it is very necessary to keep an inspector with the contract painting gang all the time or the cleaning work will stand every chance of being slighted or even entirely omitted. The surfaces of the steel may be cleaned by using a hammer and chisel, wire brush or sand blast or scraping with special tools. While the sand blast is the most effective, it is also the most expensive and is seldom used.

Paints are made from various materials and in numerous forms and combinations. Consequently their relative efficiencies vary greatly. Certain pigments may have high waterproofing qualities and yet may actually stimulate corrosion of steel. Red lead mixed with pure linseed oil is a good rust-retarding paint. The most important and frequently-used paints are mechanical mixtures of pigments and vehicles, which are a com-

bination of pulverized solids and drying oils. The most durable paints are those composed of pigments with open-kettle boiled linseed oil as the chief ingredient of the vehicle. Pigments are classed as primary and secondary. The former are strong in color and covering power, while the latter are weak in these qualities and should not be used alone. The subject of paints and painting is one which requires much study, and the maintenance engineer may well afford to seek technical advice on the subject from his steam road friends who are responsible for bridge maintenance.

PROPER BRIDGE MAINTENANCE REQUIRES CAREFUL INSPECTION

Safety of operation and continuity of service demand that bridges be given the most careful attention with respect to their maintenance. In order to do this, it is necessary that a rigid routine of periodical inspection and repair shall be followed year in and year out. The value of the inspections naturally depends upon the experience of the inspector both as to methods of maintenance and ability to forecast the effects of conditions found. Such inspections should be made, annually and preferably in the fall, so that the plans, work sheets (see page 953) and estimates for repairs may be made up in the winter and work started in the early spring. In some cases it may be advisable to provide for inspections twice each year, once in the spring and once in the fall.

The annual inspection should be thorough. A merely perfunctory examination, made while a car waits for the inspector, will not do. Hence the inspection should be made by the engineer who is directly in charge, or by assistants who are competent to do such work. In addition to the regular annual inspection, there should be an inspection by a consulting bridge engineer about every two years. Meanwhile the section foremen must be trained to make monthly inspections of the bridges on their sections, and these men should be instructed in regard to the general and particular features which should have their attention.

The notes (see page 953) concerning the condition of the structure should be made on the ground and, as far as possible, previous records of inspection and recommendations should be in hand so that it may be seen whether previously recommended work has been done. The spans, bents or piers of a bridge should be numbered always in the same direction for the same line, say from east to west or from north to south, commencing with No. 1 at the abutment, back bent or sill. Truss panels should be numbered in the same way and trusses should be designated right or left in the direction of the bent or panel numbering, although if the line and bent numbering read from south to north, the trusses can be designated east and west.

There is no short-cut method for making inspections in sufficient detail to be worth while. This is indicated by the number of things which need examination in connection with steel bridges for instance. Some of these are: (1) The rollers should move freely, at right angles to the line of the bridge and be free from rubbish. (2) Posts and compression members must be free from bends or bulges, with joints all having a firm, even bearing against each other. (3) Tension members must not be slack. (4) Floor beams and stringers must be examined for flaws in connecting angles and shelf angles, for defective, loose or missing rivets and for shearing or crushing of webs and

flanges at connections. Riveted members require testing for loose rivets. In combined highway and electric railway bridges, the timber flooring must be examined, particularly the under course, for evidence of decay. Planking must be removed to permit examination of stringers and connections. (5) Bridge seats need to be examined for cracks; evidence of crushing, and to determine whether they are level. Parapet walls need attention to see that they are not encroaching, due to pressure of fill, upon the free movement of the free or expansion ends of the bridge. (6) The structure should be observed under passage of cars and vehicles, because swaying, excessive deflection, twisting and rattling of members will show that attention is required from the bridge gang.

Piers, abutments, retaining walls and culverts should be examined for undermining, scouring, bulging, crack-

| | | |
|--------------------------|----------------------|-----------|
| DIVISION _____ | | |
| Location and Type: _____ | | |
| Clear Span: | Panel Length | _____ |
| | Over-All | _____ |
| Limiting Features: _____ | | |
| Limiting Load: _____ | | |
| Members | 100# per sq. ft. and | Car Alone |
| Truss or Girder | _____ | _____ |
| Floorbeams | _____ | _____ |
| Stringers | _____ | _____ |
| Remarks: _____ | | |

BLANK FORM FOR USE IN MAKING DIGEST OF BRIDGE DATA

ing, settling or other movement. Fender piers or piling, cribbing and grillages must be watched as they frequently become disturbed and damaged during freshets.

Timber bridges present inspection difficulties of their own and they need very careful attention since timber is very erratic in performance, while its deterioration is generally more rapid and more deceptive than that of metal. The principal aids in determining the condition of timber are sight, sound and boring. However, appearance alone is a poor gage of timber condition, although moist conditions found in dry weather are usually indicative of unsoundness. In general the sound of a timber as produced by striking with a 5-lb. machinists' hammer will give the best indication of condition, which may be further tested by jabbing suspicious spots with an awl or ice pick. Boring is resorted to where doubt still remains as to interior condition.

Trestle bents should be plumb. Sills and caps should be level. Piles need the most careful examination at the ground line and at the water line. Stringer joints and bearings on caps need careful attention. Guard timbers should be rigidly fastened to the ties and bolt heads should not project above the general surface of such timbers. This is to prevent their being struck by wheel guards, fenders and wings of snowplows.

In short stringer spans (whether of timber or steel) the ends of stringers are frequently found incased in the abutments. This practice is to be condemned and the condition corrected by freeing the ends as soon as possible. When so incased, corrosion is very rapid and the abutments soon crack and break, due to expansion of the steel.

In the paper already referred to Mr. Keith notes that corrosion and bolt holes in flanges of rolled steel beams reduce the strength far more than is generally realized. Of course the fact is known when thought of, but it is too commonly overlooked. The following figures illustrate these cases:

- If a 12-in. x 3 1/2-in. I-beam used as a stringer has
 - One hole 1/2 in. in diameter in one flange, the strength is reduced 12 1/2 per cent,
 - Two holes 1/2 in. in diameter in each flange, the strength is reduced 28 1/2 per cent,
 - 3/4 in. thickness rusted from one flange, the strength is reduced 15 1/2 per cent.
- If a 12-in. 20 1/2-lb. channel used as a stringer has

loss of section in the top or bottom of a stringer reduces the strength for resistance to bending altogether out of proportion to the amount of section lost. In a timber beam 12 in. deep a loss of

- 1 in. in depth reduces the section 8 per cent and the strength 16 per cent,
- 2 in. in depth reduces the section 17 per cent and the strength 30 per cent,
- 3 in. in depth reduces the section 25 per cent and the strength 44 per cent,
- 4 in. in depth reduces the section 33 per cent and the strength 55 per cent.

If the decay is uneven the loss of strength is even more striking. A 12-in. stringer having full depth at one side and reduced at the other side by

- 2 in. has its section reduced 8 per cent and the strength reduced 28 per cent,
- 4 in. has its section reduced 17 per cent and the strength 46 per cent.

Such cases occur where ends cut across the fiber are in contact with each other, as at stringer joints, or where trestle posts are set on sills and under caps.

The practice of placing iron castings between sills and posts and caps and posts or between trestle caps or wall plates and stringers should be extended. Similarly the use of cast-iron spacers (in the form of "spools" on each bolt) between stringers, is far better than the old practice of using wood spacers. In addition to inspection of the structures, the adjacent streams and waterways require examination with the view of determining whether they need enlarging or cleaning, whether the waterway is insufficient, and whether embankments need rip-rapping. The general condition of line, surface, joint fastenings, and guard rails should have attention and tracks on approach. Fills should be watched for sagging especially at or near abutments. Further, the condition

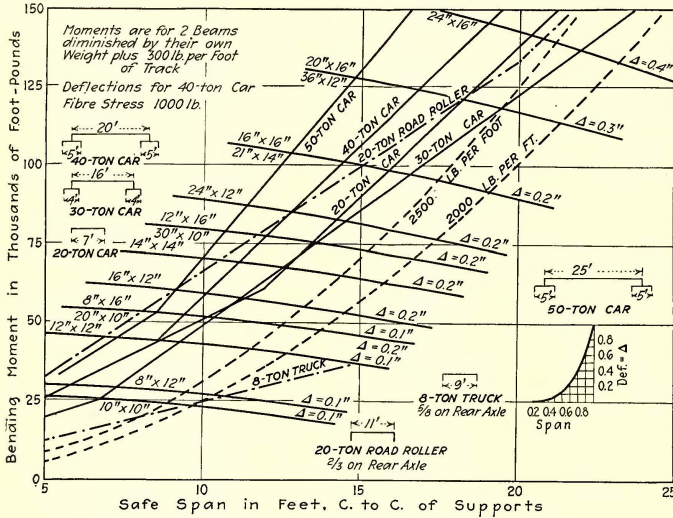


DIAGRAM SHOWING LOADS FOR WOOD STRINGERS

- One hole 1/2 in. in diameter in one flange, the strength is reduced 17 1/2 per cent,
- Two holes 1/2 in. in diameter in each flange, the strength is reduced 21 1/2 per cent,
- 3/4 in. thickness rusted from one flange, the strength is reduced 15 per cent.

Timber stringers decay more rapidly when so incased, due to capillary action along the grain. Sapwood is more subject to decay than heartwood. Exposed ends of fibers contribute to decay and tops of stringers decay more than the sides or bottom. Timber laid with rings the concave side up decays faster than when laid with the convex side of the rings up. Wherever two timbers are placed close together dirt and moisture collect and rot results.

Mr. Keith says further that the reduction of the strength of timber stringers due to decay is not always appreciated. Regardless of the reduction of strength of individual fibers which, although not so far gone as to be called rotten are approaching that stage, a slight

of paint on steel structures must be carefully noted. The condition of track bonding needs attention, as it is very desirable to prevent the escape of current to steel bridge structures.

Even timber trestles over salt water will require attention in this regard, and the writer has in mind a case where it was found that the current leakage was so great (partly because the structure was low and the tides high) that the track rails became badly corroded at the base, rendering the spiking insecure. It was remedied partly by setting up a girder rail with one end in the creek alongside the structure in guides and directly bonding to the track rails. It was surprising to note how rapidly the length of this "ground" rail decreased. The second part of the remedy consisted in replacing defective bonds on the whole line, and extending the return feeder cables.

Wood trestle bridges are very often used in the construction of a railway line to minimize the original

investment by avoiding expense for heavy or long fills and more expensive steel or concrete structures, and even at times simply to hasten construction. They are, therefore, considered primarily as temporary structures which will create a certain amount of maintenance expense. The hope is that as the line develops they may be gradually eliminated. When the condition of a trestle or other structure warrants extensive repair or complete renewal, it is time to consider whether it should be eliminated or changed in order ultimately to reduce maintenance costs. Consideration should always be given to these projects when making up bridge maintenance schedules, following annual inspections.

It follows that an investigation of the question: Will it pay? must be made. Here the use of the formula advocated by G. L. Burr in the JOURNAL for June 3, 1916, should be of assistance.

Let us assume the following:

- Reduction in annual operating expenses due to improvement = S
- Replacement charges for improvement = R
- Capital charges for improvement = C
- Total charges for improvement = $R + C = T$
- Estimated life of improvement (years) = L
- Customary rate of interest = r
- Increase in annual net earnings due to improvement = N

We must now remember that, as a result of the improvement, increased capital charges equal to rC must be met each year. Also, in the final analysis, a sum equal to C/L should in some way be potentially reserved, charged off or held back in the surplus annually to maintain the integrity of the additional capital investment. Finally, the annual prorate of the replacement charges for the improvement amounting to R/L , should be taken into consideration. The particular method of accounting for these processes is of small importance, as the main fact to be kept in mind is that, consciously or unconsciously, the indicated charges or expenditures must be met.

The following equation may then be written:

$$N = S - rC - \frac{C}{L} - \frac{R}{L}$$

Thereupon, obviously the improvement will pay whenever N is greater than zero. This condition may be expressed thus:

$$N = S - rC - \frac{T}{L} > 0$$

$$S > rC + \frac{T}{L}$$

In other words, the improvement may be made when the saving in operating expenses exceeds the sum of the increases in interest charges and amortization and replacement expenses.

While bridge and trestle piling has been treated with preservatives by many railroads, the practice is

not so extensive as it should be. Similarly other bridge timbers until recently have been mainly overlooked in this regard. When bridge timbers have been treated, creosote has been most extensively used but it may be noted that the Boston & Maine Railroad uses a brush treatment for bridge timbers. While creosoting by some pressure process is considered the most effective method of treating bridge timbers, the present high cost leads to greater use of open tank treatments, which have a far greater value than has usually been acknowledged. The photograph on page 953 indicates the condition of untreated yellow pine trestle stringers after twelve years of service.

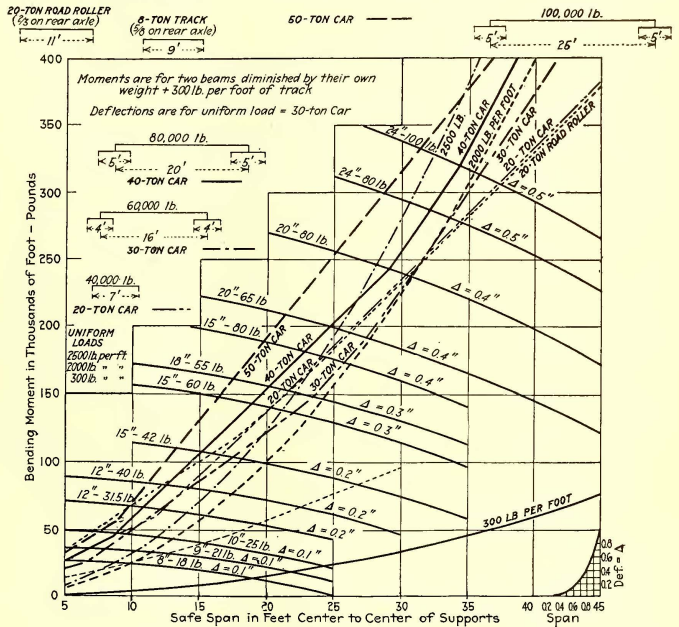
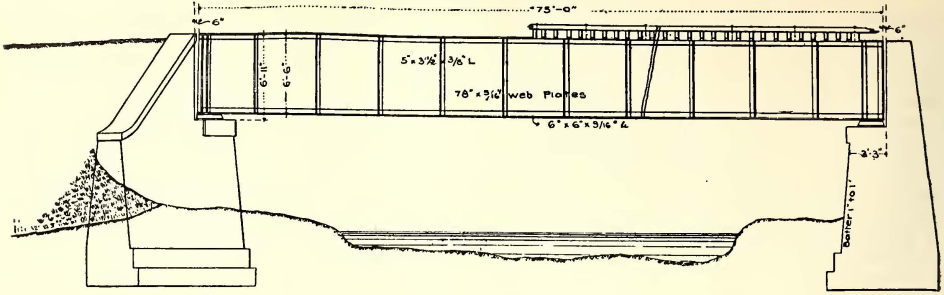


DIAGRAM SHOWING LOADS FOR I-BEAM STRINGERS

Electric railways frequently cross highway bridges which were built before the railways. Consequently the design of such bridges did not contemplate railway use. In placing tracks upon them various methods have been adopted which are not now considered desirable. In some cases it was necessary to rebuild the bridge, but more often only the floor system was altered and added to. In many instances, the construction used has been such as to render inspection and maintenance difficult.

Very often only one track is used and this placed as close as possible to one truss. Also it is seldom found that adequate provision was made, in replacing the plank flooring, for the security of a derailed car. Inside guard rails are seldom found on such bridges although they will be found universally upon steam and electric railway bridges.

During the time since tracks were first placed on highway bridges it has often been necessary either again to strengthen the floor system, or completely to rebuild the structures to provide for heavier equip-



ELEVATION
A 75-FT. DECK-TYPE, PLATE GIRDER BRIDGE, UNION TRACTION COMPANY OF INDIANA

ment. Such work has frequently led to controversies with the civic authorities over the apportionment of expense. Arguments often arise over assumption of maintenance expenses for the structure as a whole and authorities in charge are very often unappreciative (to say the least) of their responsibilities in connection with bridge maintenance. It is no infrequent occurrence to see a highway bridge brightly glowing in a resplendent coat of fresh paint, but applied over rust and dirt and all above the floor. The under parts of the structure will be passed by somewhat in the spirit of "out of sight, out of mind" despite the fact that it would be best if the procedure were reversed because the under parts need cleaning and painting much more than the upper portions which are exposed to the action of wind and sun. Such conditions, when found by the maintenance engineer, require tact and patience and constant endeavor to have the authorities realize their duties.

When highway structures carrying railway tracks fail, as they sometimes do, an attempt is not infrequently made to place responsibility for the inadequacy of the structure upon the railway. For this reason alone the engineer of the railway should be in possession of all possible information relating to such bridges crossed by his lines, and the best way to secure this is through inspections, preferably made by a consulting bridge engineer, since the reports of consultants will have more weight with investigating authorities as a rule.

ELECTRIC RAILWAY BRIDGE FLOORS AND DECKS

Electric railway bridges generally have floor systems and decks which closely follow steam-road bridge

practice, but where highway bridges are crossed a great variety of floor systems and decks are encountered. Space will not permit the discussion of the latter in this article, to the extent which the subject deserves. It will suffice to note that where timber high-

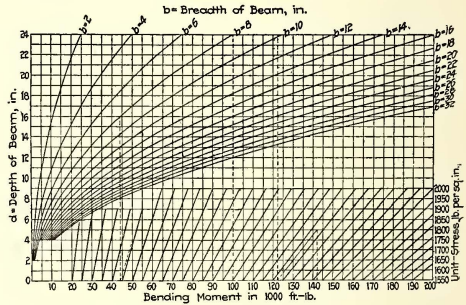
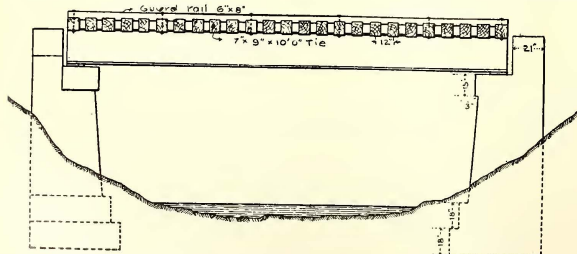
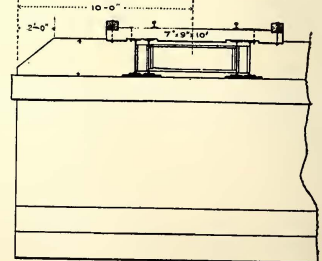


DIAGRAM FOR DETERMINING STRENGTH OF WOODEN BEAMS

way bridge floors are found, the under course of planking should preferably be of creosoted timber and, whenever possible in renewing plank floors, creosoted timber under decking and, whenever possible, creosoted wood block wearing surfaces should be substituted in the interest of economy. The greater number of highway bridges as now built which call for wood floors make provision for a wood block wearing surface, as it is well known that a 3-in. or 4-in. wood block surface will outwear an ordinary plank surface several times over.



ELEVATION



SECTION

A TYPICAL I-BEAM SPAN, UNION TRACTION COMPANY OF INDIANA

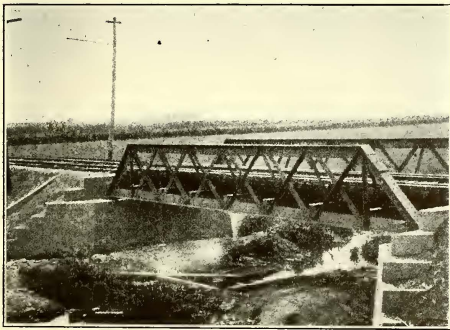
BRIDGE RECORDS ARE VERY USEFUL IN MAINTENANCE WORK

Bridges are constantly being referred to in maintenance correspondence. The general manager often wishes to know whether a foreign car will operate safely over the road. The freight department needs similar information as to acceptance of steam road freight cars. The bridges on the road usually present some limiting features the details of which should be on hand for ready reference in such cases. Clearance and strengthening problems, and addition and betterment matters, are continually arising, and these call for prompt and accurate information without waiting for field investigation. For these reasons it has been found advisable to have records at hand which will give all data ordinarily required, and the expense for obtaining the field information and preparing and revising the records will be found very small in comparison with their value as aids in connection with bridge maintenance problems.

Before outlining some of the features of bridge records it may be well to note that such records must be revised annually, so that they will be representative of existing conditions, by including all changes in structures which have been made during a season. An incorrect record is worse than none, since if no information is at hand it will be necessary to go to the bridge and get it.

Bridge records comprise two general features: (1) The field inspection record and (2) the condensed office records. The field inspection record consists of the following:

(A) *General Information*—as to the following items—(1) Location of bridge and what is crossed; (2) date of inspection; (3) type of bridge and use (whether railway only or highway); (4) number and location of tracks (eccentric location may be a serious matter); (5) skew, if any; (6) alignment and grade on bridge



TYPICAL SINGLE-TRACK PONY TRUSS ELECTRIC RAILWAY BRIDGE

and on approaches; (7) distance from floor to ground or water below and depth of water; (8) factors which might limit changes in structure such as nearness of other structures, highways, buildings, etc., and (9) clear span and length over all.

(B) *Substructure*—Information as to kind and quality of substructure; general statement as to condition; spacing of bents or piers.

(C) *Superstructure*—Information as to style and

material of structure; statement as to general condition, spacing of panel points; condition of paint; notation as to whether vibration was observed and where; arrangement of rivets at joints; connections of stringers to floor beams.

(D) *Floor*—It is important that full information concerning the floor should be recorded, such as kind, condition, size and spacing of ties, location and size of



SINGLE TRACK THROUGH TRUSS ELECTRIC RAILWAY BRIDGE

guard timbers; size and location of inner guard rails; arrangement of ends of guard rails and their extent beyond the structure; kind, size, condition, number and location of stringers; method of suspending floor beams from structure.

The condensed office records consist primarily of a digest (see page 955) of the bridge engineer's reports, which should be filed in a loose-leaf binder and should show the division, bridge number, location, type of bridge, span, capacity of truss or girder; if a highway bridge, capacity with and without highway load; capacity of floor beams and stringers; limiting features; limiting load and restraining orders governing loads or operation on the bridge. In addition a diagram should be prepared for the entire road showing the location of all bridges with their numbers and indication of capacity of each bridge. Similarly a clearance diagram should be made up which will indicate those bridges where clearance for all types of cars used, is not provided.

SOURCES OF FURTHER INFORMATION

Matters pertaining to inspection of bridges are very well described in an article by Frank B. Walker in the JOURNAL for April 28, 1917; while a description by William R. Dunham, Jr., of the carefully prepared records of the Connecticut Company appeared in the JOURNAL for Feb. 26, 1916.

The subject matter here discussed has been gathered from many sources, principally from H. C. Keith's paper on electric railway bridge inspection and reports (1918 Proceedings, Brooklyn Engineer's Club); Willard's Maintenance of Way and Structures; the Manual of the American Railway Engineering Association and the files of the ELECTRIC RAILWAY JOURNAL. It may be said in passing that the writer spent many weary days in company with Mr. Keith on bridge inspections for the Connecticut Company, and as a result, has come thoroughly to realize the necessity for and importance of accurate detailed inspections of bridges used by electric railways.

Compensation for Engineers

Engineering Association Draws Up Schedule for Salaries of Engineers in All Industries

THE committee on compensation of the Chicago Chapter of the American Association of Engineers has submitted to that chapter for consideration a schedule of salaries for engineers employed in various industries among which is included the electric railways.

In submitting this report the committee recommends that the data and schedules submitted be utilized in a nation-wide study to formulate a comprehensive schedule, that the national association secure abstracts of the laws of all states, and of the United States, as applicable to engineers and surveyors and their work and that these be published in leaflet form and given the widest possible circulation, accompanied by suggestion for improvement in these laws.

That part of the schedule which affects electric railway engineers recommends that for an electric railway with an equivalent of 60 miles of track the schedule of salaries be as follows:

| | | |
|--------------------------------|--|-----------------|
| Chief engineer | In charge of track, structure and transmission lines..... | \$3,600-\$4,800 |
| Assistant engineer, field | Doing transit work and inspection. Under direction..... | 2,400-3,000 |
| Roadmaster | Preferably technical and educated man..... | 2,400-3,000 |
| Mechanical/electrical engineer | A trained engineer in both branches having charge of power house, plant, cars and equipment..... | 4,200-5,400 |
| Office engineer | Equivalent to a first-class machine draftsman for work under direction..... | 2,400-3,000 |
| Line superintendent | Not easy to describe, but position commonly understood..... | 2,400-3,000 |
| Substation men | Duties as commonly understood..... | 2,400-3,000 |

The schedule recommended for an electric railway with the equivalent of 200 miles of single track is as follows:

| | | |
|--------------------------------|---|------------------|
| General manager | Responsible for all operation and maintenance. Preferably a technical man..... | \$6,000-\$10,000 |
| Chief engineer | Has full charge of construction and maintenance of way and structures..... | 4,000-5,400 |
| Assistant engineer | Drafting and instrument work in field and office under direction..... | 2,400-3,000 |
| Roadmasters | Preferably technical men..... | 2,400-3,000 |
| Electrical/mechanical engineer | Trained in mechanical and electrical engineering and in full charge of power house, transmission and equipment..... | 4,500-6,000 |
| Assistant engineers | Perform drafting and design under direction..... | 2,400-3,000 |
| Line superintendent | Preferably a technical man. Training for higher position..... | 2,400-3,000 |
| Substation man | Duties as commonly understood..... | 2,400-3,000 |

The committee also makes recommendation as concerns engineers on the staff of the State Public Utility Commission as follows:

SALARIES FOR COMMISSION ENGINEERS

Proposed schedule of salaries for Engineering Department of State Public Utility Commission, for a state with a population of 5,000,000:

Chief Engineer \$12,000 to \$15,000

Such an engineer would be charged with the administration of the engineering department and engaged on valuation work, standards of service, inspections and investigations having engineering aspects, etc. He may or may not be assigned the duty of hearing cases, preparing opinions, etc. During his employment by the commission and for one year thereafter he should accept no employment from any utility subject to the jurisdiction of the commission.

| | |
|---|------------------|
| Assistant chief engineer—acts as assistant to chief engineer..... | \$9,000-\$10,000 |
| Chief of railroad division..... | 8,000-9,000 |
| Chief of gas division..... | 6,000-7,500 |
| Chief of telephone division..... | 6,000-7,500 |
| Chief of water works division and mechanical engineer..... | 6,000-7,500 |

The above chiefs of departments are directly engaged on the valuation of public utilities within their own division, assisting in formulating standards of service and engaged on investigations and inspections having engineering aspects. They may or may not be assigned the duty of hearing cases, preparing rate schedules, opinions, etc. During their employment by the commission and for six months thereafter they shall accept no employment from any utility subject to the jurisdiction of the commission.

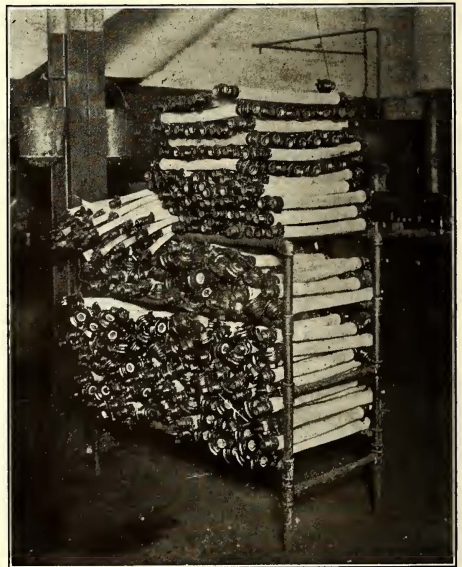
Chief of Service Division.....\$6,000 to \$7,500
A chief of service division would be engaged in the enforcement of standards of service and in investigations and inspections having engineering aspects. During the employment by the commission and for six months thereafter, he shall accept no work from any utility subject to the jurisdiction of the commission.

Assistant engineers reporting to the chiefs of the above departments should be graduates of technical schools or with equivalent technical knowledge.

| | | |
|----------|--|-----------------|
| Grade 1. | Corresponding to a division engineer on a railroad in training and ability..... | \$3,600-\$4,800 |
| Grade 2. | Corresponding in training and ability to an assistant division engineer on a railroad..... | 3,000-3,300 |
| Grade 3. | Corresponding to instrumentman on a railroad..... | 2,400-2,700 |
| Grade 4. | Corresponding to junior draftsman or junior instrument man on a railroad..... | 1,800-2,100 |

Convenient Rack for Air-Brake Hose

A RACK constructed of 1-in. pipe, with the necessary AT's and elbows, is in use at the Southern Division inspection and overhauling shop of the Brooklyn Rapid Transit Company, for holding and storing air-brake hose. The bottom of this rack is built solidly into the concrete floor and forms a very solid and substantial type of construction, as well as one which will not accumulate dirt and dust, common to all inspection shops.



AIR-BRAKE HOSE RACK CONSTRUCTED OF PIPE

The width of the rack is made just sufficient so that the coupling and nipples on the end of the hose will project outside. Three cross-pieces of pipe extend the length of the rack on which the various types of hose are laid. Each type of hose is kept separate for convenience and to assist the repairman in obtaining the proper hose without the necessity of looking through a large number of pieces. By locating such a rack in a place convenient to the inspection pit, much time and labor is saved to the repairman.

Steel-Tired Wheels and Axles

The Author Discusses Methods of Installing Wheels and Axles and Gives Special Attention to the Causes of Sharp Wheel Flanges — Good Track Maintenance Is Declared Essential to Good Car Life

BY H. VERNON

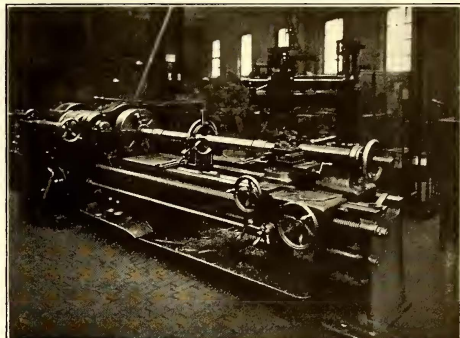
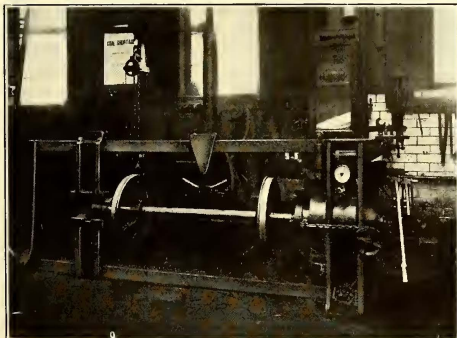
Belfast (Ireland) City Tramways

ALTHOUGH it cannot be asserted with reason that the inspection and maintenance practice of all tramways should be uniform, there are certain principles that can be followed by them. In comparing the life of axles and tires on one system with those obtained on others over an experience of thirteen years, we generally find that such comparisons are of little value, so many factors operating which may entirely vitiate the result.

We believe that there is but one test to apply to a steel axle or tire—the test of service. We make every

Before axles are fitted, the journals and wheel seats are finished off in the lathe, by means of three hard steel rollers held in a steadyrest, which is bracket-supported and fitted to the lathe carriage. These rollers are hard-pressed against the wheel seat and fed along. We find that rolling and burnishing greatly improves the fitting of axles.

In forcing the axles into position, we use neat's-foot oil as a lubricant on the axle surface. It has been found that oil helps to prevent the corrosive action of the surfaces, which action increases the difficulty of starting



HYDRAULIC PRESS IN BELFAST CITY TRAMWAYS SHOPS AT LEFT, FINISHING OFF JOURNALS AND WHEEL SEATS ON CAR AXLE AT RIGHT

effort to see that they are correctly fitted and exactly to gage before they are sent into service, not only to do justice to ourselves but also to the makers of the material. Our 4-in. axles are manufactured to the British standard specifications. We purchase them from the makers in the rough and machine them to suit our requirements.

The problem of holding car wheels on their axles is met by boring out the new wheel hub slightly smaller than the diameter of the axle, and forcing the wheel on in a hydraulic press. In turning the axle, we leave the wheel seat $16/1000$ in. (by micrometer) larger than the bore in the wheel, giving the axle a slight lead for about $\frac{1}{8}$ in. This usually gives us a pressure of about 10 tons per inch of axle diameter at the wheel seat. We have found it an advantage to make a radius of about $\frac{1}{4}$ in. in the leading end of the bore in the wheel, so that there is not the danger of the sharp corners of the hub pinching the axle when they are taking curves and loops. As our standard wheel fit is 4 in. in diameter by $4\frac{1}{4}$ in. in length, and the pressing allowance is $16/1000$ to $23/1000$ in. by micrometer, the maximum pressure on a 4-in. axle is 45 long tons.

the hubs when it is necessary to take them off. We have also found that 10 tons per inch of axle diameter does not always work out satisfactorily for all cases of pressed fitting, as both hubs and axles vary considerably in hardness. Some axles take 11 tons per inch to fit them; others less.

The question of pressure is not the only factor to be considered. The effects of the length of the axle fit, of the amount of metal around the bore, of the kind of metal and of the smoothness of the surface of both the bore and axle are also important. But the more care we take with the finishing of hubs and axles, and the smoother we make the fit, the less trouble is there in fitting them. We exercise great care in seeing that the wheel hubs are properly spaced on the axle. It is not sufficient that they be spaced to gage. They must be spaced at equal distances from the center of the axle in order to have proper end play for the motors. When wheels are pressed on it is difficult to stop the action of the press at the right moment, but by an arrangement of hollow blocks which fit over the axle, and a horse-shoe cast-iron wedge regulated by a fine-pitched screw set in between the blocks, we gage them correctly.

Allowance must also be made for the closing in of the spoke type of wheel centers. To compensate for this springing action, the wheel centers are pressed onto the axles $\frac{1}{16}$ in. less than the standard gage. Every wheel is numbered, and the same number is stamped on the axle, together with the date it was pressed on and the pressure shown by the gage. This number is recorded and filed for ready reference.

TIRE PRACTICE

Our tires, which we purchase in the rough from the makers, are made of Siemens acid steel. They are stamped with the maker's name and serial number in $\frac{3}{8}$ -in. letters in such a manner that each tire may be readily identified. When new, they weigh about 220 lb. and are rolled with a 1 in. in 20 in. taper of tread. Before shrinking on, we carefully pair and caliper them so as to get equal diameters. The heating of tires by gas is done in a furnace of simple design which we specially constructed for this purpose. It consists of three 2 $\frac{1}{2}$ -in. seamless hydraulic tubing rings, each of which is fitted with a row of gas jets or burners extending around it, placed horizontally so as to cause the flame to impinge upon the tire. The supply of gas and air to the burners is regulated by separate valves. In connection with the expanding ring for taking off worn-out tires, a cast-iron ring is provided with a flange over the burners to protect them from injury during the process of lifting wheels and axles in and out of the ring.

A light overhead traveling crane is erected over the furnace by means of which, when the tire is at the

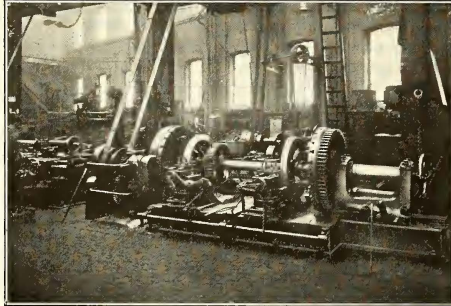
ture of the tire reached by this heating is approximately 500 deg. Fahr.

During this period the old tire is being expanded until it slips off the wheel center. Our worn-out tires weigh on an average 70 to 75 lb., and they slip off the centers when heated up to about 300 deg. Fahr. Expanding a tire off and shrinking another on is performed in 15 minutes. We can take off two old tires and shrink on two new ones at a cost of 2 shillings. A water-cooling service is supplied for cooling off the tires on the wheel centers. All wheels are gaged outside their rims at four points equally spaced on the circumference. If there is more than $\frac{1}{16}$ in. of variation, the

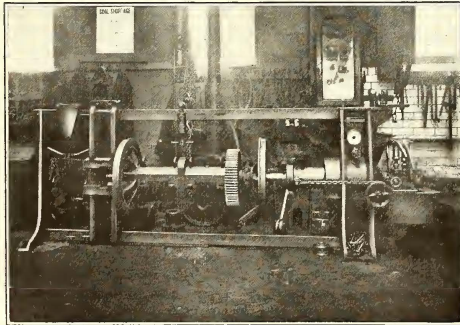
wheel rims are faced up true in the lathe before tires are fitted. The average life of our most successful make of tire used, up to the present, is 70,000 miles. During the life of a tire only about 50 per cent of its weight is worn away, 20 per cent is turned off in forming flanges and the rest is scrapped. Flange wear is one of the most important items we have to contend with, and all our efforts are directed toward saving the wheel flanges.

Since we are able to use roughly about one-half the

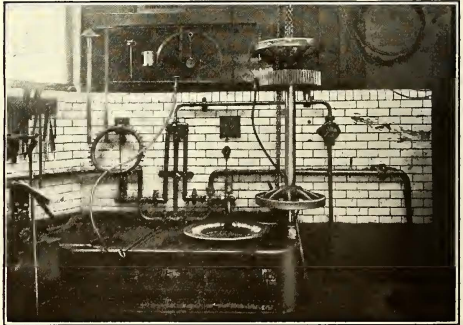
weight of the tire the problem of getting the longest life out of a tire before turning calls for careful study. Danger of car derailment at curves and heavy side oscillation generally sets the limit for flange wear. Although on some systems limit flange wear gages are used, we believe that while this may be a more desirable method and a means of saving tire metal if properly carried out, it has the disadvantage of demanding a larger number of spare cars or trucks and also wheel lathes in order to insure proper results. There are



WHEEL LATHE FOR TURNING STEEL-TIRED WHEELS



METHOD OF GAGING POSITION OF WHEEL ON AXLE IN PRESSING AT LEFT, APPARATUS FOR EXPANDING WHEEL TIRES AT RIGHT



proper temperature, the wheels and axles are lifted automatically and the bottom wheel is lowered into the tire.

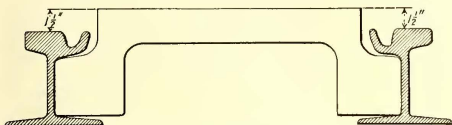
The 220-lb. tire is heated until its internal diameter is $\frac{3}{4}$ in. larger than the wheel center. The tempera-

ture of the tire reached by this heating is approximately 500 deg. Fahr. Generally speaking, they may be enumerated as follows:

1. The difference in diameter of wheels on the same axle, brought about by a difference in the quality of the metal or a difference in brakeshoe pressure.

2. Uneven shoe and wheel wear in the case of a common form of brake rigging where it is necessary to put the pivotal point, which does the equalizing between the opposite wheels on a brake beam, a little to one side of the center of the beam.

3. Tendency of a wheel flange to crowd the rail and



GAGE FOR DETERMINING CAR CLEARANCE OVER TRACK

become sharp as soon as one wheel has worn smaller than the other.

4. Sanding one rail only.

5. Running cars always in one direction. Coning the wheels will lessen the effect of such operation, but if the wheels are coned too much the cars are liable to rock.

6. Trucks out of square, propelling the cars from one side of the axle (single reduction rigid gearing) is the cause of much side thrust on curves and switches, etc.

Flanged brakeshoes, because of their abrasive action, cause a lot of unnecessary flange wear. The method of releasing outside-hung brakeshoes by release springs attached to the brakebeams is the cause of much unequal wear, both to brakeshoes and tires. This condition grows worse as the tires and shoes get smaller because the spring tension is increasing all the time. The many sharp curves on the Belfast system contribute largely to rapid flange wear, but if the metals of the rails and tires had the same resistance, as near as possible, the great wear both on rails and tire flanges at curves would be diminished.

The track should be kept up to its highest state of efficiency, first for public safety and second for keeping down the expense of car maintenance and overhead

what clearance there is left between motor gear cases and the track.

When wheels have been taken out at the car works, we use a leaf gage for making templates of the tread and tire. From this we draw a curve which represents exactly the contour of the tire. By taking another which represents the original standard tire section, and placing it beneath the curve of the worn wheel in such a way that the two curves do not intersect, we can determine the exact amount of metal to be cut away for securing a proper flange. An accompanying illustration on this page shows the details of construction for this leaf gage.

The policy of concentrating all wheel, axle and gear work under one head who is made responsible for getting every mile consistent with safety out of the tires and other parts gives excellent results. All that our depot foremen are expected to do is to see that the wheels are worn to, but not below, the scrapping limit. All cars whose tires have reached the scrapping limit are sent to our car works where they are carefully examined before being taken out.

The equipment for turning steel-tired wheels consists of a Hulse & Company's wheel lathe, which averages five pairs of wheels a day.

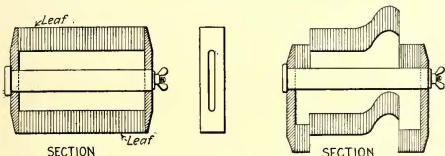
New Grinder Helps to Keep Cars Running

EARLY last winter a new pit wheel-grinder was installed in the North Albany shops of the United Traction Company, Albany, N. Y. This machine is similar in construction to that described in the Aug. 17, 1919, issue of the ELECTRIC RAILWAY JOURNAL, page 277. The grinder has been placed in a special pit under one of the tracks in the car shop and is arranged for electric-motor drive. It has been found that with two men operating this machine the average flat spots found in a pair of wheels can be ground out in from twenty minutes to thirty minutes. A set of four wheels can be ground in one hour and eight wheels in two hours or less.

It is seldom that all the wheels under a car are flattened at the same time. Hence, for most cars one-half to one hour's work is found sufficient to put them in satisfactory running order again. Previous to the installation of this grinder when a car was taken out of service for flat wheels it might not be able to return again for several days.

The new machine is supported on the right and left sides by strong cast-iron frames and is arranged for two emery wheels which can be moved up or down or horizontally by means of screws. After a car has been run over the pit it is jacked up and sections of rail are removed to permit the wheels to drop down onto the emery wheels. The workmen wear goggles during the operation and the particles of steel and emery which fly from the damaged wheel go into a steel box from whence they are drawn off through pipes by fan motors, thus keeping the working space free from dust. During the grinding operation the car wheels are turned very slowly by applying power to the motors in the usual manner.

The time and labor saved by this new device is very great, cars are returned to service much sooner and the company's engineers believe it has already paid for itself.



LEAF OR LAMINATED GAGE FOR MAKING TEMPLATES OF WHEEL TREAD AND TIRE

This gage is composed of a number of thin plates of copper about 1/64 in. thick with a slot hole in the center. The plates are clamped together by means of a flat bolt and two thick plates at the outer end. The bolt has a wing nut and washer for tightening up. In applying the gage the bolt should be left slack so that the ends of the plates may rest on the surface required to be taken. When the surface is properly covered the bolt is tightened and the gage is removed whereupon the true outline of the surface will have been secured no matter how irregular it may be.

work. The track is the foundation of the system. If the cars run smoothly it is because the track is kept in a good state of repair. If, on the other hand, the track is in poor condition, the effects are transmitted through the wheels to the whole car.

In order to check the wheel tire wear, we have fitted a limit gage at the ends of the overhauling pits at each of our seven depots as shown above. This track clearance gage is fastened across the pit, and cars must pass over it. By this means, we are able to see exactly

Some Mysterious Car Ailments

Little but Important Troubles That Tend to
Keep Equipment Men Interested
in Their Work



CONTRIBUTIONS ARE INVITED FROM THE FIELD

Applying the Brakes in Starting a Car

One line of an electric railway was experiencing considerable trouble due to the blowing of circuit breakers. There were no excessive grades on this line and the engineers of the company were somewhat puzzled to find a reason for such a phenomenon on one line while everything was apparently satisfactory on the others. Accordingly a man was detailed to watch the operation of the cars.

He discovered that there was a section of track which was very slippery and that the motormen had trouble in starting the light-weight cars at this point. They had received instructions to accelerate rapidly, which to them meant operating the controller rapidly. On this particular section of track it was the practice to notch up the controller very fast, and when the slipping point of the wheels had been reached to apply the brakes to keep the wheels from slipping. The reverse of this method was also found to have been applied in stopping the cars. The brake application produced a very rapid rate of retardation, and when the slipping point of the wheels was reached power was applied to prevent the wheels from skidding.

Preventing the Burning Out of Reversers

ON A CERTAIN electric railway property using electro-pneumatic control equipment the reversers which were installed underneath the cars were frequently burned out. The motormen operating this type of equipment were questioned and insisted that they were not abusing the equipment in any manner and that these burnouts occurred while the car was running along normally. Special investigations by the engineers of the manufacturer and the railway forces showed that it was possible for the reverser to throw entirely independent of the motorman, due to foreign matter lodging on the valve seat of the opposite reverser magnet valve, or due to false circuits caused by an accumulation of dirt and dust. These reversers were not designed to break or open the circuit, as the contacts were not provided with blowouts, and the construction was such that a violent short-circuit would occur whenever the circuit was opened on the reverser contacts. The magnets controlling the air supply to the air cylinders were cut out after the circuit for throwing the reverser was completed and the reverser had been thrown to its proper position.

In order to overcome this trouble and to eliminate

any possible chance of the reverser throwing, the manufacturer has changed the connections so that the reverser magnet is now energized all the time that power is on. This change has been extended to the control equipment for both two and four-motor equipments and has reduced the number of burnouts considerably.

Coaxing a Multiple-Unit Equipment to Go Ahead by Reversing It

A CAR equipped with type-M control operated on a line having a loop at either end so that the car was operated from one end only. Its operation was satisfactory in this way, but one day there was a block on the line which required the turning back of the car from the downtown section. The motorman changed ends, threw his reverser and operated the car through the crossover and to his first stop satisfactorily, but when he tried to start the car again there apparently was no power, as the car would not operate. The motorman examined all his fuses and gave a rapid examination of other parts which apparently were all in satisfactory condition. He threw his reverser to the reverse position, then ahead, and applied power again and the car started satisfactorily. At the next stop the same condition occurred and when the motorman again operated his reverser the car worked O.K. He was forced to repeat this operation at each stop until he reached the end of the line. The car was then "shopped" for a closer inspection. All circuits were tested out with a bell circuit and they all rang out correctly. A blueprint of the connections was consulted for a possible solution, but still the trouble could not be located. The car was then turned over to the general "trouble man" with instructions to "stick to the job" until he had located the cause of the trouble. The cover was removed from the reverser and all fingers were tested and found to have the proper tension. All contacts were also found to be bright and free from dirt. On a very close examination, however, it appeared that one of the fingers was not touching the contact properly when the reverser was in the forward position. The reverser was operated several times, and it was discovered that there was a screw at that point which had loosened slightly so that the head projected above the contact surface. By watching the operation of the reverser, it was noticed that after it had been thrown from the reverse to the forward position the drum dropped back a trifle so that while in the first position the finger made proper contact, and when the drum had dropped

back it rested on the head of the screw. The screw was then tested out in its loose position and it was found that the circuit would not ring to the contact plate. The screw was then driven in tightly and the equipment operated satisfactorily. The screw in its loosened position had held the finger from making proper contact. After the slight play in the reverser had taken place, which occurred each time the power was shut off the control circuit, the finger would ride up on the head of this screw. The seat for the screw was imbedded in insulation so that with this loose there was no contact for the current.

Accurate Resistance Tests Locate Trouble Where Inspection Fails to Do So

A CONSIDERABLE amount of trouble was experienced on a certain series of surface cars which were equipped with tapped-field-control motors and multi-unit control for two-car train operation. In the most severe cases motors flashed and the control contactors were welded in. In milder cases cars were reported for being "fast" or for armatures which were baked or open-circuited.

The tests commonly made by shopmen were applied at the inspection shops in an endeavor to locate the trouble but in vain, so a special investigation was started by the railway's engineers. In this detailed investigation resistance readings were taken of the fields of the various motors by means of a Queen dial "decade" testing set which measured the resistance of the field windings accurately. These readings showed that in the tapped-field position some motors were running with but 10 per cent of the full-field winding instead of 65 per cent, as was intended. The reason for this condition can best be understood by referring to the accompanying diagrams.

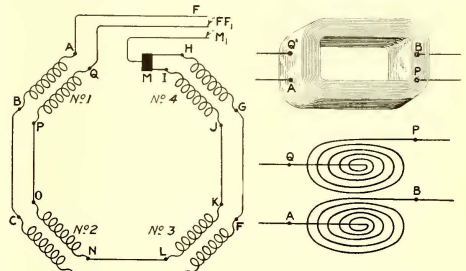
The first of these gives the schematic connection for the field windings of this particular type of motor. When operating on full-field position the circuit through the field windings would be from the terminal F through the windings AB, CD, EF and GH to M and then through the windings IJ, KL, NO and PQ to the FF₁ terminal. On the fifth and ninth positions of the controller, connections were made so as to cut out the first four windings just enumerated. In this position the field circuits started from M, and included only the windings IJ, KL, NO and PQ.

A second illustration shows an individual field coil with two terminals on each end. For the sake of clearness the windings as connected to the terminals are shown outside and below the field coil. Each field coil is made up of two distinct windings, there being no connection at all between the sections AB and PQ. The resistance of the winding between the terminals A and B is 0.018 ohm and between the terminals P and Q, it is 0.033 ohm. Using these values for the resistance of the various windings and referring again to the first diagram it will be seen that the resistance of the four windings from F to M is four times 0.018 ohm or 0.072 ohm, and the resistance from M to FF₁ is four times 0.033 or 0.132 ohm. When operating in full-field position the resistance will then be 0.132 + 0.072 = 0.204 ohm. The action of the contactors in passing from the full-field to the tapped-field position cuts out 0.072 ohm or 35 per cent of the field windings, leaving 0.132 ohm or 65 per cent.

TABLE FOR LOCATING POSITION OF TROUBLE FROM RESISTANCE READINGS

| Resistance in Ohm | From | To | Condition of Fields |
|-------------------|------|----|--|
| 0.204 | F | FF | O. K. |
| 0.072 | F | M | |
| 0.132 | FF | M | |
| 0.051 | F | FF | First or second field shorted. Second or third field shorted. Third or fourth field shorted. |
| 0.102 | F | FF | |
| 0.153 | F | FF | |
| 0.204 | F | FF | No. 1 field reversed. |
| 0.087 | F | M | |
| 0.117 | FF | M | |
| 0.204 | F | FF | No. 2 field reversed. |
| 0.102 | F | M | |
| 0.102 | FF | M | |
| 0.204 | F | FF | No. 3 field reversed. |
| 0.117 | F | M | |
| 0.117 | FF | M | |
| 0.204 | F | FF | No. 4 field reversed. |
| 0.133 | F | M | |
| 0.072 | FF | M | |

The trouble in the cases referred to was found to be due to two causes. First, in some cases a short-circuit had occurred between the two sections of some of the fields and secondly, some fields had been installed upside down and end for end which made the terminals come right for connecting but reversed the amount of resistance and the winding in the circuit from what was originally intended. In both of these cases motors would rotate properly, but as a wrong percentage of



AT LEFT, SCHEMATIC DIAGRAM FOR THE WINDINGS OF A TAPPED FIELD MOTOR; AT RIGHT, INDIVIDUAL FIELD COIL FOR A TAPPED FIELD MOTOR

the field was being cut out in the tapped-field position trouble occurred. The severity of this depended upon the position of the field in the circuit.

In one case a short-circuit was found between A and Q so that in the full-field position the entire field windings would be short-circuited for this motor. In other cases short-circuits were found in field coils other than the first one in circuit. With a short-circuit between BC and OP the resistance between F and FF₁ was 0.051 ohm instead of 0.204 ohm. With a short-circuit between DE and NL the resistance between the terminals F and FF₁ was 0.102 ohm. By comparing these with the resistances that should have been indicated, the variation in the results will be understood.

In the cases where the fields were installed the wrong way around the resistance as read between the terminals F and FF₁ would be correct, that is, 0.204 ohm, but the readings between F and M and between FF₁ and M would vary as follows: First, if the No. 1 field coil was reversed, F to FF₁ would be 0.204 ohm, F to M would be 0.087 ohm instead of 0.072 ohm and from FF₁ to M would be 0.117 ohm instead of 0.133 ohm. If the second field coil was reversed the resistance from

F to FF , would be 0.204 ohm, from F to M would be 0.102 ohm instead of 0.072 ohm and from FF , to M the resistance would be 0.102 ohm instead of 0.133 ohm.

From the various readings taken the accompanying table was developed to show the various combinations of errors which occurred. By referring to this table it was possible to determine which one of the field coils was reversed from the results obtained by taking the resistance from F to FF , from F to M , and from FF , to M . The use of this table saved a great amount of trouble and enabled the work to be handled by inspectors who otherwise would not have been capable or dependable to locate the trouble by any other simple tests.

Open Circuits Cannot Always Be Located by Inspection

A CAR was pushed to the terminal depot and the motorman reported that it had suddenly gone "dead." As there must have been an open circuit somewhere, the inspector started to find it. He examined all terminals, gave all the leads a pull to make certain there were no loose connections, examined the grid resistors for broken grids, brush-holders for broken brushes and all contact surfaces for poor contact, but everything appeared normal. A lamp cluster used for "lighting out" circuits was then tried and the open circuit was definitely located in the field circuit of No. 1 motor. As all connections appeared normal it was thought that the field was open-circuited. The field leads were disconnected and the field was tested out separately with the lamp circuit and it was found "O.K." One of the leads, however, was found to be open. Eventually this open circuit was located inside the terminal. When the lead had been soldered into the terminal the insulation had entered the end of the terminal also. A poor job of soldering and the movement of the lead had caused the strands to break off close to the insulation. The heat from the open circuit had melted the compound in the insulation of the wire so that it stuck tight in the terminal. To all appearance the connection was sound and even a hard pull on the lead could not dislodge it.

Frequent Derailments Had a Reason

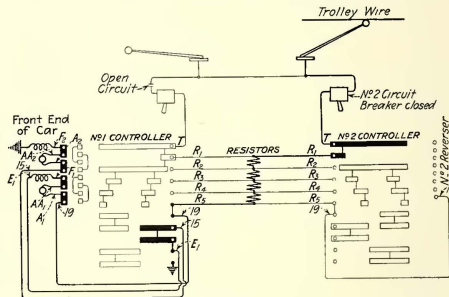
VERY serious derailment occurred on a trestle of an electric railway system. The car derailed was a single-truck closed type and was one of fifty-six similar cars operated by the company. This particular car had been reported for a number of derailments at curves previously and apparently was the only one having trouble of this nature. While to all appearances this car was the same as the others of its class, still it was evident that there must be some uncommon condition existing on this car different from the others of this type to cause the trouble. In checking up the record of the car it was found that the derailments had started shortly after the car was last overhauled. This led to the theory that some of the truck parts had been improperly reassembled. The car body was jacked up from the truck, and all parts of the latter were carefully examined. The truck was a Brill No. 21 E with the motor suspension bars resting on springs fastened to the side frames by suspension bar bolts. The inside faces of the motors were bolted rigidly to the motor suspension bars. The ends of these bars

were slotted to receive the bolts that secured them to the side frames and to permit limited end play.

Inspection showed that these motor suspension bars had been replaced with new ones at the last overhauling of the car and the new bars had not been slotted to provide for the necessary end play. As a result, derailments were frequent and one proved most unfortunate.

Operating a Car from the Front Controller with the Circuit Breaker on That End Out of Service

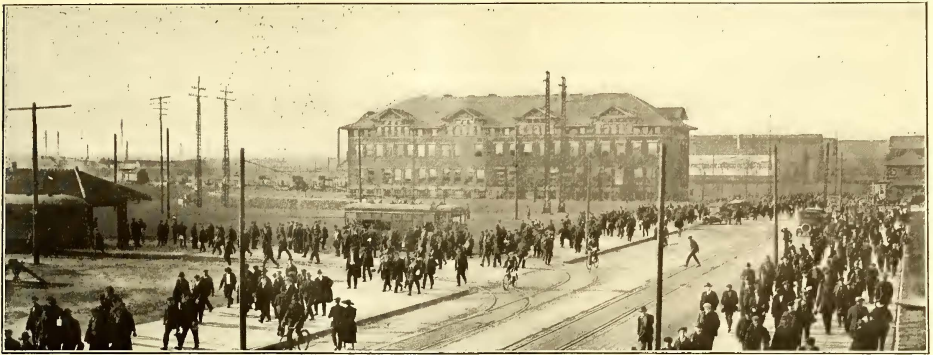
DURING lunch hour at one of the shops of a large Eastern railway the men were telling of their various experiences in bringing in disabled equipment off the road. The controller repairman told of an interesting experience where the lead running from the trolley base to the circuit breaker had burned off. "Brought the car in by operating from the front end of the car where the lead was burned off and without making any temporary connections," he said. "How did I do it?" No one was able to tell how it



SIMPLIFIED DIAGRAM OF CAR CONNECTIONS

could be done, so the controller man took them all out in the yard and showed them that it could be done.

The "stunt" used by the repairman is best illustrated by referring to the accompanying diagram, which shows simplified connections for the car equipment. The trolley pole on the rear of the car was used in the usual manner and the circuit breaker on the rear end was closed instead of the one on the front. Next the reverse drum in the rear platform controller was turned backward to an open-circuit position. This allowed the main drum to be operated and still kept the circuit to the motors open. The main drum of the rear controller was then placed in the first resistance position. Then by going to the front end of the car and throwing the reverse drum of No. 1 controller ahead and putting the main drum on the first point the motorman established a circuit from the trolley through the circuit breaker No. 2 on the rear end to the trolley finger in controller No. 2. From this T -finger current passed to the R -1 finger through the drum contacts of No. 2 controller and through the grid resistors to the No. 19 finger of the reverser in No. 1 controller. With No. 1 reverser thrown, current passed through No. 1 motor and through contacts E -1 and 15 to No. 2 motor and to ground. The circuit was thus established through the motors and the various steps of the resistors could be cut out as usual by operating No. 1 controller.



SECOND AND BROADWAY, GARY, IND., WITH SAFETY CAR IN FOREGROUND

Safety Cars in Gary Make Jitneys Unprofitable

The Gary (Ind.) Street Railway Installed Ten Safety Cars on Feb. 2 on Its Line of Heaviest Traffic and Increased Car-Miles by 62 Per Cent with Gratifying Results

GARY, IND., is a city of 75,000 population. Within the city limits and surrounding territory are the United States Steel Corporation plants of the Indiana Steel Company, American Bridge Company and American Sheet & Tin Plate Company, and the plant of the National Tube Company under construction. These industries employ at present about 17,000 men and during the pre-armistice period employed approximately 21,000. During the past year the Gary Street Railway has ordered rolling stock to the extent of doubling its equipment due to the extraordinary war activity in its territory. Ten Birney safety cars were purchased. Of these eight were placed on the Broadway line serving the Indiana Steel Company. This company employs about 12,000 men and approximately 7000 of these are released at the street railway terminal at Second and Broadway between 5.30 and 6.00 p.m.

JITNEYS REDUCED BY A THIRD

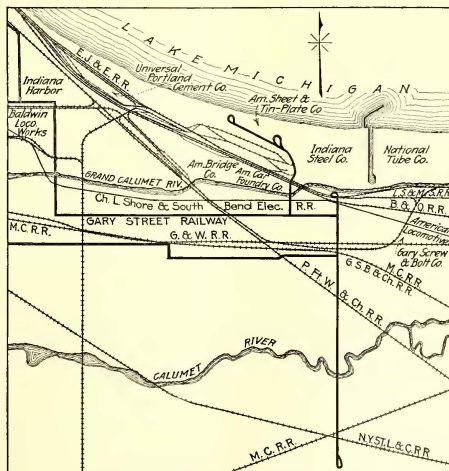
Safety-car service was inaugurated on Feb. 2, after a week's publicity work through the local newspapers. The men were trained on the Fifth Avenue line on cars operated without passengers. The new cars on the Broadway line completely equip it for ordinary service and replace five 23-ton double-

truck cars. A headway of seven and one-half minutes had been maintained on this line formerly with the exception of the last few months, when it has been impossible to keep up the service due to a lack of men. As a result the jitneys secured an even stronger hold on the traffic than ever before and prior to Feb. 1 about 100 jitneys were operating on Broadway.

With the new cars the headway was reduced to five minutes during the day. During the rush hours from 5 to 9 a.m. and 4 to 8 p.m. this service is supplemented by two-man-car tripper service, further reducing the headway to three and one-half minutes. To-day but about sixty-five jitneys are operating with much reduced patronage.

GRADE CROSSINGS ARE NO OBSTACLE

The Broadway line is straight for 5 miles and is double track for practically the entire distance, as is shown on the accompanying map. At one end it loops in front of the Indiana Steel Company's plant. Thence it passes through the heart of the business district of the city, extends beyond into what is considered one of the best residential sections of the city. Along the line are transfer points to all other lines. This line receives all classes of traffic amounting to an average

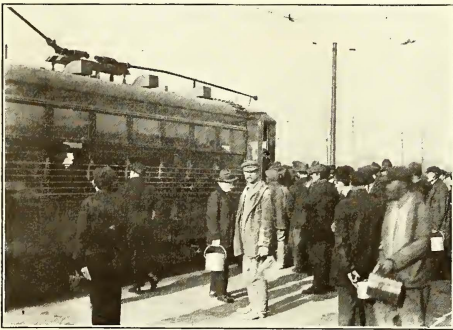


MAP OF GARY STREET RAILWAY SYSTEM SHOWING SAFETY CAR LINE

of approximately 10,000 passengers per day. There are seven separate grade crossings on the Broadway line. Three of these are double track, main-line steam railroad crossings, one is a double-track electric interurban crossing and the others are single-track steam road freight and passenger crossings. These have not interfered with the service, however. The safety-car operator flags himself across by bringing his car to a stop, going upon the crossing and observing in each direction before proceeding, except during the rush hours when a flagman is stationed at each crossing.

GARY CARS WEIGH 13,000 LB.

The cars used at Gary are the standard Birney type. They were furnished by the American Car Company. They are equipped with two GE-258 motors, K-63 control and General Electric air brakes, and Gurney ball bearings. The total weight is 13,000 lb. The platform



INDIANA STEEL COMPANY EMPLOYEES BOARDING CAR AT SECOND AND BROADWAY TERMINAL, GARY

for the trolley base as used on many of the safety cars is not used here but one a few inches high and built up especially in the railway shop has been installed so that a 14-ft. pole could be used. This was necessary to take care of the greater height of the trolley wire at railroad crossings. The cars are arranged for double-end operation.

BETTER SERVICE IS REFLECTED IN GREATER EARNINGS

In January, 1919, the last month under the old operation, the Broadway line operated 954 car-miles a day. In February with the new equipment this was increased 62 per cent, to 1,537 car-miles. The car-hours were increased 70 per cent. In spite of these increases, the power consumption was decreased 20 per cent including that used for heating the cars. The gross earnings increased 16 per cent, which is attributed entirely to the increased service resulting from the use of safety cars and if maintained will result in a net revenue gain of more than \$40,000 per annum.

One of the safety cars was also installed on the Fifth Avenue line which operates to the plant of the American Bridge Company but this is used together with standard two-man cars. The headway on Fifth Avenue was reduced from twenty to ten minutes by the introduction of the safety car.

The men are pleased with the new cars for they receive a 10 per cent increase in their pay, making their

wages approximately 50.6 cents per hour. The public and the city authorities are also pleased. The latter is indicated by the fact that when the Central Labor Union tried to get an ordinance through the council compelling the use of two men on the cars, due to grade crossings, etc., the proposal was immediately rejected.

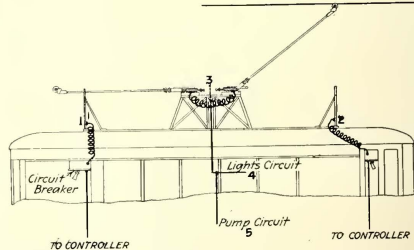
Connections for Insuring Proper Position of Trolley Poles

BY C. H. COPLEY

Superintendent, Springfield Traction Company, Springfield, Mo.

PREVIOUS to the use of one-man cars by our system all our cars were equipped with one pole and were operated by two men. The changing of the trolley pole at the end of each trip was part of the duties of the conductor. When we changed to one-man operation considerable trouble was experienced due to the operator forgetting to pull down the front pole when changing ends. As a result, when the car was started up this front pole would catch in the overhead work and frequently tear the trolley wire down.

In order to make it necessary to pull down the front trolley pole before these cars could be operated, I arranged the wiring as shown in the accompanying diagram. With these connections it is impossible to operate the car unless the proper pole is on the wire. Instead of connecting circuit breakers to the trolley base these were connected to a hook at each end of the car. The two trolley bases were joined together by a jumper, and with the trolley pole on the rear end of the car in position on the trolley wire and the pole on the front end of the car under the hook, a circuit



METHOD OF CONNECTING THE TWO TROLLEY POLES OF A SAFETY CAR SO AS TO INSURE THAT THE FRONT TROLLEY POLE IS DOWN BEFORE THE CAR IS OPERATED

was established from the trolley wire through the rear and front trolley poles to the hook and then to the circuit breaker at the operating end.

This method of connecting the trolley poles has been adopted as standard for all our lines and has now been in operation for six months. During this time no trolley wire has been pulled down, no poles have been bent, nor have any delays been caused to the service by the operator forgetting to place the right pole on the wire.

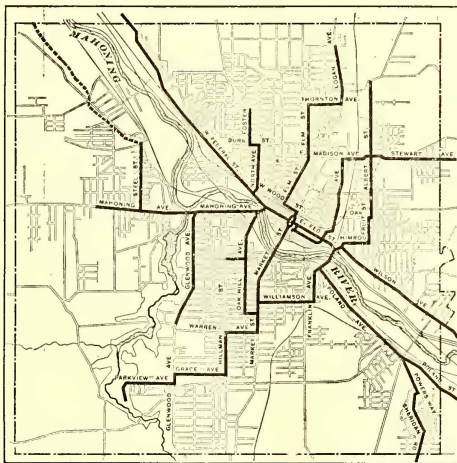
The United Railway of Yucatan has received three storage-battery passenger cars from the Railway Storage Battery Company for use between Merida and Progreso, 23.6 miles. The total weight of the car equipped and with storage batteries is about 37½ tons, and it seats sixty-six persons.

Relieving Congestion at the "Diamond" in Youngstown

Company and Transit Commission Are Co-operating to Reduce Time Loss and Accident Hazard at Central Square

AS IN MOST cities, traffic conditions in Youngstown, Ohio, are complicated by the desire of the patrons to be brought directly to the business center, locally the public square or "Diamond." Unfortunately, this square is small, being but 365 ft. x 220 ft. from curb to curb. It is divided into two equal plots by Federal Street, permitting a figure-8 track loop. (See Fig. 1.) All city lines, i.e., those of the Youngstown Municipal Railway, come to this point as well as all of the Mahoning & Shenango Railway & Light Company's interurban lines except the Sharon line. The accompanying diagram of the loop shows in solid lines the existing track, and the map shows the relation of the loop to the city lines.

All loading and unloading in the loop is done on Federal Street. The lines which enter at A and use the north section of the loop are Mosher, South Side, Ohio Works, Glenwood Avenue, Mahoning Avenue,



RAILWAY LINES IN YOUNGSTOWN, OHIO

North Avenue and Woodland, and Girard and Warren interurban. At B the following enter, using the north section: Albert Street, East Youngstown, Poland Avenue and Poland Street Railway, as well as the Newcastle interurban. During the rush hours eighty-four city cars (three with trailers) and twenty-four interurban cars (eight with trailers) go through the loop between 5 and 6 p.m., and in the half hour from 6 to 6.30 there are fifty-three city cars (two with trailers) and eleven interurban cars (four with trailers). The congestion during this period is obviously very great.

So much for the conditions at the "Diamond."

The vital question to the company and to the transit commissioner, Hon. William L. Sause, is how to relieve the congestion. Some things have been done; others are in process or in contemplation. One plan is to minimize the time required for loading in the loop. On the Youngstown-Warren interurban line, where Peter Witt



NORTH SECTION OF CENTRAL SQUARE OR "DIAMOND," YOUNGSTOWN, OHIO

front-entrance, center-exit cars are used, this is accomplished by opening both entrance and exit doors in the loop and not attempting to collect fares in the city limits as the passengers pass the conductor. On Feb. 1 under the direction of Mr. Sause the Park and Falls line, which reaches the loop by way of Market Street, was removed from the loop proper and arrangements were made to "wye" the cars at point C, Fig. 1, in the

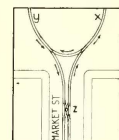
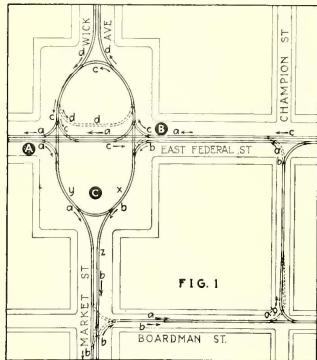


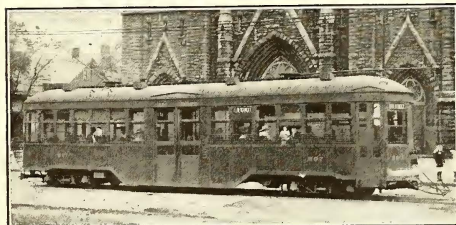
FIG. 1.
PRESENT AND
PROPOSED
TRACK
AROUND THE
"DIAMOND,"
YOUNGSTOWN

FIG. 2.
"WYING," THE
PARK AND
FALLS LINE
CARS,
YOUNGSTOWN

manner shown in Fig. 2. The cars proceed northbound to point *x*, Fig. 2, unload their passengers, back to point *y* without reversing the trolley poles, load at point *y* and proceed southbound. The main objection to this plan is that cars must back against street traffic in a section where traffic is congested, particularly during the rush hours. To prevent accident the city maintains extra traffic officers at this point.

Mr. Sause proposes to locate a double crossover at point *z*, Fig. 2, to permit northbound cars to proceed directly to point *b*, where they would unload, then backing to point *x* (with traffic) for loading. This crossover involves a cost of about \$7,500 and it may be installed when finances permit. In the meantime no serious accidents have occurred at the "wye."

For ultimate solution of the "Diamond" problem, J. B. Stewart, Jr., superintendent of the city lines, pro-



STANDARD CITY CAR, YOUNGSTOWN

poses the extension of the loop to include East Federal, Champion, Boardman and Market Streets, as shown in Fig. 1, in which the necessary new track is indicated by the dash lines. Under this plan there are four routes through the business center as indicated by the arrows and lettering in Fig. 1. One group of lines (Mosher, North Avenue, South Side, Woodland, Ohio Works, Mahoning Avenue and Glenwood Avenue) enter via West Federal Street and make the large loop as indi-

cated by the letter *a* and arrows. The second group contains the Park and Falls line, which "wyes" as now (see *b*). Group 3, which can be traced by letter *c* and arrows (East Youngstown, Albert Street, Poland Avenue and Poland Street Railway) enter from East Federal Street and round the northern half of the old figure 8. The fourth group contain the Elmwood line for which a new loading and unloading track is provided as indicated by letter *d*.

The rearrangement described would cost possibly \$75,000 and it is not expected to be feasible for some time.

Institute of Metals on Condenser Tube Corrosion

THE Institute of Metals, of Great Britain, held its annual meeting in London near the end of March and received the fourth report of the corrosion committee. A quite important part of the report is concerned with the corrosion and the protection of condenser tubes. The report extends to great length, much research work is reported and many very technical points are discussed. The oral discussion by high officers of the British Navy and by condenser tube manufacturers added greatly to the breadth and scope of the treatment of the subject. But aside from the considerable prominence given to a preoxidizing process (in which it seems the Admiralty has long been interested) and the emphasis put upon the significance of full recognition by the manufacturers of their responsibilities during the making of tubes, seemingly nothing of commanding importance was brought out. Very little was conclusively established.

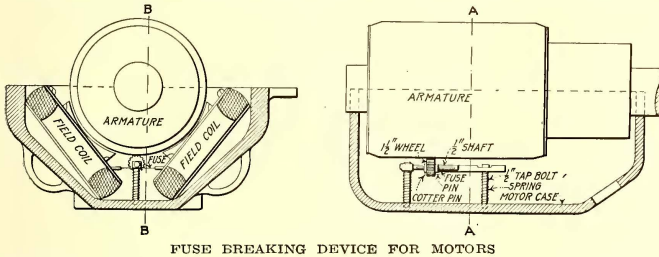
The methods used in the investigation and the tentative results presented appear not distinguished by practicality. From this aspect the whole discussion is far less impressive than the symposium on the cracking and corrosion of brass presented last June at the annual meeting of the American Society for Testing Materials. And indeed one of the most remarkable features of the British report is the lack of any reference to the really notable recent American work. It is true that in the oral discussion a British condenser tube manufacturer did refer to a change in his practice adopted because of American research work. And it is perhaps more interesting still to point out that this very change in his practice, the heat-treating of the tubes, has striking similarity to the means by which the preoxidizing process is effected, namely, the heating of the finished tubes in an oxidizing atmosphere for half an hour in the temperature range of 500 to 570 deg. Fahr. Recent American investigators feature annealing the finished tubes at temperatures somewhat higher than those just mentioned, and oxidizing has not attracted attention. The basic similarity, however, is striking.

The Federal Board for Vocational Education reports on May 5 that among the disabled soldiers now undergoing the re-educational process there are twenty-four studying architecture; thirty, chemistry; twenty-one, dentistry; fifty-eight, drafting; 178, engineering; two, foreign trade; nine, journalism; seven, languages; sixty-eight, mechanical drawing; eight, music; two, optical work; forty-nine, law; eight, teaching; four, theology; three, veterinary medicine; eight, wireless telegraphy.

New Device Prevents Rubbing of Armature on Pole Faces

A PATENT has been issued to Walter B. Uffert, New York State Railways, Rochester Lines, Rochester, N. Y., for a device to prevent an armature from rubbing on the pole pieces due to worn bearings, sprung shafts, hot bearings or other causes. It can be installed in either the older types of motors or the more modern interpole motors.

The device as shown in the accompanying illustration consists of a small grooved brass wheel mounted



FUSE BREAKING DEVICE FOR MOTORS

so that it will rotate. The wheel is equipped with a side contact which will make contact on the under side with a bare field jumper. This jumper can be either a bare wire or a strip of copper as is necessary to meet conditions. When the armature clearance is reduced to a dangerous point the laminations of the armature will come in contact with the small brass wheel, causing it to turn, and make contact with the field jumper. The contact of the laminations of armature with the small wheel will ground the wheel, which in turn will ground the field jumper, burning this off, and opening the motor circuit.

Three cars in Rochester, one in Syracuse and one in Utica, are equipped with this device. In Rochester there have been four successful tests, where armatures were saved. In two of the cases the bearings were worn out, one had hot armature bearings, and one had a sprung armature shaft. In all these four cases the circuit of the motor affected was opened and the armature saved without injuring the other motor connections. These tests took place in GE-54, GE-80 and GE-67 motors.

Car Equipment Notes from Belfast

IN CONNECTION with the article on Belfast practices with "Steel-Tired Wheels and Axles," by H. Vernon, published elsewhere in this issue, the following supplementary notes made during January, 1919, may be of interest:

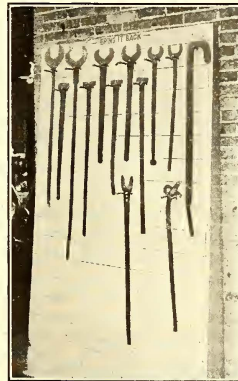
The steel-tired wheels now in use are of Baker manufacture, of 31½-in. diameter, new, and 28½-in. diameter when retired after making 70,000 miles. With a 28½-in. car wheel the distance between the ground and the platform step is only 8 in. Axles are of ordinary steel, but heat-treated metal will be used when it becomes obtainable. Because of the poorer quality of gas obtained lately, it takes fifteen instead of twelve minutes to shrink on tires. British Westinghouse gears are now standard, but Belfast has always enjoyed long gear life, not more than 100 gears having been scrapped in

the thirteen years of the Tramways' existence. This is an average of 0.026 gear per car per annum on the basis of 23,000 to 24,000 car-miles per car per annum.

Careful maintenance of bearings in line to avoid backlash is given as the secret of long life of gears so far as the user is concerned. Pinions recently delivered have been of unusually poor quality because of war conditions and average only nine months' life.

The standard trolley wheel is 4 in. in diameter and includes 1½-in. x ¾-in. x ¼-in. graphite bushings, both made by Fleming, Birkby & Goodall. The average wheel life is 6000 miles, of which 1000 miles is ascribed to the returning of the wheels. The flanges are restored to the original contour as soon as the grooves become too deep for safety in running under frogs and other special work. Trolley wheels are operated under a tension of 22 lb., the tension adjustment being definitely secured by a weight instead of spring regulation, which is considered less reliable. The graphite bushings are usually good for two wheels. For the motors, which are Westinghouse No. 200, 35 hp., Le Carbone brushes are used, Belfast's standard for thirteen years. Every car depot is provided with spring scales to see that the prescribed tension of 4 lb. to 5 lb. per square inch is maintained. The brushes average about six months life.

Conserve Workmen's Time by Having a Place for Every Tool



BOARD FOR SPECIAL WRENCHES AND LARGE TOOLS

THE many different special wrenches and large tools necessary in an electric railway shop for truck overhauling and where pit work is being done makes it a problem not where to put the tools but where to find them when wanted. In the shops of the Winnipeg Electric Railway much time of workmen has been saved by providing a tool board or rack for such tools in a convenient location. The front of this board is painted a light gray color and the exact outline of each tool is painted in black on the board so that the work-

man always knows where the tool belongs and can readily place it in its proper position. An accompanying illustration shows this board. No tools were on it at the time the photograph was taken. The brief instructions at the top of the board, "Bring it back," are very significant. They serve as a constant reminder to the workman every time he passes the board that tools have a proper place.

New Furnace Design

A Cleveland Company Puts the Stoker Under the Mud Drum in Order to Get the Desired Gas Flow

IN THE 1918 addition to the Lake Shore station of the Cleveland (Ohio) Electric Illuminating Company a new furnace design has been worked out. Its essential features are shown in the accompanying cross-section. Chain grate stokers are used, and instead of being placed in the usual way under the front of the boiler they are installed in the rear under the mud drum. An igniting arch extends under the mud drum,

ways, advises further that in general "Phono" has been found to wear twice as long as hard-drawn copper of the same gage. In the matter of breakage, No. 0 and No. 00 have been found superior to copper. The No. 000 size, however, which is installed on Sackville Street, the main traffic artery, does not appear to possess the same freedom from breaks, which occur nearly always at frogs and crossings. This may be due either to some defects in the manufacture of this particular wire or to the unusually severe traffic conditions.

LETTERS TO THE EDITORS

Accurate Track Cost-Accounting Data Are Sorely Needed

BROOKLYN, N. Y., May 14, 1919.

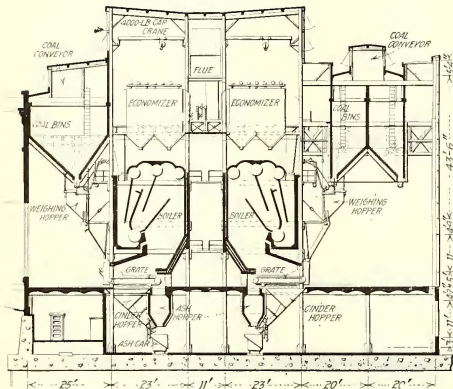
To the Editors:

There never was a time in the history of the electric railway industry when the subject of costs was so important as it is to-day. But although all departments are affected, the tendency seems to be to think and talk only of the cost of platform time, as it naturally bulks large in the payrolls. The transportation department can usually tell at a moment's notice just what the cost for car crews was for yesterday's mileage, and very likely the mechanical people can tell the cost to a nickel for car repair labor on the ten cars put through the shop yesterday. But how many way men can tell the cost for maintaining any particular piece of track? The correct answer to this inquiry is probably "very few indeed," yet if it is important to know just what platform time and car repairs are costing, it is just as important to know what the maintenance cost is for track. True, we can probably find the cost from the comptroller's accounts for the heterogeneous lot of tracks entire with which most roads are blessed, but it is next to impossible to get any information in detail as to where the money was spent and, what is more important, why.

When the maintenance of way engineer asks for accounting in sufficient detail to secure this information he generally is told that it either can't be done or that it would cost too much. So he must continue to make a guess as to where the money goes. On the other hand, no modern manufacturing plant could be run a week, successfully, if its management failed thoroughly to analyze the cost details in every department, and such plants spend money gladly for the purpose of keeping accurate costs.

Records of construction and reconstruction costs for tracks on electric railways are fairly plentiful, and if they were not, it is a comparatively simple problem to estimate them. On the other hand, track maintenance cost records which have any value even on one system are almost as scarce as hens' teeth. Only once have we seen any such thing which we felt could be called dependable.

In view of the fundamental desirability of knowing the truth about costs, it would seem a most appropriate time for the Accountants' Association and the Engineering Association jointly to revive the subject of maintenance cost accounting with particular reference to the matter of track maintenance costs, because money



STOKER SET UNDER MUD DRUM OF BOILER WITH FOUR-PASS BAFFLING

which sits rather high, its center being 15 ft. 8 in. above the floor line. The boiler baffling is of the type known as "Four-pass baffling." With this arrangement the gases in passing through the boiler enter the first bank of tubes at the top instead of the bottom. This puts the uptake also at the rear of the boiler and permits the gases that have passed through the two banks of economizers to be taken off in a single centrally located flue.

Extra-Wear Trolley Wire in Dublin

LIKE many American electric railways, the Dublin United Tramways realize that the advantages of extra-wear trolley wire for the maintenance of service on busy streets offset the disadvantages of lower conductivity. Such disadvantages, of course, are relatively small when there is in parallel plenty of feeder copper which never wears out.

At this time the company has in use approximately 62 miles of Phono-Electric trolley wire, comprising 10 miles of No. 0, 50 miles of No. 00 and 2 miles of No. 000. This is more than one-half of the total mileage of 110 miles. In addition, the company has recently erected 10 miles of No. 00 phosphor-bronze wire to replace No. 0 Phono-Electric wire that had been in service ten years on a line with heavy traffic. This is the first Dublin installation phosphor bronze working under severe traffic conditions, so that it is not possible to forecast the results.

R. Tanham, electrical engineer Dublin United Tram-

spent in accurately determining the cost of maintaining the several types of track on any one system will more than repay the expenditure if it assists, as it surely will, in settling the question of what type of track is the cheapest to maintain on that property.

WAY ENGINEER.

Welding Special-Alloy Steel Rails

METAL & THERMIT CORPORATION

NEW YORK CITY, May 14, 1919.

To the Editor:

I was very much interested in your editorial entitled "The Relation of Rail Steel to Rail Joints on Electric Railways," published in the issue of May 10, but cannot but feel that the conclusions which you draw are just the opposite of what they should be if we are to look at the matter solely from the point of view of the best interests of the street railway companies. Instead of investigating the "relation of chemical analysis and details of manufacture of rails to the suitability of steel for adaptation of the several forms of joint welding now current," the object should be to adjust the welding processes so that successful welds can be made on the best steel for street railway purposes. This naturally implies first a careful investigation into the wearing quality of different kinds of rail steel and I have no doubt that in the end it will mean the adoption of a special alloy rail steel.

When a rail steel has been determined which will give the longest life in street railway service, the next step is to find a welding process which will weld the rails together so effectively that the life of the weld will be the same as that of the rail itself; nothing less than that should be considered.

Special-alloy rails are already coming into quite general use but there is no question also that they are the ones which are giving the greatest trouble from the point of view of most of the rail welding concerns. This difficulty not only can be overcome, but in my opinion has already been overcome, by at least one process which successfully welded a great many joints on Mayari steel rails in 1915. These, as your readers perhaps know, are a special-alloy rail containing nickel and chromium; the elements in question being contained in the ore which is mined in Cuba. The rails are considerably harder than ordinary steel rails and a much longer life is claimed for them. When it came to welding these rails, however, it was found absolutely impossible to do so by many well-known processes. One, however, was found to be entirely suitable, with the result that the joints welded four years ago as still in perfect condition.

With instances such as these in front of us, proving conclusively that special-alloy rails can be successfully welded, there certainly can be no occasion for reducing the quality of the steel or softening the rails simply to favor those welding processes which cannot successfully weld these alloy rails at the present time.

WILLIAM R. HULBERT,

Sales Manager Thermanit Department.

The United Railways of St. Louis, Mo., is using the backs of transfers for carrying a safety message. A series of special illustrated advertisements is used for this purpose.

AMERICAN ASSOCIATION NEWS

Oct. 6-10 the Big Week

THE thirty-sixth annual convention of the American Electric Railway Association will be held at Atlantic City, N. J., on Oct. 6 to 10, 1919, on Young's Million Dollar Pier.

A convention committee has been appointed as follows: L. S. Storrs, New Haven, Conn., chairman; C. L. Henry, Indianapolis, Ind.; J. J. Stanley, Cleveland, Ohio; T. W. Wilson, Wilmington, Del.; E. P. Waller, Schenectady, N. Y., C. R. Ellicott, New York, N. Y., and L. E. Gould, Chicago, Ill.

This will be the first convention held since 1916. The armistice has been signed, the country is returning to peace conditions and a large and enthusiastic attendance is assured. The program will be selected with special reference to the needs of the industry, and the subjects to be considered will be of interest and value.

An exhibit will be held in connection with the convention, and detailed announcements as to arrangements in this connection will be issued later. The exhibit committee intends to make this feature of the meeting of special importance and value. The necessity of improved and economical methods of operation is known to every railway man, and the committee has in mind a visual presentation of modern economies covering both devices and methods.

Toledo Section Has 998 Railway Members

AT THE request of the editors of this paper D. H. Shapiro, assistant secretary Toledo Joint Section, has compiled a table showing the distribution of the membership of 1502 among departments and national associations. Excluding twenty-eight associate members who are not affiliated with particular societies, the active membership of 1474 divides thus: American Electric Railway Association, 998; National Electric Light Association, 426; National District Heating Association, 31; American Gas Association, 19.

The railway members are well distributed among the electric railway sub-departments and the heating and electrical departments as well. Mr. Shapiro attributes the large railway membership to the fact that a very considerable percentage of the employees are engaged in railway work. In addition it is possible that the small fee charged by the railway association has something to do with this.

Bulletin on Labor Turnover

A bulletin just issued by the United States Training Service of the Department of Labor, C. T. Clayton, director, Washington, D. C., contains a number of suggestions regarding the reduction of the labor turnover in the industries. Much of the blame for the turnover is laid at the door of the employer, the principal factor being the failure to obtain from workers a full measure of efficiency. Six reasons assigned for reduction in efficiency are: (1) Power failure; (2) failures of equipment and repairs and like limitations; (3) lack of instructions; (4) lack of training; (5) failure to supply material, and (6) personal slacking.

News of the Electric Railways

FINANCIAL AND CORPORATE • TRAFFIC AND TRANSPORTATION

PERSONAL MENTION

A Railway for One Dollar

A Proposition That Ought to Satisfy the Most Truculent Advocate of Municipal Ownership

The fully equipped and operating electric railway at Merrill, Wis., has been offered to the city for the moderate consideration of \$1 by the Wisconsin Valley Electric Company of Warsaw. Except for a variation here and there, the property at Merrill has gone over the same route toward abandonment that the electric railways in many other small towns have traversed. The plan is to turn the road over to the city for operation with power supplied from the plant of the electric company. In the event that the city should decide to abandon service, the equipment would be turned back to the electric company for sale as junk.

HISTORY OF COMPANY

The franchise to operate in Merrill was granted on Dec. 9, 1889, for a period of thirty years. It was accepted on Dec. 30, 1899. The franchise accordingly expires on Dec. 30, this year. The enterprise has always been a financial failure. Nothing has been realized on the actual investment. Things were made worse for the company with the coming of the automobile. As an experiment 7-cent fares were put in with the approval of the local citizens and the Railroad Commission of Wisconsin. After four months' experience with the new fare the extra charge has not resulted in any increase in gross receipts. The loss for the current year is estimated at \$5,000. Under these conditions the company will not ask for an extension of its franchise. Accordingly the company has written to the Mayor and Common Council to the effect that if it is desired by the city that the line should continue in operation it will be necessary for the city to operate the road after that date and thus absorb the deficit. The actual offer of the company as contained in the communication to the Mayor and Common Council is as follows:

In view of the possible desire of the city to continue this operation and our desire to co-operate with the city in every reasonable way possible, we have, therefore, decided that we will offer this property to the city of Merrill for the consideration of \$1. Such offer to be conditioned upon the city operating the line for at least a reasonable period and the property so offered to consist of all tracks, trolleys, cars, tools, etc., now used and useful in the operation of the line, but not to include any real estate or power-house equipment. We will, of course, furnish the necessary power for operation at reasonable rates, and in the event of acceptance on the part of the city, we are, of course, to be relieved of all future responsibility or expense of every kind or nature with reference to this property, exclusive of the obligation to furnish the necessary power as above stated.

We are, therefore, bringing this matter to your attention at this time, so that it can receive your careful consideration in ample time for you to take such action as may seem best in the matter, before the expiration of our franchise on the date herein named. This property, of course, has a considerable value as a scrap proposition to this company, but before considering the sale of the property for this purpose at this time, we prefer to make an offer of a donation of the use of same to the city.

Commission Reorganization Program Completed

Governor Smith of New York has completed his legislative program for the reorganization of the Public Service Commission for the First District (Greater New York) by signing the second Foley bill which creates the office of Transit Construction Commissioner to administer subway and elevated construction work in the Greater City.

The first Foley bill, wiping out the five-headed commission which administered both construction and regulatory functions and substituting a single commissioner, with only regulatory duties, was signed recently and its approval was accompanied by the appointment of Lewis Nixon as commissioner.

The second bill was not accompanied by an announcement of who should fill the place and under the terms of the measure the Governor has twenty days to make the selection. The post pays a salary of \$15,000 a year, and there is to be one deputy at \$7,500.

Insist on Eight-Hour Day

Motormen and conductors of the Seattle (Wash.) Municipal Railway are taking steps to enforce the strict eight-hour day, with time and a half for all work in excess of eight hours.

The men have gone on record as unanimous in their demand for the strictly eight-hour day, and have taken action to enforce their demands by a strike if their claims are not allowed.

The trainmen also demand that as far as they are eligible the former employees of the railway division of the Puget Sound Traction, Light & Power Company, which the city purchased, be taken over by the city in a body, as they were given to understand would be the case. This latter demand will be taken care of by the city.

Thomas F. Murphine, superintendent of the municipal railway, is making an effort to work out new schedules to make all the runs come within the eight-hour day. He claims that the utilities department has no authority to pay the men time and a half for overtime. The men are now paid the regular rate for overtime, but the controversy is over the difference between straight time for extra work, and time and a half.

Chicago At It Again

Faint Hope That Enabling Legislation May Be Secured Looking Toward Traction Settlement

The first meeting of the local transportation committee of the City Council of Chicago, Ill., held on May 7, resulted in the speeding of plans for a settlement of the traction problem. This matter has been neglected since the tentative ordinance was defeated by the voters last November. Three bills for enabling laws have gone to the Legislature and two others are under way.

ALDERMAN PRESENTS PLAN

Negotiations with the companies are to be based on a plan suggested by Alderman U. S. Schwartz. His proposal contemplates a new municipal corporation which would have debt-creating power and the authority to issue securities for acquiring the railway properties. Through a board of control these securities would be offered for the existing bonds of the companies, and having additional security of the municipality behind them a lower rate of interest, perhaps 4½ per cent, would be possible. Thus the financing of the properties would result in reducing the fixed charges about \$1,000,000 and the board would be less likely to require a raising of the rate of fare to pay the cost of service. It was suggested that the board should have a majority of members appointed by the City Council and the rest by the investors and the employees.

Walter Fisher, special counsel for the city, did not take kindly to the Schwartz plan, saying it probably would meet many obstacles in the Legislature and in the courts. He thought that previous decisions of the State Supreme Court indicated an unfriendly attitude toward such proposals, which would tend to increase the city's debt limit. However, the committee decided to seek enabling legislation so that time would be saved if an agreement can be reached with the companies on such a basis.

LEGISLATION SOUGHT

The three bills already filed at Springfield provide for authority to combine the surface and elevated roads; additional power for the city to build subways and for the city to lease and operate transportation lines. The Legislature will also be asked to create such a municipal corporation as the Schwartz plan contemplates and to give the city power to change rates of fare independent of the State Utilities Commission. Quick action will be necessary inasmuch as the Legislature is expected to adjourn about June 1.

Cleveland Railway's Franchise Renewed

Service-at-Cost Grant Extended for Ten Years—Changes That Were Made Are Explained

In renewing the franchise of the Cleveland (Ohio) Railway on April 7 the City Council extended its life for a period of ten years, from May 1, 1934, to May 1, 1944. As a matter of fact, the ten-year extension was the primary purpose of renewing the ordinance, since the franchise under which the company was operating provided that whenever the grant or any renewal thereof had less than fifteen years to run, the company would have a right to fix, charge and collect the maximum rate of fare mentioned in Section 22 of the franchise ordinance. This rate is 4 cents cash and seven tickets for a quarter, with a transfer charge of 1 cent and no rebate. In addition the city would lose control of the schedules and operation. In other words, had the franchise not been renewed before May 1, 1919, the company would have been able to operate under its own policies for the remainder of the franchise term of fifteen years. All rights retained by the city are enumerated in Section 9.

AGITATION FOR SIGNIFICANT CHANGES

While some of the members of the City Council desired to make important changes in the ordinance and Mayor Davis wished to take advantage of the opportunity to secure to the city certain features of control over the road that it does not now possess, the revision includes only such matters as were necessary to comply with ordinances that had been enacted independently from time to time by or as amendments to the original grant. A few portions, which applied only to agreements that have been finally satisfied or to companies which have gone out of existence, were omitted from the new draft.

Up to Section 8 the new ordinance is practically a duplicate of the old grant. This section, which related to the installation of pay-enter cars and the collection of fares has been replaced by the following:

The company shall continue the most modern system of fare collection by fare boxes or otherwise.

MODERN FARE COLLECTION ASSURED

This gives the company the right to install any modern system that may be considered better than the present or an improvement over the fare-box system now in use.

Section 10 was amended by omitting the following words at the beginning:

Immediately upon the taking effect of this ordinance.

This provided for the appointments of a street railway commissioner at once, as it stood, and might have resulted in complications. The section otherwise relates to the commissioner and his duties. No other change whatever was made in it.

In Section 16, which relates to the capital value of the company, the figures, applicable when the old franchise

was written, have been omitted. The items of which the capital value shall consist are now described as follows in the renewal ordinance:

(a) The bonded indebtedness of the company as described in amended ordinance No. 16323-A, Section 16, and any renewals thereof and additions thereto, made pursuant to the provisions of said ordinance.

(b) The floating indebtedness of the company represented by bills payable as of March 1, 1919.

(c) The residue of the capital value of the company as fixed by amended ordinance No. 16323-A with such additions thereto as have from time to time been made pursuant to the provisions of said ordinance.

FINDING THE CAPITAL VALUE

The figures mentioned in this section of the old ordinance, it will be seen, are made the basis for finding the capital value of the company. They included the bonded debt at the time, the floating debt, the appraised value of both the properties of the Cleveland Railway and the Forest City Railway, unsecured debts of the two companies, guarantees of one kind and another and a number of other items. Aside from this the section remains as it was.

Section 17, relating to debts of the Municipal Traction Company, was omitted entirely, as they have been discharged. Section 18 in the old franchise becomes Section 17 in the new one, as a consequence of this omission. The numbering of the sections follow this in regular order to No. 36, which was repealed. There Section 37 in the old ordinance becomes Section 35 in the new one.

INTEREST FUND PROVISIONS STAND

No change was made in the section relating to the establishment and maintenance of the interest fund (Section 16, new ordinance) with the exception of increasing the figures for car-mile allowance from 11½ to 19½ cents, to accord with resolutions that have been passed by Council from time to time, as necessity arose. A few lines were revised to improve the diction.

The figures for the maintenance fund in Section 20 (Section 19, new ordinance) were also corrected to accord with resolutions since enacted. They were increased 1 cent per car-mile. It was also necessary to change the references in the different parts of the ordinance because of the slight change in the section numbers. This was done where any section after number 16 was mentioned.

RATES OF FARE DEFINED

Section 21 (Section 22, old ordinance) deals with the rates of fare and to this was added Section 21-A, which covers the war rates authorized on Aug. 3, 1918, which are to continue for six months after the conclusion of the war. As was noted at the time, the action of the City Council provided a sliding scale of rates, as follows:

Six cents cash, nine tickets for 50 cents, 1 cent for transfer and no rebate.

Five cents cash, five tickets for 25 cents, 1 cent for transfer and no rebate.

Five cents cash fare, eleven tickets for 50 cents, 1 cent for transfer and no rebate.

Five cents cash fare, six tickets for 25 cents, 1 cent for transfer and no rebate.

Four cents cash, five tickets for 20 cents, 1 cent for transfer and no rebate.

After this, the rates named in the original franchise apply.

NEW RATES IN SUBURBS

New rates for the Euclid Avenue line east of East Cleveland are provided for in Section 21-B. Between Ivanhoe and Green Roads, the fare is fixed at 5 cents, but from any point on this line to any point in East Cleveland or in Cleveland, west of East Cleveland, the rate is to be 10 cents. Passengers are entitled to such transfer privileges as may be in force in East Cleveland and in Cleveland.

The first paragraph of Section 23 (Section 22, new franchise) was omitted. This portion described the manner in which the fare schedule should be put into effect and the steps that should be taken in case the interest fund was decreased by it. Since all this became history at the time, the matter was obsolete. The remainder of this particular section of the ordinance is retained as it was.

OTHER SECTIONS OMITTED AS UNNECESSARY

In Section 25 (Section 24, new franchise) the second paragraph providing for the extension of the Lorain Street line to the westerly city limits was also omitted, as that extension has been completed.

The last paragraph in Section 28 (Section 27, new franchise) was omitted, as it merely provided for the expenditure of a certain amount of money immediately after the old franchise took effect and this has, of course, long since been done.

In Section 30 (Section 29, new franchise) the last paragraph, relating to the extension of lines in Collinwood and Newburg City were stricken out, as the provision was no longer deemed necessary.

CLARITY BY CONDENSATION

Considerable superfluous matter was omitted from Section 35 (Section 34, new franchise). The sense of the section was not changed, but rather clarified by the omission. A slight revision was made in Section 43 (Section 41, new franchise) by the omission of the words between the word "expiration" and the word "or" in the third line from the last.

The company's letter of acceptance was changed in form to conform to the fact that there is only one company, while five existed at the time the original grant was formulated. It consisted merely of the omission of all the names except that of the Cleveland Railway.

With the aid of this brief explanation, it is believed that those who have copies of the franchise in its original form may be able to understand the conditions of the new grant without difficulty.

Both Parties Rebuked in Milwaukee

Legislative Investigating Committee Deprecates Company's Delay in Raising Wages and Commission's Dilatoriness in Deciding Rate Case

The special investigating committee of the Wisconsin Legislature, after inquiring into the matter of the strike of Milwaukee Electric Railway & Light Company trainmen on Jan. 1, 1919, has just reported its findings that the cessation of service was the result, on the one hand, of the company's failure to meet the just wage demands of the trainmen and, on the other hand, of the failure of the Wisconsin Railroad Commission to function expeditiously.

NO CONSPIRACY

There was no finding of conspiracy between the company and its men, but the committee remarked that in no case should the commission be coerced into a decision by a party litigant. As to the company's ability to pay higher wages without a fare increase, the committee repeated the admission of the chairman of the commission that the company in 1918 was not earning much over 4 per cent on its invested capital, thereby sustaining the report of Hagenah & Erickson made at the request of the railway employees.

The case before the investigating committee arose as a result of the desire of the Milwaukee company and its Employees Mutual Benefit Association to have higher fares and therefore higher wages. In regard to this association, in which the employees have a gradually increasing influence, the committee report says:

The company's policy in encouraging this association has largely contributed to bringing about among employees a commendable and general spirit of loyalty to the company and to the service. In and through the association the company management and the employees have come to stand upon a footing of mutual regard, forbearance, respect and confidence, a condition which cannot be too highly commended.

During the war period, while the cost of living was constantly rising, the demands for more wages became insistent. In April, 1918, a contract between the company and the association members was made as follows: The company agreed to employ permanently only persons who had become members of the association and the association agreed to provide the company with a sufficient number of employees. The company agreed to continue its contributions toward the activities of the association, as in the past, and to contribute the services of a medical director to the association.

COLLECTIVE BARGAINING

The company agreed to treat collectively with the members of the association on matters of wages, to make effective an eight-hour day, to increase wages (when the commission should provide the basis) on the basis of increased cost of living since the year 1914 and to adjust wages thereafter each half year, according to the cost of living, and to continue in operation the bonus pension system. It was mutually agreed that the members of the association of each department might elect representatives to a labor adjustment committee for the purpose of adjusting wages and conditions of labor, that the contract might be terminated by either party on six months' notice, that the company should not discharge an employee except for cause and that discipline should be meted out to members and the company should be arbitrated.

After this contract was signed a committee of employees visited the Wisconsin Railroad Commission and endeav-

ored to secure a decision on the November, 1915, petition of the company for increased revenues. Upon the representation of the committee after its return that a decision would be handed down not later than May 19, the company raised wages 10 cents an hour, effective May 1. On June 1 the commission increased the fares but, according to the company's contention, not sufficiently to allow a reasonable rate of return.

The men were only partially satisfied with their wages, and by August they were again agitating for a further increase. The company again applied to the commission for an increase in revenues, it being admitted by all parties in interest that the demands of the men were reasonable. Hagenah & Erickson made an audit for the employees and reported on Oct. 26 that the 1918 revenues amounted to only 3.84 per cent on invested capital and that the men's demands, if granted, would reduce this to less than 1 per cent. A period of inaction followed, although this finding was admitted to be in general accord with the commission's rulings, and the employees ceased work on Jan. 1.

COMPANY SHOULD HAVE RAISED WAGES

In regard to this general situation the legislative investigating committee now says that it was the unquestionable legal and moral duty of the company to maintain service on Jan. 1, even though it was necessary to comply with the demands for increased wages. Had the company done so and had such action resulted in a total or partial loss of the fair return to which the company is entitled by law, it would have become the plain duty of the commission to make such order with respect to rates as would enable the company to earn a fair return in the future and to recoup its loss. In the public policy so declared in the railroad commission law, it is said, is found ample protection to the company against ultimate loss in paying any reasonable standard of wages.

TEMPORARY INCREASE POSSIBLE

The investigating committee finds that the company was able to increase temporarily the wages of the men according to their reasonable demands and continue the service, the conclusive evidence of that fact being that it did advance the wages and continue its service after Jan. 1. The committee adds, however, that it is fair to say that the company never at any time conditioned its continuance of the increased wage upon a favorable decision from the commission. The company demanded only that a decision be rendered so that, if unfavorable, it might appeal to the courts for a review.

In regard to the general question of commission relationship to wage demands, the investigating committee says:

There is a sharp difference of opinion between the company and the Wisconsin Railroad Commission as to the power and duties of the commission with reference to wages. The company contends that the commission has the power and duty to pass on the question of wages as a factor in the administration of the railroad commission law and that there is no power so determined upon by the commission it is its duty, as a condition precedent to the payment thereof, to furnish revenues lawfully required for that purpose. The commission contends that it has no power and no duties in regard to wages, except to consider them when paid as an operating expense.

It is the opinion of this investigating committee that the commission takes too narrow a construction of the law and that it has the power to consider wages the same as it has the power to consider any other factor in the law and that the power is not sufficiently specific in the statutes as now provided the commission should be given that power. In other words, the commission should have full and comprehensive administrative jurisdiction to keep the wheels going and prevent cessation of service.

COMMISSION DELAY CRITICIZED

In concluding its report the special committee remarks that although on April 4 the commission denied a fare increase no further cessation of railway service is assumed. The main difficulty in the situation, however, is still existent, for there appears to be a general lack of confidence in the ability of the Wisconsin Railroad Commission to administer the law. On this point the report says:

There appears to be a general lack of confidence between officials of the city of Milwaukee and the members of the street car company in the ability of the Wisconsin Railroad Commission to administer the law. The city officials and the railway men are equally suspicious of each other. The employees of the street car company and the public utilities are equally distrustful of the commission. The attitude of the company has been such as to make its employees hostile to the commission. The character of its advertisements, such as such as to bring the administration of the law through the commission into public contempt, and the manner in which it has brought upon itself the contempt of the commission. As there is no change of venue from the commission, this presents a serious question.

The beginning of the trouble probably came from lack of prompt decision on the part of the commission. That condition has existed for a long time. Decisions have been delayed seemingly for unreasonable periods. There can be little justification in a hearing pending from November, 1915, to June, 1918. But other decisions have been delayed much longer.

COMMISSION SHOULD KNOW

The commission has the power and jurisdiction to require books to be kept by the companies in the manner and form required by it, and to require reports from the companies in the manner and form and at the time demanded by it. By a careful checking of these reports as filed, and prompt correction of errors, there would seem to be no reason why the commission should not be fully advised of the financial conditions of the companies at all times. Such a system would in itself furnish a valuable check on the management and the service of such companies.

By a full accounting system, the commission should have no serious difficulty in determining the general level of returns on invested capital from month to month and in maintaining that level by adjustment of rates and taxes. Hasty and ill-considered action should not be taken, but reasonably prompt decisions are necessary to any system for administering justice.

It would be desirable to guard against unwarranted delay in the future by providing in the law that whenever any party deems it to be in the public interest, it may obtain in the circuit court an order to show cause why the commission should not be ordered to render a decision within a reasonable time to be fixed by the court.

Detroit Company Ready

Outlines General Conditions Under Which Needed Railway Improvement Can Be Secured by the City

A meeting of the members of the Street Railway Commission of Detroit, Mayor Couzens and the officials of the Detroit United Railway was held on May 9. The main points brought out were that the company was willing to build the needed extension on Twelfth Street and St. Jean Avenue, and a hint that increased fares would be demanded soon.

FARE DISCUSSION INCLUSIVE

The Twelfth Street plan provides for extending service of Trumbull cars 1 mile farther north on Twelfth Street. The St. Jean line will run from Jefferson Avenue north to connect with Kercheval, Mack, Gratiot, Grand Belt and Harper lines. The Epworth Boulevard extension was reported as two-thirds completed and construction progressing on the remainder. This line runs north from Warren Avenue to Grand River Avenue at Highfield and Joy Road.

The discussion of increased fares was not pursued to any definite conclusion as the meeting was called to discuss extensions and rerouting of present lines, not to consider fares.

The City Council instructed the corporation counsel to draft the agreement relative to the proposed extensions. The terms under which the new lines will be built provide that the city may take over the tracks at cost less depreciation whenever municipal operation is decided upon.

Councilman Nagel suggested the possibility of the city building and financing extensions and leasing them to the company, but Frank W. Brooks, general manager of the railway, expressed confidence that the two extensions could be financed with the company's present resources. He stated that \$13,000,000 would ultimately be required to provide all extensions and improvements to service needed in Detroit and that the company could not provide for the improvements without an increase in fares.

SOME IDEAS ON FARES

Owing to the extension of the city limits, Mr. Brooks stated, double fares were necessarily charged in some sections of the city. This practice would be discontinued by the company if the city granted the universal 5-cent fare basis with universal transfers and workmen's tickets to be sold at eight for 25 cents. It might be necessary, however, to charge for transfers. According to Mr. Brooks the lines are losing money at the present rates, but he declined to answer a question from Mayor Couzens as to how long the railway could operate under present conditions without going into receiver-ship.

It was brought out by the company that the major part of the required expenditure was needed for the purchase of new equipment. The day-to-day

agreement between the company and city was referred to by Mr. Brooks as "clouded." He also pointed out that additional capital could not be secured under such an arrangement.

No comment was made by the members of the Council on the proposal by Mr. Brooks for abrogating the franchises on the 3-cent lines. Mr. Brooks gave it as his opinion that these franchises could be abrogated by agreement. A five-year agreement was suggested as a guarantee of good faith.

The officials of the company were instructed to outline plans for better service in congested sections by rerouting certain cars, and to submit plans at the next meeting on May 23. Council members were opposed to breaking up east and west runs and were inclined to order present routing changed, but this action was forestalled by the company. In discussing this matter it was stated by Mr. Brooks that Woodward cars carry more passengers than the Broadway tubes in New York and hence through cars crossing Woodward Avenue would add to the congestion.

The officials of the company agreed to the extension from the Eight Mile Road to the Six Mile Road, or the Palmer Boulevard line under the same agreement as the others.

TURNBACKS CONSIDERED

The question of turning back interurban cars at the city limits was not agreed to by the officials of the railway and the matter was postponed for consideration at the next meeting when the company will be asked for proposed plans looking toward the relief of congestion caused by the interurbans.

Publicity Campaign Precedes Referendum

The business men and industrial leaders of Akron, Ohio, organized into the Citizens' Progressive Association of Akron, conducted during the week ended May 17 an extensive publicity campaign in favor of the Morse-Witwer ordinance, which will go before the voters on May 20, at a referendum election. The ordinance was passed by the City Council in March. It provides for a 6-cent fare, nine tickets for 50 cents on the city lines of the Northern Ohio Traction & Light Company and for a complete survey of the city's transportation problem to determine upon a comprehensive practical plan of transit development to keep pace with the growth of the city.

The referendum was asked by petition of opponents of the ordinance organized as the Car-Riders' League, and headed by ex-Mayor W. J. Laub. The railway is taking no part in the campaign. The Citizens' Progressive Association, which includes the city's leading men representing every industry and walk of life, has taken up the ordinance as a necessary part of the plans for civic improvements, industrial developments and adequate housing. Lee, Harris & Lee are directing the publicity campaign.

Pittsburgh Troubles Multiply

Employees Strike to Enforce Wage Demands While Creditors Clamor and Bond Interest Is Unpaid

The 3000 platform employees of the Pittsburgh (Pa.) Railways struck at midnight on May 14, leaving most of Allegheny County and part of Washington County dependent on jitney buses and the steam railroads for transportation. Up until midnight on May 15 neither the officials of the union nor the receivers of the company had made any move toward a settlement.

The cause of the tie-up was a dispute over the new wage schedule. The men demanded an increase of 12 cents an hour over the prevailing scale of 43, 46 and 48 cents an hour according to length of service. They had been receiving these rates under a contract which expired on May 1.

ARBITRATION CAUSE OF TROUBLE

The actual point of difference upon which the strike was called, however, was the method of arbitration to be used in the settlement. The men demanded a final binding arbitration before the War Labor Board. The receivers, who are in charge under the United States District Court, contended that as receipts of the company are not sufficient to meet the current requirements, let alone the increased demands that the proposed new schedule would entail, they could not enter into binding arbitration without the express consent of the court.

The union gave the receivers until midnight on May 14 to obtain this consent. The judges refused to authorize arbitration except on condition that the results of the arbitration should be subject to court review. The strike followed.

The wage increases the men demand would cause a direct additional labor cost of \$1,000,000 annually, and if the pay of other employees were to be equalized the additional expense would be raised to \$2,000,000.

In declining to grant the receivers authority to enter arbitration before the War Labor Board, the results of which should be binding upon the court, the judges took the stand that such permission would amount to delegation by a court of part of its particular functions to another body.

Permission to arbitrate was granted, with reservation on the part of the court of the duty of passing upon the findings of the board. As to the demand of the men that the receivers be permitted to agree in advance to accept the findings, the court held that to do this would bind not only the receivers, but the court itself, and "that it is beyond our power to part with any of the authority vested in us by the Constitution of the United States and the Acts of Congress."

Immediately after the court handed down its decision on May 13 the court issued an invitation to the union officials to meet with it and prepare an

appeal to the War Labor Board, in accordance with the terms of the judicial permission—that is, that resultant findings should be passed upon by the court. On this suggestion the attitude of the men was that they would be required to submit their claims to a double arbitration, once before the board and then again before the court. A deadlock ensued and the men refused to meet the receivers.

The vote authorizing the union officials to call the men out was taken on May 9. The count was 2,637 to 21. Armed with this authority, the labor leaders on May 10 forced the receivers to agree to ask the court for permission to enter binding arbitration proceedings. The receivers presented their petition in court on May 12. The judges handed down their refusal in less than twenty-four hours, for the ultimatum of the union officials to the receivers on May 10 stated that the men would be called out at midnight on May 14 unless binding arbitration was agreed to by that time.

REVENUES INSUFFICIENT

At the time the receivers petitioned the court for the requisite permission one of them, S. L. Tone, presented a separate statement reviewing the financial history of the company for the past three years. He said that the difficulties the company was now experiencing arose from granting wage increases without making provision to meet the added expense incurred. He submitted that the revenues of the company were not sufficient to meet operating and maintenance demands; that bond interest had been defaulted; and that even indebtedness incurred in the purchase of supplies and equipment had not been paid. He argued that creditors of the company for material delivered had just as valid a claim as the men, particularly in view of the fact that the men, through refusal to accept certain working conditions, had forced labor cost higher than reasonable compliance on their part would have made necessary.

Conductorettes Properly Protected

The Lockwood bill extending the protection of the labor law to women and minors employed in connection with the operation of electric railways was signed by Governor Smith of New York on May 13. The new law, which takes effect immediately, prohibits the employment of females under twenty-one years of age on electric railways and provides that no female employees shall work before 6 o'clock in the morning or after 10 o'clock at night, nor more than nine hours a day for six days a week, and must be allowed one hour for meals. The Governor said:

It has been urged to me that the signing of this bill might mean the loss of positions to some women. I cannot bring my mind to the position where I can be moved by that argument. I regard it as a matter of State duty to protect the health and provide for the welfare of women and minors who must work.

New British Labor Agreement

A general agreement between the tramway systems of Great Britain, represented by the Municipal Tramways Conference and the Tramways & Light Railways' Association, and the employees as represented by the National Transport Workers' Federation, was reached on March 20, 1919, subject to the grant by the authorities of an increase in fares before June 30. Without this grant, the agreement is terminable at one month's notice on either side. The agreement will mean for the London County Council tramways an additional annual expense for labor of \$360,000. This is on a basis, for 1919-1920, of a wages bill of £2,421,250 and car mileage of 53,000,000, the figures for 1918-1919 being 48,052,801 car-miles and a wages bill of £1,888,600. An abstract of the agreement follows:

The working week will consist of forty-eight hours, inclusive of signing on and signing off. Where railways in the past have had a week of fifty-four hours or less, the employees will receive fifty-four hours wages for forty-eight hours work. Where the companies have had a week of more than fifty-four hours, the employees to receive for the reduced working week, wages equal to those received for the week provided such work does not impinge on another man's job and is only of a temporary character. Overtime is to be paid for as mentioned below, and the men are to be guaranteed at least seven hours' work a day.

For work on Christmas in England and on May Day in Scotland, a double time is paid. On the four other general holidays of the year, time and a half is paid. On Sunday time and a quarter is paid. Overtime is carefully specified, but, in general, the rate is time and a quarter for the first two hours and time and a half for any additional work. If an employee works voluntarily on his seventh or "rest" day, he receives time and a quarter on the rate of pay prevailing that day. All employees have a six-day holiday with pay annually after twelve months continuous service, with an additional two days during 1920.

A Scramble for Improvements

The City Council of Seattle, Wash., and the utilities department have received urgent petitions from property owners on East Marginal Way providing for the construction of an electric railway to serve that district. The Industrial Association of the South End is backing the movement, insisting that the railway is essential not only to the industrial development of Seattle and the full usefulness of the investment approximating \$3,000,000 in the Duwamish Waterway, but also that the line would pay by carrying the many employees of plants located along it, and the people of the South Park district.

The plan advocated is to build a connection with the elevated at Spokane Street down East Marginal Way, a distance of approximately 2 miles to a connection with the South Park car line at Eighth Avenue South, diverting the South Park traffic over East Marginal Way and relieving the crowded Georgetown line. The construction of the East Marginal Way railway was approved by the City Council last Au-

gust in an ordinance providing for extensions, and a hearing on the petition for immediate construction will be held before the city utilities committee in the near future. It is pointed out that the cost of the line would not exceed \$775,000, with operating expense about \$250 a day and income about \$500 a day.

Chicago Men Apprehensive

The award of the War Labor Board to the employees of the Chicago (Ill.) Surface Lines, made as of Aug. 1, 1918, was for the period of the war. With the fare situation as it is in Chicago, the employees are becoming apprehensive lest occasion arise for going back to the old wage scale. The situation is reflected as follows in the *Union Leader*, the official journal for Chicago of the organized surface and elevated railway employees:

If Chicago street car men are to be forced to return to a wage ranging from 30 cents to 39 cents an hour, which would mean a wage loss of 23 per cent to 43 per cent, or any reduction from the present wage, it should be plain to everyone what will happen in this city. With war costs still prevailing and going higher, these men cannot exist on a less wage than now paid. In fact, they are finding it difficult to support their families on the present wage, which is not sufficient to provide the necessities of life and the comforts to which their wives and little ones are entitled. Reducing the wages of the Chicago street railway employees would mean a challenge to every worker in this city to protect his wage rights.

Wage Increase in Salt Lake

A decision awarding the employees of the Utah Light & Traction Company, Salt Lake City, a total increase in wages of \$73,000 a year was reached recently by the board of arbitrators which has been considering the wage dispute between the company and its employees.

The award gives the carmen \$60,000 a year increase, the shop and carhouse men \$7,000, and the track men \$6,000. Conductors, motormen and brakemen of the company, under the terms of the award, will receive 39 cents an hour for the first nine months' work, instead of 34 cents an hour for the first twelve months; 43 cents an hour for the second year, instead of 39 cents, and 47 cents an hour thereafter, instead of 42 cents.

An increase of 4 and 5 cents an hour is made in the rate of the shop and carhouse men, and an additional 30 cents a day to the track men.

The most important part of the award pertaining to hours and pay for overtime work provides that all regular runs of regular men shall not exceed nine hours where practical, and that time and a half shall be paid for work by regular crews who have completed a regular day's work and are then called out for extra work. A joint committee is provided for in the award to consist of representatives of the employees and of the company to work together in adjusting runs.

The new wage scale and other provisions of the award became effective on May 1.

Arbitration in Scranton Under Way

With Charlton Ogburn, examiner in charge of the electric railway department of the National War Labor Board, sitting as the fifth man and umpire, the arbitration of the dispute between the Scranton (Pa.) Railway and its employees was begun on April 29. The company's arbitrators are W. L. Connell and Attorney H. C. Reynolds; the union is represented by former Sheriff P. F. Calpin and former Deputy Sheriff John J. O'Malley.

At the opening it was explained that the representatives of the company and the men had agreed relative to most of the items contained in the demands and that the points at issue refer only to the wage scale, reduction of hours for certain workers and time and one-half for overtime. The principal demands follow:

Conductors and motormen, first three months, 58 cents an hour; next nine months, 55 cents; thereafter, 60 cents. Time and one-half is demanded for all work done in excess of the regular schedule runs.

Time and one-half for all crews on sweeper cars and each crew to include three men.

Eight-hour day for carhouse men, shopmen and power house men at the following schedule of wages:

Blacksmiths, 57 cents an hour; car inspectors, 68 cents; armature winders, 70 cents; men now classed as monthly men, 68 cents; blacksmiths, 71 cents; drill press men, 68 cents; pit men, 68 cents; car washers, 57 cents; fire men, 62 cents; oilers, 57 cents; pit helpers, 68 cents; painters, 68 cents; janitors and watchmen, 57 cents; controller men, 68 cents; pipe fitters and repair men, 68 cents and sprindler men, 57 cents.

Eight-hour day for trackmen and track foremen and the following wage scale: Trackmen, 57 cents an hour; foremen, 64 cents an hour; teamsters, 57 cents.

News Notes

Something New in Taxes.—The new revenue bill in Louisville, Ky., designed to supply funds for the city to offset the saloon revenue, which will be lost after July 1, will include a provision that all street car advertising in the city shall be taxed \$300 a year.

Wages Up in Alliance.—Motormen and conductors of the Stark Electric Railway, Alliance, Ohio, were granted an increase in wages on May 7. Men on the city lines in Alliance will receive an advance of 3 cents and those on the interurban line an advance of 4 cents an hour.

Peculiar Wreck on Ohio Road.—On April 30 several workmen were injured in a head-on collision between a work car and a freight car on the Columbus, Delaware & Marion Railway. A derrick on the work car fell across the trolley wire and the short-circuit this made set fire to the cars, which were destroyed before the apparatus sent by the Delaware fire department reached the scene.

Promise of Five Cents More an Hour.—A strike on the Toledo, Bowling Green & Southern Railway, Findlay, Ohio, was averted on May 8 through the promise of Charles F. Smith, general manager, that he would make a recommendation to the board of directors of the company that the men be granted an increase of 5 cents an hour in wages.

Five-Cent Wage Increase.—Conductors and motormen of the Cleveland, Alliance & Mahoning Valley Railroad, Ravenna, Ohio, have been granted an increase in wages of 5 cents an hour. The new pay schedule provides 40 cents an hour for the first year of service, 43 cents an hour the second year and 45 cents the third year.

Railway Displays Skyscraper.—The St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo., is displaying a new window decoration in the form of a miniature skyscraper 7 ft. high and brilliantly lighted from the inside with electric lights. The model is taken from the Union Central Building in Cincinnati, which is 495 ft. high, reaching thirty-eight stories above ground.

Back Pay by May 24.—The receivers of the Rhode Island Company, Providence, R. I., have informed the officers of the union that, in the event of no appeal from the order of the court to pay the back wages due the car men being taken within the statutory time allowed, payment of such wages will begin on May 24, and be completed as soon as possible. The executive board of the union met immediately after the adjournment of the conference and unanimously concurred in the action of the union officers in accepting the receivers' proposition.

War Savings Society Started.—The British Columbia Electric Railway War Savings Society has been started with a branch at the head office. Each Tuesday every employee signing up will be called upon and given a thrift stamp or stamps for the amount he hands over. He can buy more stamps than he signs up for. As his thrift card is filled up, he will be able to buy a War Savings stamp with it. The next step will probably be the formation of War Savings societies in New Westminster, North Vancouver and the various other units of the company.

Wage Agreement on New York State Lines.—The New York State Railways and representatives of the employees have signed an agreement for a year. The agreement covers Rochester, Syracuse and Utica and calls for the same pay as during the last year. Under this agreement men beginning work on the cars will draw 41 cents an hour for the first three months. They will then be jumped to 43 cents an hour for nine months, and all men who have worked a year or more will get 45 cents an hour. Time and a half will be paid for overtime. This agreement is in accordance with the finding of the War Labor Board which was handed down last year.

Wage Disagreement in Sioux City.—The employees of the Sioux City (Iowa) Service Company have rejected the offer of a wage increase of 2 cents an hour, made as a compromise offer to the union's demand for an increase of 15 cents over the prevailing scale of 30 cents and 35 cents an hour. In the company's communication to the men it was stated the 2-cent raise would be allowed, although the present condition of finances did not warrant it, but the company made plain that it would not grant the nine-hour day and the clause for time and a half for overtime asked by the men. The union voted to submit a proposition for arbitration to the service company.

Improvements Planned in Quincy.—In compliance with the wishes of the City Council, the Chamber of Commerce and patrons of the company generally, the officers of the Quincy (Ill.) Railway, which is included in the Illinois Traction System, have agreed to install twenty-five new cars, to run cars more frequently on nearly all of the lines and to improve the roadway. The company has been anxious to make these improvements, but has been prevented by the war situation. At the request of the railway, President Fawcett of the local Chamber of Commerce has appointed a committee of city officials and business men to go to St. Louis and inspect the type of cars proposed for the Quincy lines.

Programs of Meetings

Arkansas Utilities Association

The date of the convention of the Arkansas Utilities Association has been changed from May 20-23 to June 10-12 on account of the dates in May conflicting with the convention of the National Electric Light Association at Atlantic City.

Hearing of Public Utilities Committee at Washington

The second public hearing of the public utilities committee of the United States Chamber of Commerce on means for relieving the electric railway situation will be held in Washington, D. C. on May 28-29.

The first hearing of the public utilities committee was held in St. Louis at the time of the meeting of the Chamber of Commerce in that city and was reported in last week's issue of this paper.

The purpose primarily is to secure testimony on the best form of street railway franchise, the future direction of prices, the mutual interest of the home-owner and retail merchant in good street railway service, possible future economies in operation, relief from special taxes and other extra burdens and service-at-cost franchise plans.

The hearings will be held in the rooms of the United States Chamber of Commerce in the Riggs Building, Washington

Financial and Corporate

\$374,017 Deficit for Chicago Railways

Decreased Earnings and Higher Expenses Cause Loss of Almost Twice Net of Fiscal Year 1917-18

Another aspect of the heavy loss in gross earnings of the Chicago (Ill.) Surface Lines during the year ended Jan. 31, 1919, is shown in the recent report of the Chicago Railways. This part of the unified surface system suffered a decline from a net income of \$409,975 in the preceding fiscal year to a deficit of \$374,017 in the latest fiscal year. The Chicago Surface Lines include the Chicago Railways and the companies known as the South Side Lines, namely, the Chicago City Railway, the Southern Street Railway and the Calumet & South Chicago Railway.

INCOME STATEMENT OF CHICAGO RAILWAYS FOR YEARS ENDED JAN. 31, 1918 AND 1919

| | | |
|--|---------------------|---------------------|
| 60 per cent of residue receipts of Chicago surface lines... | 1919 \$5,386,896 | 1918 \$7,207,762 |
| Joint account expenses and adjustments applicable to previous years..... | 198,831 | 368,205 |
| | \$5,188,065 | \$6,839,557 |
| Interest at 5 per cent on valuation..... | 4,501,960 | 4,418,135 |
| Income divisible with city of Chicago..... | \$686,105 | \$2,421,422 |
| City's share, 55 per cent..... | 377,358 | 331,783 |
| Company's share, 45 per cent | | |
| 5 per cent interest allowance on capital valuation of property..... | 4,501,961 | 4,418,136 |
| Interest on bank balances..... | 31,146 | 66,992 |
| Interest on treasury securities | 78,778 | 79,392 |
| Total income..... | \$4,920,632 | \$5,654,359 |
| Deductions: | | |
| Interest accrued on— | | |
| First mortgage bonds.... | \$2,784,050 | \$2,784,050 |
| Consolidated mortgage bonds..... | 1,772,947 | 1,777,884 |
| Purchase money bonds.... | 203,649 | 203,650 |
| Interest on loans..... | 19,475 | |
| Sinking fund reserve accrued..... | 250,000 | 250,000 |
| Federal income tax on interest coupons..... | 42,000 | 60,000 |
| Corporate expenses and adjustments..... | 222,528 | 168,800 |
| Total deductions..... | \$5,294,649 | \$5,244,384 |
| Net income..... | \$374,017 | \$409,975 |
| * Deficit. | | |

As shown in the ELECTRIC RAILWAY JOURNAL of April 5, 1919, the net income of the Chicago City Railway, which constitutes most of the other part of the unified system, fell from \$1,501,384 in 1918 to \$846,186 in 1919. These losses were the result of a loss of \$404,535 in the gross earnings of the combined surface lines and an increase of \$2,630,242 or 11.3 per cent in operating expenses, the expenses of conducting transportation alone advancing \$1,675,139, or 15.5 per cent. Detailed figures for the combined lines, before the splitting of the residue receipts 40 per cent to the South Side Lines and 60 per cent

to the Chicago Railways, were published in the issue of April 5.

The accompanying table gives the details for the Chicago Railways. This company's surplus carried forward from the year ended Jan. 31, 1918, after the deduction of \$100,000 of interest on adjustment income bonds, was \$411,143. This, with the loss for the latest year of operation, left a surplus balance of \$37,126 on Jan. 31, 1919. This figure is secured without provision for interest on adjustment income bonds for the year ended on that date.

The chief items of the company's income are the 5 per cent interest return on the capital valuation as fixed by the ordinance, and its share (45 per cent) of the net receipts divisible with the city. The 5 per cent interest return provides for the interest on that portion of the bonded debt of the company which is equal in amount to and therefore covered by the purchase-price of the property. The company, however, has an outstanding bonded debt in excess of the capital valuation or purchase price. The result is that the only source (aside from miscellaneous income) from which can be paid the interest on these excess bonds is the company's proportion of the net divisible receipts.

During the six-months period beginning Aug. 1, 1918, when the wage award of the War Labor Board became effective, not even the 5 per cent interest on the capital valuation was earned. Thus for this period as a whole there were no divisible receipts. Consequently, since August the interest was hardly earned on the bonds covered by the purchase price, to say nothing of those not covered by the purchase price.

The capital account or purchase price of the property at the close of the year was as follows: Purchase price Jan. 31, 1918, \$89,529,413; added during the year for capital additions to the property, \$1,058,227; purchase price Jan. 31, 1919, \$90,587,640. Only absolutely essential additions to the property were made during the year.

The condition of the renewals and depreciation reserve fund at the close of the year was as follows:

| | |
|---|-------------|
| Amount in reserve fund Jan. 31, 1918..... | \$5,150,945 |
| Additions to fund during year..... | 1,948,305 |
| | \$7,099,250 |
| Renewal expenditures during year..... | 1,378,544 |
| Reserve fund at Jan. 31, 1919..... | \$5,720,706 |

This fund is an actual deposit in bank. It is the principal item of "cash and cash items" appearing in the balance sheet. No expenditures may be made from this fund except with the approval of the Board of Supervising Engineers as prescribed by the ordinance.

D. & H. Lines Suffer

Increased Burdens Bear Heavily Upon Electric Railway Subsidiaries of Company During 1918

Nothing in the adverse conditions of the last few years quite approximated the difficulties of 1918 for the electric railway subsidiaries of the Delaware & Hudson Railroad. The report of this company for the year ended Dec. 31, 1918, gives the following data in regard to the various controlled electric railway lines:

ALBANY INCOME DOWN \$23,000

The gross operating revenues of the United Traction Company, Albany, N. Y., amounted to \$2,530,057, operating expenses to \$2,211,417 and net operating income to \$124,835. These figures show an increase in operating revenues, as compared with 1917, of \$71,209; an increase in operating expenses of \$94,528, and a decrease in net income from operations of \$23,008. Compared with 1913, operating revenues decreased \$16,566, operating expenses increased \$545,767, and net operating income decreased \$552,926. The year 1918 shows a net deficit, after payment of fixed charges, of \$132,740, an increase over the deficit of 1917 of \$78,634, or 145.33 per cent.

HUDSON VALLEY DECREASE

The operating revenues of the Hudson Valley Railway, Glens Falls, N. Y., amounted to \$803,344, the operating expenses to \$695,153 and the net operating income to \$62,127. Compared with 1917, operating revenues increased \$100,969, operating expenses increased \$174,052, and net operating income decreased \$76,967.

To compare the calendar year 1918 with 1913, the later year showed an increase in operating revenues of \$97,236; operating expenses, an increase of \$220,266, and net operating income, a decrease of \$132,925. The net deficit of 1918, after payment of fixed charges, was \$118,364, an increase of \$13,239, or 12.59 per cent.

The operating revenues of the Plattsburg (N. Y.) Traction Company were \$33,907, operating expenses, \$24,498, and net operating income \$7,786. These data show a decrease of \$4,972 in operating receipts, compared with 1917; a decrease of \$3,919 in operating expenses, and a decrease of \$1,235 in net operating income. The net income, after payment of fixed charges, was \$1,695.

STILL ANOTHER DECREASE

The Troy & New England Railway, Troy, N. Y., had gross operating revenues aggregating \$33,037, operating expenses of \$27,090 and net operating income of \$4,585. Compared with 1917, there was an increase in these revenues of \$3,213, an increase in operating expenses of \$7,442 and a decrease in net operating income of \$4,229. The net deficit, after fixed charges, was \$5,729.

Reorganization Filed

Plan Presented to California Commission Under Which Oakland & Antioch Railway Will Be Readjusted

The reorganization committee for the Oakland & Antioch Railway has filed with the California Railroad Commission a petition for an order approving the plan the committee has provided for the readjustment of the finances of the companies involved—the Oakland & Antioch Railway, the Oakland, Antioch & Eastern Railway and the San Ramon Valley Railroad. The plan provides for the organization of the San Francisco, Oakland & Sacramento Valley Railway as the successor company, and the issuance of first mortgage bonds and common and preferred stock in accordance with the agreement.

The total authorized bond issue will be \$3,000,000. Not to exceed \$1,950,000 of the par value of these bonds will be used or set aside for the purpose of carrying out the reorganization plan. The balance of the bonds, \$1,050,000 par value, will remain in the treasury and may be issued for the purpose of defraying cost of additions and betterments. Furthermore, the deed of trust securing these bonds will provide that the remaining bonds will be issued only if the net earnings for the twelve months preceding have been at least one and one-half times the annual interest on the bonds outstanding plus one and one-half times the annual interest on the bonds to be issued.

COMMON AND PREFERRED STOCK

Six per cent preferred stock will be authorized to the amount of \$1,500,000, par value. Not to exceed 13,300 shares of this stock will be issued for reorganization purposes; the balance, 1700 shares, will remain in the treasury to finance additions and betterments.

Common stock will be authorized to the amount of \$4,000,000 par value, consisting of 40,000 shares of a par value of \$100 each. The common stock is to be non-assessable.

Creditors having first and direct liens on the mortgaged property which are valid and enforceable at law, and are approved by the bondholders' committee, are to be paid in cash.

The Oakland & Antioch Railway bondholders, Oakland, Antioch & Eastern Railway bondholders and San Ramon Valley Railway bondholders are to surrender all bonds held by them, together with all unpaid coupons maturing on or after Jan. 1, 1915, and will receive therefor:

Twenty-year first mortgage 5½ per cent gold bonds of a par value equal to 20 per cent of the par value of the bonds now held by bondholders; 6 per cent preferred stock of a par value equal to 20 per cent of the par value of bonds now held by the bondholders, and common stock of a par value equal to 60 per cent of the par value of bonds now held by the bondholders.

Creditors whose claims are secured by bonds are to cancel their obligations, and receive for each bond new twenty-

year first mortgage 5½ per cent gold bonds, preferred stock and common stock in proportions noted.

Holders of Oakland, Antioch & Eastern Railway 6 per cent four-year convertible gold notes come within the provisions of this subdivision. Each depositing noteholder will be treated as if each note was separately secured by its pro rata of all the bonds held by the Union Trust Company, San Francisco, as security for the entire "Four Year Convertible Gold Note" issue.

Creditors whose claims are valid and enforceable at law and are approved by

the bondholders' committee are to cancel their claims and receive common stock remaining in the treasury after common stock has been distributed to bondholders and secured creditors.

The advantages claimed for the reorganization plan follow:

The fixed annual charges are kept well within the net annual income of the road conservatively figured. Bondholders retain the full benefit of all the security they hold after providing only for such creditors as already hold a lien prior to their lien. Creditors are dealt with in the order of their equities and treated in accordance with their equities. Bondholders automatically, through stock ownership, secure the benefits of all increased earnings as they accrue. The company will be permitted in the future to maintain its road and equipment in a state consistent with the best possible service to the public. Provision is made for additions and betterments, with proper safeguards to the interest of bondholders and stockholders.

Dallas Outlook Bad

President Strickland Points Out Inadequacy of Income and Difficulty of Raising New Money

The Dallas (Tex.) Railway is in a bad way financially after eighteen months of operation under the service-at-cost franchises, according to J. F. Strickland, president of the company. During this time, Mr. Strickland says, the company has earned on its capital an average of 4.1 per cent a year, not one penny of which has gone for dividends but which has been used for improvements and betterments. The rate of return permitted under the franchises upon the agreed valuation is 7 per cent a year.

The Dallas Railway, according to Mr. Strickland, is financed by short-time notes amounting to practically the value of the property owned at the time the franchises were granted. These notes amount to \$5,000,000 and fall due on April 1, 1922. With the present earning capacity, as disclosed during the eighteen months of operation, Mr. Strickland has little hope that he will be able to refinance the company when the notes fall due. The notes are held by a holding company and are not secured.

The only hope, Mr. Strickland believes, is that the holders of the notes of the Dallas Electric Light & Power Company, a subsidiary company of which Mr. Strickland is also president and which has shown earnings of 9 per cent during its term of operation under the service-at-cost franchise, will be sufficiently well pleased with the investment that they will be willing to take the notes of the traction company too.

HIGHER FARES FAILED ELSEWHERE

In answer to a direct question, Mr. Strickland stated he is opposed to increased fares, and that if it comes to a point where fares must be raised to avoid bankruptcy, he is through with the Dallas Railway. Increased fares, in his opinion, have proved unpopular wherever they have been tried, and the experience of those companies that have resorted to this plan for increasing revenues is that the plan has failed

dismally. The unpopularity of the increased fare, coupled with its inconvenience, has almost universally resulted in decreased earnings through decreased patronage. In these days of automobiles, electric railways are compelled to cater to the public, for otherwise the electric carriers will get little business.

NEW MONEY HARD TO RAISE

Speaking of the possibility of the Dallas Railway raising funds for additional improvements, Mr. Strickland said the company had already been compelled to pledge its property for the loan of \$1,000,000 for improvements required under the terms of its franchise. These improvements are now being made. This loan of \$1,000,000 cost the company 10 per cent, as it was necessary to go to Scandinavian banking houses to get the money, for which 7 per cent had to be paid, and the bonds had to be discounted 3 per cent in this country, making the total cost 10 per cent. The whole Dallas property is pledged to pay this loan and the money borrowed to erect the Interurban Building, and it cannot be pledged for additional loans. Dallas will need extensions and improvements after the \$1,000,000 now being spent is gone, but where the money is to come from is not known. The question, Mr. Strickland said, is one he will put frankly up to the public.

The gross income of the company has increased 33½ per cent during the last year since the jitneys were put out of operation, but during the same time the cost of operation has increased 46 per cent. While it is expected that the gross income will continue to increase for some time, it is regarded as highly improbable that the operating cost will be decreased to any material extent for many years, if at all.

One of the plans for relief that has been suggested is for the city to relieve the company of its paying obligations, which have been a heavy drain on the company's income.

Financial News Notes

Wants Line Reopened.—A petition for a hearing over the reopening of the Lee-Huntington line of the Berkshire Street Railway has been filed with the Public Service Commission.

Protest Against Abandonment of Ohio Road.—On April 30 the Commissioners of Hamilton County filed with the Public Utilities Commission of Ohio a protest against the abandonment of the Cincinnati & Columbus Traction Company's line. The hearing has been set for May 28.

Ohio Road Sold.—The Fishel & Marks Company, Cleveland, Ohio, is reported to have purchased the property of the Columbus, Magnetic Springs & Northern Traction Company, Richwood, Ohio, for \$88,133, two-thirds of the appraised value. The road has not been operated since Jan. 1.

Interurban Merger Being Urged.—A merger of the Elgin & Belvidere Electric Company and the Rockford & Interurban Railway in the interest of through service and faster time between Elgin and Rockford, Ill., is said to be under way. The merger is being urged especially since Camp Grant has been made a permanent institution, with prospects of a steady volume of both freight and passenger business.

Representatives of Note Holders at Birmingham.—A conference of several of the large note holders of the Birmingham Railway, Light & Power Company, Birmingham, Ala., which is now in the hands of a receiver, was held recently in Birmingham. George Hooper Taylor and E. H. Rollins, bank-

ers, Chicago, and others attended the conference. They conferred with City Commissioner J. Ellis Brown and asked a number of questions in regard to the service and how the business of the company was progressing.

Canadian Government Makes Payment.—It is announced that the Canadian government has paid to the Quebec Railway, Light, Heat & Power Company, Quebec, Que., the balance of the money owed it in connection with the sale of the Saguenay Railway, making, with the amount paid at the time of the sale, a total of about \$3,400,000. The railway will use this money to reimburse the bondholders of the Saguenay Railway, which will benefit the Quebec company by relieving it of its obligation in the form of interest on the Saguenay bonds.

Committee Report Postponed.—The special committee named by the Indianapolis (Ind.) Street Railway, operated under lease by the Indianapolis Traction & Terminal Company, to devise a plan for reducing the fixed charges and eliminating sinking funds will report to the stockholders on June 2. The committee planned to submit its report on May 8, but it was unable to do so, and an extension of time was granted. The appointment of the committee was regarded as the first step toward the financial readjustment of the local Indianapolis lines. The matter was referred to in the ELECTRIC RAILWAY JOURNAL of April 26, page 840.

New Directors for Chicago Suburban Lines.—At a special meeting of the board of directors of the Aurora, Elgin & Chicago Railroad, held in Chicago, Ill., on May 3, R. M. Stinson of R. M. Stinson & Company, Philadelphia; Lewis B. Williams of Hayden, Miller & Company, Cleveland, and A. B. Conant of A. B. Conant & Company, Boston, were elected to the board of directors. Messrs. Stinson, Williams and Conant, who are members of the

protective committee recently formed to safeguard the interests of the company's first and refunding mortgage bonds, accepted places on the board of directors for the better protection of the interests which they represent.

Foreclosure Sale on May 24.—All of the property of the Parkersburg & Ohio Valley Electric Railway, Parkersburg, W. Va., which operated between Friendly and Sistersville, will be sold at public auction on May 24 at Parkersburg, by Judge M. H. Willis, New Martinsville, special commissioner. The object is to pay off the debts of the concern. The line has had a troublous career ever since its organization in 1903. After several years of operation by the interests that built it, the road passed into a federal receivership. Then the Tyler-Wetzel Traction Company leased the line and tried to operate it, but it proved unprofitable. No cars have been run on the line for several years. The road is advertised as being "valuable for its material or for consolidation with two adjacent lines of electric railway."

\$4,500,000 Michigan Railroad Bonds Offered.—The Michigan Railroad, Kalamazoo, Mich., which owns and operates interurban railroads in Michigan, has sold to the National City Company, New York, \$4,500,000 of first mortgage five-year 6 per cent gold bonds. The bonds were offered on May 13 at 95 and interest to yield 7.21 per cent. The mortgage will provide for a sinking fund to retire semi-annually \$50,000 of the issue. The company is required, under the mortgage, to expend annually or deposit in cash with the New York trustee in a general reserve fund not less than 20 per cent of its gross earnings for maintenance, repairs, replacements and renewals of the property. Net earnings are nearly 1.85 times the annual interest charges on the first mortgage bonds.

Electric Railway Monthly Earnings

BANGOR RAILWAY & ELECTRIC COMPANY, BANGOR, ME.

| Period | Operating Revenue | Operating Expenses | Operating Income | Fixed Charges | Net Income |
|-----------------|-------------------|--------------------|------------------|---------------|------------|
| 1m., Mar., '19 | \$83,717 | \$57,862 | \$25,855 | \$20,217 | \$5,638 |
| 1m., Mar., '18 | 76,107 | \$47,448 | 28,659 | 19,621 | 9,038 |
| 12m., Mar., '19 | 949,857 | \$617,288 | 332,569 | 241,040 | 91,529 |
| 12m., Mar., '18 | 892,825 | \$527,164 | 365,661 | 231,360 | 134,301 |

INTERBOROUGH RAPID TRANSIT COMPANY, NEW YORK, N. Y.

| | | | | | |
|----------------|-------------|-------------|-------------|--------------|--------------|
| 1m., Mar., '19 | \$3,994,180 | \$2,625,592 | \$1,368,588 | \$1,556,053 | \$119,337 |
| 1m., Mar., '18 | 3,649,670 | \$2,025,425 | 1,624,245 | 1,175,342 | \$502,934 |
| 9m., Mar., '19 | \$1,260,158 | \$1,435,806 | 9,604,352 | \$13,584,175 | \$13,377,064 |
| 9m., Mar., '18 | \$3,014,418 | \$1,896,992 | 13,247,026 | 9,998,674 | \$3,656,733 |

NASHVILLE RAILWAY & LIGHT COMPANY, NASHVILLE, TENN.

| | | | | | |
|-----------------|-----------|-------------|----------|----------|----------|
| 1m., Mar., '19 | \$267,284 | \$194,902 | \$72,382 | \$39,880 | \$32,502 |
| 1m., Mar., '18 | 218,584 | \$141,476 | 77,108 | 40,980 | 36,128 |
| 12m., Mar., '19 | 3,036,775 | \$2,097,087 | 943,688 | 478,712 | 464,976 |
| 12m., Mar., '18 | 2,471,564 | \$1,601,615 | 870,949 | 489,600 | 381,349 |

NORTHERN TEXAS ELECTRIC COMPANY, FORT WORTH, TEX.

| | | | | | |
|-----------------|-----------|-------------|-----------|----------|-----------|
| 1m., Feb., '19 | \$229,801 | \$149,028 | \$80,773 | \$27,966 | \$52,807 |
| 1m., Feb., '18 | 237,353 | \$141,189 | 96,164 | 28,238 | 77,309 |
| 12m., Feb., '19 | 2,916,386 | \$1,903,954 | 1,012,432 | 336,093 | 770,738 |
| 12m., Feb., '18 | 2,740,100 | \$1,534,565 | 1,205,535 | 347,427 | 1,906,024 |

* Includes taxes. † Deficit. ‡ Includes non-operating income ** Revised report. † In December, 1918, \$331,482; December, 1917, \$150,706; twelve months, 1918, \$539,189; twelve months, 1917, \$180,706, included for depreciation.

PENSACOLA (FLA.) ELECTRIC COMPANY

| Period | Operating Revenue | Operating Expenses | Operating Income | Fixed Charges | Net Income |
|-----------------|-------------------|--------------------|------------------|---------------|------------|
| 1m., Feb., '19 | \$49,842 | \$39,487 | \$10,355 | \$9,115 | \$1,240 |
| 1m., Feb., '18 | 35,228 | \$23,829 | 11,399 | 7,996 | 3,403 |
| 12m., Feb., '19 | 534,016 | \$390,561 | 143,455 | 102,220 | 41,235 |
| 12m., Feb., '18 | 368,674 | \$222,194 | 146,680 | 94,020 | 52,660 |

PORTLAND RAILWAY, LIGHT & POWER COMPANY, PORTLAND, ORE.**

| | | | | | |
|-----------------|-----------|-------------|-----------|-----------|-----------|
| 1m., Dec., '18 | \$741,742 | \$8716,469 | \$25,273 | \$188,894 | \$183,621 |
| 1m., Dec., '17 | \$94,020 | \$8479,885 | 114,135 | 179,036 | 164,901 |
| 12m., Dec., '18 | 7,667,129 | \$5,127,035 | 2,540,094 | 2,218,187 | 321,907 |
| 12m., Dec., '17 | 6,023,509 | \$3,576,959 | 2,446,916 | 2,152,051 | 294,865 |

SAVANNAH (GA.) ELECTRIC COMPANY

| | | | | | |
|-----------------|-----------|-----------|----------|----------|-----------|
| 1m., Feb., '19 | \$96,399 | \$82,917 | \$13,482 | \$25,356 | \$181,874 |
| 1m., Feb., '18 | \$5,198 | \$6,906 | 28,292 | 24,382 | 3,910 |
| 12m., Feb., '19 | 1,214,833 | \$908,972 | 305,861 | 305,291 | 570 |
| 12m., Feb., '18 | 1,002,397 | \$672,128 | 330,269 | 292,499 | 37,770 |

TAMPA (FLA.) ELECTRIC COMPANY

| | | | | | |
|-----------------|-----------|-----------|----------|---------|----------|
| 1m., Feb., '19 | \$102,948 | \$58,728 | \$44,220 | \$5,338 | \$38,882 |
| 1m., Feb., '18 | \$7,102 | \$47,303 | 39,799 | 5,261 | 34,538 |
| 12m., Feb., '19 | 1,096,591 | \$639,299 | 457,292 | 61,722 | 395,570 |
| 12m., Feb., '18 | 992,187 | \$569,706 | 422,481 | 57,836 | 364,645 |

TWIN CITY RAPID TRANSIT COMPANY, MINNEAPOLIS, MINN.

| | | | | | |
|----------------|-----------|-----------|-----------|-----------|----------|
| 1m., Mar., '19 | \$914,419 | \$672,932 | \$241,487 | \$162,156 | \$79,331 |
| 1m., Mar., '18 | \$83,293 | 614,391 | 220,902 | 160,696 | 60,206 |
| 3m., Mar., '19 | 2,618,503 | 1,976,393 | 642,110 | 471,501 | 170,609 |
| 3m., Mar., '18 | 2,457,390 | 1,881,090 | 576,300 | 466,150 | 110,170 |

Traffic and Transportation

Zones for San Diego

Suggestion Is Made for Five-Cent Stand-By Charge and Commutation Rates

The preliminary hearing of the San Diego (Cal.) Electric Railway before the State Railroad Commission on its application for an investigation into the affairs of the company came to an end on April 30 with the presentation of the suggestions of the company regarding the schedule of fares which should be allowed in order to afford the company sufficient revenue for its maintenance and an examination of the present condition of the company's roadbed in different parts of the city. The final hearing, based upon the commission's examination of the data which has been prepared and presented by the company, will be held on June 17.

A FIVE-CENT BARE

The suggestion of the company provides for the creation of a zone system by which the short and long hauls shall be differentiated, with a charge of 5 cents a ride for all journeys within the limits of the "inner" zone, and a fare of 16 cents for all rides of whatever length in the "outer" zone.

All fares for rides beginning and ending in the inner zone are to be 5 cents, including transfer privilege. The distance which may be traveled within this zone for 5 cents is approximately 3.3 miles.

The outer zone is to include all the territory from the edge of the inner zone to the limits of each car line, with the exception of the National City and Chula Vista line. The fare for all rides originating or ending in the outer zone, without regard to their length, will be 10 cents.

Patrons, however, may go for 10 cents through both zones into any part of the city with the same transfer privileges which are now extended. Thus, a patron may ride only ten blocks in the outer zone, and his fare will be 10 cents, or he may pass for the same fare from one end of the outer zone through the inner zone to the end of another portion of the outer zone.

STAND-BY CHARGE EXPLAINED

The reason for the foregoing plan is that a car, in serving the outside districts, is giving a "stand-by," or "ready-to-serve" service which must be continually maintained, and which is brought about by the expense necessarily incurred in sending a car over the entire line in order to reach a patron in the outlying districts. Under any other system, it is pointed out, patrons could ride for 5 cents over long distances, subjecting the company to a heavy surcharge, due to the necessity

for maintaining service through both the inner and outer zones, without an adequate return on the investment or maintenance charges.

Modifications of the 10-cent fare are suggested, however, which will effect a material saving over the straight cash payment. The first of these modifications is based upon the belief of the officials of the company that the patron who uses a car at least twice a day is to be considered, as it were, a wholesale patron, to whom transportation is being sold in quantities, and who is therefore entitled to a wholesale price. To such a person it is the plan of the company to sell a commutation book with two tickets good for each day of the calendar month, the price of the book to be \$4. The tickets will be good only for the day for which they are stamped, but they will be transferable and they will carry the present transfer privileges.

A second rate for the patrons will be a 7½-cent ticket, which will be sold in blocks of four or more. This ticket must also be used in the month in which it is bought and is transferable to other parties. It also carries the usual transfer privilege.

Wants Ten Cents in Cuyahoga Falls

At a special session of the Village Council of Cuyahoga Falls, Ohio, on April 30 a formal application for a new franchise of five years duration was presented by the Northern Ohio Traction & Light Company in a communication signed by A. C. Blinn, general manager, accompanied by a proposed franchise ordinance covering many points relative to operations, pavements, rights-of-way, etc., and containing the important fare question, as follows:

A cash fare of 10 cents between Cuyahoga Falls and Akron.

Five tickets for 30 cents good for transportation from any point in Cuyahoga Falls to a transfer point in Akron.

One cent additional for transfers.

At the conference between the traction officials, the Councilmen and Mayor, and a citizens' committee, some time ago, the company was told that the village insisted on a 5-cent fare to a transfer point in Akron, and 1 cent additional for transfers.

The proposal of the company as submitted on April 30, apart from the 10-cent cash fare item, is 1 cent from being in agreement with the proposal of the village.

According to Mayor Taylor, who presided at the meeting, no franchise will be granted which calls for a fare of 10 cents, cash or otherwise, between Cuyahoga Falls and Akron.

The proposal of the company was referred to the Council as a whole.

Increase Not Contemplated

Motives of Philadelphia Rapid Transit Company in Advertising Fare Changes Misunderstood

No intention of asking the public of Philadelphia to subscribe to an increase in fare is intended by the Philadelphia (Pa.) Rapid Transit Company, according to statements made by officials. It is declared that the fare is to remain 5 cents a trip, plus the addition of 3 cents for a transfer, as it has been for years.

The statements were made in reply to numerous inquiries which have been made in regard to the placards which have been displayed in all cars for several weeks and which tabulate the fares of several leading cities, to wit: Boston, 8 cents; Pittsburgh, 7 cents; St. Louis, 6 cents; Philadelphia, 5 cents. The idea seems to have spread that this publication was leading up to a demand for a fare increase. An official of the company is quoted in the Philadelphia *Public Ledger* as follows:

The whole idea of publishing this table and displaying it prominently in the trolley cars was to inform the traveling public exactly how cheap are the transportation facilities afforded them by our lines. There was no idea whatsoever of leading up to a demand for an increase in fares.

The signs have been removed from the cars, and this removal, I understand, has given rise to suggestion that they were only used with the purpose of impressing upon the people of Philadelphia that they were the objects of a proposed and subsequent legislation leading to an increase in proportion to that now in effect in other large cities. But their removal had nothing to do with any such purpose, even if it was contemplated.

We have substituted Willow Grove signs, because it is necessary to give the public and its free attractions all the advance publicity possible at this time of the year. It costs many thousands of dollars to provide these amusements, therefore it is readily apparent, or it should be, that we must avail ourselves of all possible means to advertise them properly.

Rainier Valley Line Wants Six Cents

The Public Service Commission of Washington recently notified Corporation Counsel Walter F. Meier of Seattle, Wash., that a hearing would be held in that city on the application of the Seattle & Rainier Valley Railway to increase fares on its lines. The company's new tariff, filed with the commission, provides for an increase of regular fare to 6 cents with a charge of 1 cent for transfers to other lines and charge of 2 cents on all transfers from other lines.

The purchase of this company's lines is proposed by the city to complete the municipal railway system. Negotiations were opened by the city when the purchase of the railway lines of the Puget Sound Traction Light & Power Company was approved last December. In anticipation of the purchase of the Rainier Valley lines, the Legislature at the request of the city of Seattle, passed a law permitting cities to operate railways outside the corporate limits. This permits Seattle to operate the Renton interurban line, which is a part of the Rainier Valley system.

Boston Elevated Service Improvements

Many Changes Carried Out Recently in the Interests of the Public and As Economies to the Company

C. D. Emmons, general manager of the Boston (Mass.) Elevated Railway, recently issued a press statement summarizing improvements in service on the Boston property since Dec. 1, 1918, and outlining work now in progress to better transportation facilities in the metropolitan district.

SEATING CAPACITY INCREASED

There has been an increase in seating capacity on the entire system of 6 per cent. In the Washington Street tunnel a 50 per cent increase in service has been provided, and in the Cambridge subway four-car service is now furnished in the rush hours. The East Boston and Chelsea service of the company has been increased by the addition of two-car train service in rush hours, through the East Boston tunnel. At Park Street, Boston, the subway service has been improved by the substitution of many two-car trains in rush-hour periods for single cars, and in the maximum hour 271 cars are now supplied at this important traffic center.

Deliveries have begun on 250 center-entrance cars lately ordered at an outlay of more than \$3,000,000. From seventeen to twenty cars a week are now being painted in the company's shops, and this rate will soon be increased to twenty-five a week. A one-man car has been placed in test service in West Roxbury. Between Jan. 7 and May 5 the Board of Health inspected 8426 cars for cleanliness. Of these, 6909 were given 100 per cent, and only thirty-three were marked below 70 per cent, the "passing" mark. Of 8475 cars inspected for ventilation, 6909 cars were graded at 100 per cent, and thirty-four were marked below 70 per cent. Regarding overcrowding, 8960 cars were inspected, 7705 being given 100 per cent and only fifty-three below 70 per cent. In every case where a car was checked below the passing mark, the number of the car was taken and the condition was immediately remedied.

BUDGET SYSTEM ESTABLISHED

An important forward step has been taken in the establishment of a budget system, under which the company plans to expend \$21,500,000 for improvements during the next five years. This was detailed in the *ELECTRIC RAILWAY JOURNAL*, Feb. 22, 1919, page 367. Within a few weeks the Everett elevated extension has been opened, representing a cost of \$3,000,000, and shortening the running time between Malden, Everett and Boston by about five minutes and eliminating the necessity for changing cars at the Sullivan Square station in Charlestown.

The company is restoring to their jobs all returning service men from the United States forces. So far about 600 men have been reinstated, out of 1743 men who served in the war. Other im-

provements in the service include track rearrangement and reconstruction, new track laying, etc., totaling about \$1,000,000 appropriation; rearrangement of ticket booths and provision of increased platform attendance at certain points; destruction of 500 antiquated cars formerly stored at Forest Hills; introduction of metal tickets; provision for rush-hour sale of metal tickets from bags in charge of extra employees stationed at subway entrances; a campaign against expectation, and a closer following up of the causes of collisions. A minor but appreciated convenience is the provision of broken stone platforms at reservation stops.

London Proposes to Shorten Zones

On April 15 the London County Council voted to increase the fares on its tramway lines. At present routes are divided into sections of an average length of 0.6 mile, any three of which can be traversed for 1d., six for 2d., nine for 3d. and any further distance for 4d. It is now proposed to have the sections of an average length of 0.75 mile, two sections to be traversed for 1d., four for 2d., six for 3d., and eight or more for 4d. This would reduce the length of ride for a penny from 1.8 to 1.5 miles. The lengthening of the sections and the reduction of their number, it is thought, will give the conductors more time to collect their fares. Workmen's tickets are sold at a lower rate. The Council hopes that these revised fares will increase the revenue by £416,000.

Toledo Fares in Court

Judges Warrington, Knappen and Denison of the United States Circuit Court at Cincinnati, Ohio, heard arguments on May 7 in the appeal of the city of Toledo from the injunction order issued by United States District Judge John M. Killits restraining the city from interfering with the collection of a 5-cent fare by the Toledo Railways & Light Company.

Mayor Cornell Schreiber, who is an attorney, contended that the city is prevented from enacting legislation to regulate the rate of fare while the injunction is in force. Should it attempt such legislation it might be held in contempt of court. He also contended that the Federal Court has no jurisdiction in the case and that Judge Killits exceeded his authority when he granted the order.

Director of Law Ralph Emery told the court that the injunction was standing in the way of an adjustment of the differences between the company and the city. He asked that the decree be reversed.

George D. Welles, representing the company, charged that Mayor Schreiber

had always been hostile to the company and to prove his contention quoted from Mayor Schreiber's speeches both before and after his election as Mayor. He also asserted that the injunction does not prohibit the city from enacting rate legislation.

The long fight between the company and the city, extending back over years, is too familiar to most railway men to require comment. The company has been endeavoring in every way to secure a renewal of its franchises on terms that will allow it to operate on a fair margin of profit and give the service that the city should have. The court took the case under advisement.

Louisville-Detroit Freight Service

Handling of freight by electric railway between Louisville, Ky., and Detroit, Mich., is promised through arrangements by A. F. Vandegrift, acting traffic manager of the Louisville Board of Trade, for the completion of plans for an interurban freight station in Louisville by the Inter-State Public Service Company, which operates across the Ohio River into Indiana. The extended freight service is promised by Aug. 1.

New tariffs will be made covering movement of freight into Indiana and Ohio except stations on the Chicago, Lake Shore & South Bend Railroad, and to stations on such lines in Ohio as the Ohio Electric Railway, the Dayton & Troy, the Dayton, Covington & Piqua, the Western Ohio, Toledo & Indiana and the Toledo & Western.

Storage Battery Cars at Point Shirley

The Point Shirley Street Railway, operated by the Boston, Revere Beach & Lynn Railroad, has placed two storage-battery cars in service on its 1.2-mile line between Winthrop Beach and Point Shirley, superseding gasoline passenger trucks previously used. Recently patrons of the former company petitioned the Public Service Commission on behalf of improved service.

The line was originally served by a gasoline-electric car and later by a Federal storage-battery car. Last fall, after about four years service, the battery became worn out and the auto-bus service was inaugurated by the company. This was unsatisfactory and the patrons asked the commission to require the company to install an overhead trolley line. The commission refused to order this, on the ground that the cost of so doing, including power-plant facilities and the purchase or alteration of cars necessary would be about \$45,000, an expenditure which the company was unprepared to make and which the traffic did not justify.

The company purchased two cars from the Third Avenue Railway, with electrical equipment, and has installed batteries supplied by the General Lead Battery Company, Newark, N. J. The new service, started on May 1, has been a great improvement over the auto-bus.

Transportation News Notes

Hearing on Transfer Charges.—The Public Service Commission of the Second District of New York will hold a hearing at Syracuse on May 19, on the petition of the New York State Railways for authority to charge 1 cent for transfers in Syracuse.

Protests Fare Increase.—The Chamber of Commerce of Clarksburg, West Va., has announced it will file a protest with the Public Service Commission against the proposal of the Monongahela Valley Traction Company to increase fares from a 5-cent and 6-cent rate to a flat 7-cent rate.

Six Cents in Bluefield.—A decision was announced by the Public Service Commission of West Virginia on April 9 under which the Appalachian Power Company was authorized to increase fares on its railway line in Bluefield from 5 cents to 6 cents, but with twenty tickets for \$1 and fifty school tickets for \$1.50.

Wants Interline Dispatch Rates.—Application has been made to the Public Service Commission of Indiana by the Marion & Bluffton Traction Company, Bluffton, Ind., for the establishment of interline merchants' dispatch rates from points on its line to points on other electric railways in Indiana and for readjustment of the rates between any two points on the company's road.

Alton Fares Stand.—The Public Utilities Commission of Illinois has issued a final order denying the application of the Alton, Granite City & St. Louis Railway, Alton, Ill., for an increase in fare on the Alton city lines to 8 cents. The same order covers the Venice, Granite City and Madison local service where a similar increase was asked. Alton now has a 7-cent fare. Citizens protested against any further increase. The increase was also opposed by the Board of Trade of Alton.

Hearing May 20 on St. Louis Fares.—The Public Service Commission of Missouri has decided to hold a hearing on May 20 in St. Louis to consider the application of the United Railways for an extension of the 6-cent fare beyond June 1, on which date it automatically expires. The applications of the United Railways and of the Missouri Electric Railroad, a subsidiary road, for a continuance of the present rates of fare in St. Louis and St. Charles Counties will be heard at the same time.

Asks Seven Cents in Davenport.—The Tri-City Railway, Davenport, Iowa, is asking the City Council to call a special election at which a 7-cent fare will be voted on. The fare is now straight 5

cents. In addition to asking the increased fare the company is asking that the Fourth Street line be discontinued. This line parallels the two main lines through the business section and has lost money for years. It serves Suburban Island, a summer resort and park. The park line will be maintained according to the plan and traffic handled by transfer from the Third Street line.

Appropriations for Fare of City Employees.—An ordinance introduced in the City Council of Seattle, Wash., provides for the payment of fare of policemen and firemen who use the municipal railway from the general fund. The ordinance stipulates that the utilities department shall be paid monthly at the regular 5-cent fare for all policemen and firemen carried. The amount is to be determined by a check twice a year of the number of policemen and firemen riding. The ordinance carries an appropriation of \$20,000 for the Police Department and \$18,000 for the Fire Department.

Six-Cent Appeal in Johnstown.—A petition for an increase in fare from 5 cents to 6 cents will be filed by the Johnstown (Pa.) Traction Company, according to a statement given out by General Manager Scott S. Crane. The petition will include the provision that when the increase is granted, the present zone system will be done away with and a universal transfer system installed. This will tend to eliminate much of the inconvenience now caused workingmen, who have to pay a double fare from their homes to the shops. It will permit a person boarding a car at one end of the city to ride to the extreme other end by the payment of one 6-cent fare, instead of the 10 cents now necessary.

New Transfers Unsatisfactory.—After a brief tryout the new transfer system of the Kansas City (Mo.) Railways proved unsatisfactory. The public objected to it and the conductors rebelled against the burdens which it placed upon them. The company will continue the new slips, as it has a supply on hand, but will punch nothing but the time, as has been done with the old slips. The new system was in use only two days. At the end of the first day several conductors resigned. The second day many conductors refused to punch the slips as required. They merely passed the transfers out to the passengers. Under the system as now modified patrons are not required to announce their place of transfer, but may change cars wherever they wish.

Must Answer Fare Complaint.—The Public Service Commission of Pennsylvania on May 12 dismissed the denurrer of the Philadelphia Rapid Transit Company in the case of the North-west Business Men's Association of Philadelphia against the company, and directed the company to file an answer within fifteen days. The original case involves the complaint of the business men's association against the alleged discriminatory rates of fare in Philadelphia, the complaint being based on

the way the company gives out transfer tickets on certain lines and does not extend the same privilege on other lines. The company demurred on the ground that the commission has no jurisdiction in the matter because of the 1907 agreement between the city and the transit company.

Skip Stops on Municipal Line.—The skip-stop plan will be introduced on the Seattle (Wash.) Municipal Railway on the Phinney Avenue line, between North Eighty-fifth Street and Lake Washington Canal. A survey of the line has been made under the direction of T. F. Murphine, superintendent, and the system will go into effect as soon as the signs have been put up. The stops will be staggered. There are now 197 stops on the line from the terminus on North Eighty-Fifth to the downtown loop. It is proposed to eliminate fifty-eight stops. The average distance between stops now is 376 ft. Under the proposed system, the distance between stops will be 540 ft. The present time of thirty-eight minutes to make the run one way will be cut down so as to effect a saving of eight minutes on the round trip.

Change in Freight and Commodity Rates.—The Public Service Commission of Indiana has authorized interurban railways operating in Indiana to readjust their class freight rates and commodity rates so that the readjusted rates, zones, and classifications shall be on parity with those used and in effect by steam railroads operating in Indiana. E. I. Lewis, chairman of the Indiana Public Service Commission, says that the new rates will be lower than the present rates for all hauls of more than 80 miles, lower than most hauls of more than 60 miles and somewhat higher for hauls less than 60 miles. The new rates represent no general increase, but only readjustment all the way through. The increases will not generally exceed 5 per cent of the present rates, but the decreases on the long-haul business are considerable.

Car Ticket Agencies in Atlanta.—Seven private agencies for the sale of car tickets to the public and to conductors have been established by the Georgia Railway & Power Company, Atlanta, Ga., which is operating under a 6-cent fare with seventeen tickets for \$1. Among these seven agencies every route in Atlanta is provided with one or more ticket reservoirs that its cars pass on every trip. The order of the company requests conductors who purchase books at these sub-agencies to use bills in payment, rather than small change, and so to be as little trouble as possible to the people who are handling this service for the company. Conductors are required to start their runs with \$10 worth of books, which are issued to them on credit. They can replenish their supply while on duty by purchasing from representatives of the company at downtown points. These new sub-agencies will provide against emergencies overtaking conductors out on their routes.

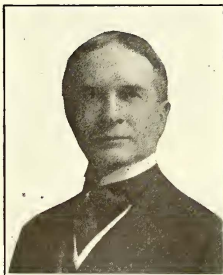
Personal Mention

Mr. Townley Heads A. I. E. E.

Manufacturer, Former Railway Operator, Elected President of American Institute of Electrical Engineers

Calvert Townley, assistant to the president of the Westinghouse Electric & Manufacturing Company and formerly vice-president of the Connecticut Company, New Haven, Conn., was on May 16 elected president of the American Institute of Electrical Engineers.

Since leaving the operating railway field Mr. Townley has maintained an active interest in railway operation, being at present chairman of the American Electric Railway Association committee on electrolysis. He is chairman of the public policy committee of the A. I. E. E. Mr. Townley was graduated from Yale University in 1886 and later



CALVERT TOWNLEY

received the degree of mechanical engineer from that university. Immediately after graduation he joined the technical staff of the Westinghouse Electric & Manufacturing Company and from the first showed an interest in electric railway problems. After securing extensive experience in the company's works at Pittsburgh, he was transferred to the Boston office in 1895. Nine years later he took charge of and consolidated for the New Haven Railroad the electric railways which that company had recently purchased in Connecticut. After the formation of the consolidated company he was elected its vice-president. This position he resigned in the summer of 1911 to take up his present work.

In connection with his duties with the Westinghouse Company Mr. Townley also served for a time as president of the Lackawanna & Wyoming Valley Rapid Transit Company, Scranton, Pa., and its subsidiary companies, representing the Westinghouse interests in that property.

Fred D. Fauser, claim agent for the Peoria (Ill.) Railway, included in the Illinois Traction System, has accepted the position of chief claim agent for the St. Louis (Mo.) Terminal Railroad Association.

Edward M. Hunt, assistant counsel and director of the Trenton & Mercer County Traction Corporation, Trenton, N. J., has returned from overseas, where he was a captain in the service of the American Red Cross in France.

Leon C. Smith, Columbus, Ohio, has been provisionally appointed chief inspector by the Public Utilities Commission of Ohio to succeed James B. Dugan, who recently resigned to become superintendent of the Lima division of the Ohio Electric Railway. Mr. Smith has been assistant to Mr. Dugan.

Robert R. McCoy has been appointed superintendent of the southern division of the Illinois Traction System, with headquarters at Staunton, Ill. Mr. McCoy has recently been discharged from military service. He has been serving the Illinois Traction System at Springfield, Ill., for a number of weeks as trainmaster.

Roy W. George has been appointed superintendent of Division B of the Georgia Railway & Power Company, Atlanta, Ga., succeeding J. M. Means, who has become assistant superintendent of transportation. Mr. George is only thirty-five years old. He became connected with the company at Atlanta in 1902, but left the service for three years and returned in 1906. He was appointed dispatcher in 1915.

E. A. Wetmore, who resigned as treasurer of the Boise Valley Traction Company and the Idaho Power Company in July, 1918, has since that time been connected with the ordnance department of the War Department. At present he is supervisor of the finance section of the Ordnance Department for several war contracts which are now being concluded. These are being carried out in Alabama. Mr. Wetmore has not determined upon his future plans, but may return to the electric railway business.

L. M. Helmreich, until recently assistant engineer to the Public Utilities Commission of Missouri, has been appointed engineer of the newly organized Arkansas Corporation Commission to take charge of the general supervision of the utilities operating in that State. He will establish headquarters at Little Rock. Mr. Helmreich was formerly head of the Ranken Mechanical School of St. Louis. He was graduated from the University of Missouri with the degrees of mechanical engineer and electrical engineer.

Edison Medal to Mr. Lamme

A. I. E. E. Award for Meritorious Achievement in Electrical Science Goes to Chief Engineer Westinghouse Company

Benjamin G. Lamme on May 10 was awarded the Edison medal by the American Institute of Electrical Engineers for meritorious achievement in electrical science, electrical engineering, and the electrical arts. In making the award the institute refers particularly to his work as pioneer in alternating current railway development. Mr. Lamme has been chief engineer of the Westinghouse Electric & Manufacturing Company for more than fifteen years. He was born in Springfield, Ohio, fifty-five years ago, and was graduated from the Ohio State University as a mechanical engineer in 1888.

Almost immediately after graduation Mr. Lamme entered the testing department of the Westinghouse Company and he has been continuously with the company ever since. During thirty years he has invented and designed many important pieces of alternating



B. G. LAMME

and direct-current apparatus, including railway generators and motors, and holds about 140 patents, many of which are of fundamental importance. In 1900 he was made assistant chief engineer of the company, becoming chief engineer three years later.

Aside from Mr. Lamme's personal engineering activities he acts in an advisory capacity to the whole engineering interests of the company, and is chairman of the company's committee which passes upon new inventions and appliances. He is the author of many technical papers presented before engineering societies. In 1915, upon nomination of the A. I. E. E., he was appointed by the Secretary of the Navy to membership on the Naval Consulting Board, where he served during the period of the war.

J. M. Means has been appointed assistant superintendent of transportation of the Georgia Railway & Power Company, Atlanta, Ga. Mr. Means has been in the service of the company and its predecessors since 1895, with the ex-

ception of six years spent in government work. He was appointed division superintendent of the company in 1909. His appointment as assistant superintendent gives the transportation department two assistant superintendents, C. H. Mathews having served in that capacity since January, 1911.

J. L. Murphy has been appointed industrial representative of the Georgia Railway & Power Company, Atlanta, Ga., including the Atlanta Gas Light Company, the Atlanta Northern Railroad and all other subsidiary companies, both inside and outside the 7-mile zone. The industrial representative will work to secure closer relations of co-operation and mutual benefit between the management of the company and its employees. He will try to secure the carrying out of the contracts between the company and the labor unions or associations, not only in letter but in spirit. To this end he will confer with the committees representing the unions and with the rank and file of the employees. He will report direct to the chairman of the board of directors, or the president.

Edward D. Ransom has resigned as assistant engineer for the mechanical department of the Brooklyn (N. Y.) Rapid Transit Company to accept the position of sales engineer in the New York electrical department of the H. W. Johns-Manville Company. Mr. Ransom received his technical education at Union College, Schenectady, where he was graduated in 1910 with the degree of Bachelor of Engineering. He entered the service of the Brooklyn Rapid Transit Company in 1912 as wireman at the Thirty-ninth Street general construction shops. He later served as testing inspector and in 1915 was promoted to the position of assistant engineer. Since that time he has been engaged in operating engineering work for the company. Mr. Ransom has contributed several articles on car equipment maintenance to the **ELECTRIC RAILWAY JOURNAL**.

Lynn B. Milam has been appointed by Mayor Wozencraft of Dallas, Tex., as supervisor of public utilities to succeed M. N. Baker, who resigned with the change in city administration. The appointment has been confirmed by the City Commissioners. Mr. Milam was born in South Dakota, and his parents moved to Texas shortly afterward. He was educated in the public schools of Dallas, and later attended Drury College at Springfield, Mo., and took a course in law at the University of Texas, where he received the degrees of A. B. and LL. B. He entered the newspaper field, but after working for a short time in Dallas and Austin he gave up newspaper work and began the practice of law. He has specialized in corporation law and was associated with the Dallas firm of Thomas, Milam & Touchstone. Mr. Milam had no experience in traction matters other than in the practice of law until his appointment as supervisor of public utilities.

Obituary

Prepayment Inventor Dead

Duncan MacDonald, Inventor and Former Manager of Montreal Street Railway, Died May 8

Duncan MacDonald, formerly manager of the Montreal (Que.) Street Railway, who invented and patented the pay-as-you-enter system of car operation adopted in Montreal in 1905, died of tuberculosis at St. Agathe on May 8.

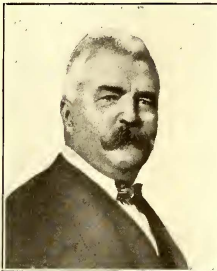
The great work for which Mr. MacDonald will always be remembered by the industry was his development of the pay-as-you-enter car in conjunction with W. G. Ross, then general manager of the Montreal Street Railway. It took a great deal of courage to believe that the public as well as the operators would appreciate the benefit of changing from collection within the car to

miles of tramway in and around Paris, France.

Mr. MacDonald resigned his position as general manager at Montreal on July 5, 1912, and opened offices there to devote his time to various interests with which he was identified. On April 6, 1914, he was elected a member of the Board of Control by the city of Montreal and served as a controller for two years. In the civic elections of April 3, 1916, he was a candidate for the office of Mayor but was defeated. He retired to private life in 1916. He was president of the Montreal Tunnel Company, Montreal; president of the South Shore Land & Improvement Company; vice-president of the Dominion Park Company and, following the development of the prepayment car, was president of the Prepayment Car Sales Company.

Paul Lüpke, one of the pioneers in the electrical industry, died on Feb. 9. Mr. Lüpke was born in Osnabrück, Germany, in 1861, and was educated at the local Real-Gymnasium and at the Royal Polytechnic Institute, Stuttgart, Württemberg. Prior to coming to the United States in 1884 he had been connected with the Siemens & Halske Works in Charlottenburg and the Allgemeine Elektrizitäts-Gesellschaft in Berlin. At the time of his death Mr. Lüpke was in charge of the extensive library of the three companies which make up the Public Service Corporation of New Jersey, besides being editor of *Service*, the official publication of the corporation. For many years he was superintendent of the southern division of the Public Service Electric Company at Trenton, N. J.

Emil Swenson, for twenty years a consulting engineer of the Manhattan Elevated Railway, New York, and for nearly as long a technical adviser of the Pittsburgh (Pa.) Railways, died on May 13 in his home in Pittsburgh. Mr. Swenson was born in Sweden and was educated in the government technical schools of that country, coming to the United States shortly after graduation. He started as a draftsman, but soon became division engineer of survey and construction for the ill-fated South Penn Railroad project. Later he was connected with the American Bridge Company, but resigned from that company to take up private practice. One of Mr. Swenson's most important works was his study of the Pittsburgh traction situation several years ago. At that time he prepared, at the behest of Mayor George W. Guthrie, a report recommending improvements in construction and treating of subway propositions, that has since proved one of the standard documents in the never-ending discussion of transportation in Pittsburgh. Mr. Swenson designed or helped design many buildings in Pittsburgh, Chicago and New York. He also was widely known as a bridge engineer. He is survived by his widow, a daughter and three sons.



DUNCAN MACDONALD

collection on the platform. Mr. MacDonald and his associates, however, acted on the theory that the change would be successful if it was accompanied by improvements in car construction and service that carried assurance to the public that the modification of fare collection practice was intended primarily for their advantage. Thus the inauguration of prepayment was the impulse which led to such remarkable improvements in the design, equipment and operation of rolling stock on the city railways in the United States and Canada.

Mr. MacDonald was born on June 17, 1859, at St. Thomas, Que. He was educated at Rimouski College. He entered electric railway work as a conductor when he was twenty years old and served as roadmaster, inspector, assistant superintendent, engineer and general manager of the Montreal Street Railway. His continuous service at Montreal was broken, however, during the period 1902 to 1904 when he was employed as managing director for 400

Manufactures and the Markets

DISCUSSIONS OF MARKET AND TRADE CONDITIONS FOR THE MANUFACTURER,
SALESMAN AND PURCHASING AGENT

ROLLING STOCK PURCHASES

BUSINESS ANNOUNCEMENTS

Better Market Ahead

With Last of Liberty Loans Over
Money Should Be Freer
for Industry

One, and perhaps the greatest, of the difficulties that lie in the path of the electric railway purchasing agents is that of getting the necessary money. For some time the money market has been in the position of not wanting to place long loans. The demand of the government for money has made it necessary for the banks and other financial interests to keep their assets quick for the government. Now the last of the Liberty Loan campaigns is over. In this drive the banks and other interests with large sums of money to invest were not required to place as much money in the Victory Notes as they had expected. Consequently, the day of freer money for the industries among which must be included the electric railways appears to be nearer.

Easier money should mean greater expenditures by the electric and therefore better market conditions. For some time the market has been open almost wholly for maintenance equipment. There now seems a possibility of a new equipment market opening up soon in appreciable volume.

Fare Register Outlook Hopeful

While Discussing General Business
Conditions, John F. Ohmer Tells
of Increasing Production

Well-defined prosperity ahead was the keynote of an interview on general business conditions in the Dayton *Sunday Journal* with John F. Ohmer, president of the Ohmer Fare Register Company, being one of a series with Dayton business leaders. The following paragraphs taken from the interview are particularly interesting.

"There is going to be," said Mr. Ohmer, "a great scarcity of labor within the next few months.

"Unfortunately, there is a tendency among too many people to believe that a reduction or curtailment in the amount of production is necessary in order to stimulate the demand for labor. They overlook the fact that we must have greater production in order to reduce the cost of manufacturing.

"Because of the depleted world stocks I can see no hope of a reduction in the high cost of manufacturing or the high cost of living for another year, after which we will enter into a plane of business never before experienced, and this will continue for several years.

"In our own business we still are engaged in filling our contracts for the government, but we are gradually tapering down this production for government purposes and proportionately increasing the production of our own commodities, the demand for which is very good at this time. With the final development of new things in our line, the outlook is most hopeful."

Automatic Substation Equipment Demand Increasing

Factory Production at Capacity with
Sales Largely to Long Interurban
Systems

One of the more recent developments in electric railway work is the automatic substation. Its utilization, at first rather slow, has increased in a satisfactory manner and present manufacturing capacity has been reached. It is not meant that substation equipment is up to manufacturing capacity, but merely the automatic equipment necessary to convert manually operated substations to automatically operated. While rotaries are running about three months delivery the automatic control is up to four and five months.

The cost of automatic equipment cannot be given as any fixed percentage of the cost of the remainder of the substation. That is, the cost to equip with automatic control a 600-kw. station would not be double that for a 300-kw. station. There would be a slightly higher cost for the larger capacity contactors, buses, etc., but nothing in proportion to double. The difference in cost for substations of different voltage, however, runs in the neighborhood of 10 to 15 per cent increase for the higher primary voltages.

To offset the cost of the automatic equipment there is found reduced labor costs for operation, smaller substation equipment and better copper distribution along the line. Labor charges in substation operation are considerable and the main feature of this equipment is the reduction in labor.

Frequently the capacity of the station equipment may be reduced under automatic control to about 80 per cent on the direct-current side. This may mean considerable saving in copper and equipment.

Large interurban lines have special adaptation for this automatic equipment, as the substations run for rather long periods of time without load. The West and Middle West have taken to this equipment more than has the East, and naturally so, as there is more heavy interurban traffic in these sections.

Outlook on Prices

Price of Labor Cannot Yet Come Down,
Says Roger W. Babson—Few Radical
Declines Looked For

A recent statement by Roger W. Babson, dealing with the outlook on prices, states that "No single question appears to bear more vital relation to the speedy return of nation-wide prosperity than the question of prices. With each month that has passed since the signing of the armistice, developments have tended to upset preconceived ideas as to exactly what would happen. The one outstanding fact is that in spite of the most highly competitive conditions, brought on by a scarcity of orders in many industries, prices have not materially receded, excepting for raw materials.

"Many who have pinned their faith to lower prices are pointing to declines in the cost of a few raw materials like cotton, wool and leather. They forget that wearing apparel and other manufactured products, before reaching the public, have gone through so many hands and processes, all requiring labor in its broadest sense, that the final cost is largely determined by the labor cost. We should not forget that 75 per cent or more of the total cost of most commodities consists in labor in some form or other. The price of labor cannot come down in this country as long as we have the present potential scarcity of workers, great latent demand for goods, high taxation and world scarcity of food.

"Exactly what will happen to prices in the near future no one can of course definitely foretell. However, expectations which are entertained as to speedy and radical declines, except where profits can be shown to be excessive, are apparently based more on hope than on a careful study of the law of supply and demand. Raw materials and foodstuffs will be lower; but otherwise we surely are on a new price level for some time to come. There is little likelihood of a sudden fall in manufactured goods in the near future beyond the elimination of war prices made necessary to stimulate production in high cost plants."

Guy Insulators Slightly Higher

In the market for line material there has been reported an increase of 5 per cent in the price of high-voltage porcelain guy insulators. No special increased domestic demand has been noted. Factory deliveries have been given as two weeks. On line material in general, however, there has been a favorable increase in foreign demand.

Trade Opportunities Abroad

A man in Switzerland (No. 29,115) desires to secure an agency for the sale of electrical apparatus such as dynamos or electric locomotives. Correspondence may be in English. A firm in this country (No. 29,153) with a branch in Italy, and also proposing to open offices in other European countries, desires to secure agencies for the sale of electrical railway equipment, insulated wires and cables. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., by mentioning the number.

Rolling Stock

Madison (Wis.) Railways announces its intention to purchase fifteen one-man safety cars.

Richland Public Service Company, Mansfield, Ohio, has ordered two sets of General Electric air brakes for cars formerly equipped with hand brakes.

North Branch Transit Company, Bloomsburg, Pa., announces that there is under construction for that road one trailer dump ash car and one two-motor work and ash car.

Cincinnati Traction Company, Cincinnati, Ohio, announces through vice-president Walter A. Draper that an order has been placed for 105 new double truck, pay-within type, four-motor cars.

Recent Incorporations

Bay City Southern Railroad, Lansing, Mich.—Articles of incorporation will be filed with the Michigan Railroad Commission by the Bay City Southern Railroad, which plans to construct a combination gas and electric line to connect Lansing, Dewitt, St. Johns, Mape Rapids, Middleton, Perrinton, Ithaca, St. Louis, Breckenridge, Wheeler, North Wheeler, Midland, Bay City, west and east sides, 125 miles. The road will be capitalized at \$1,000,000. It is reported that the proposition involves the purchase of the Lansing-St. John's line of the Michigan United Railways and the Midland-Bay City branch of the Michigan Central Railroad.

Franchises

Sacramento, Cal.—The Pacific Gas & Electric Company has asked the City Commission of Sacramento for a ten-year extension of its franchise on J Street between Second and Third Streets.

Detroit, Mich.—The Detroit & Lake St. Clair Railway (a part of the Detroit & Port Huron Shore Line Railway) has been granted a thirty-year franchise by the City Council to construct a double track on Fisher Road and Grosse Pointe Boulevard, from Jefferson Avenue to Weir Lane.

Trenton, N. J.—The Trenton & Mercer County Traction Corporation has received permission from the City Com-

mission of Trenton to construct double tracks on Mulberry Street and Center Street.

Track and Roadway

Trinidad, B. W. I.—According to Consul Baker, Trinidad, British West Indies, is seeking more up-to-date equipment for its railroads. Plans are under way to improve yard and shop lighting and two oil engine lighting generators of about 50-kw. capacity each are needed. Stations are to be lighted by a battery system at present used on the cars. Hand brakes are to give way to air equipment.

Municipal Railway of San Francisco, San Francisco, Cal.—Work will be begun May 20 on the relocation of the tracks of the Union Street line of the Municipal Railway. The double track on Union Street will be extended from Franklin Street to Van Ness Avenue and a new connection will be made between the tracks in Vallejo Street and in Van Ness Avenue by a double track out of Vallejo Street into Van Ness. All the present track in Franklin Street and in Vallejo west of Union will be removed. The new route of the Union Street cars will be from Vallejo Street into Van Ness Avenue and northerly along Van Ness to Union and then west on Union.

Fort Wayne & Northern Indiana Traction Company, Fort Wayne, Ind.—The Fort Wayne & Northern Indiana Traction Company will double-track its line on Calhoun Street between Creighton Avenue and Pontiac Street.

NEW YORK METAL MARKET PRICES

| | May 1 | May 15 |
|---|----------------|----------------|
| Copper, ingots, cents per lb. | 15 3/71 | 16 00 |
| Copper wire base, cents per lb. | 17 25 to 18 00 | 17 25 to 18 00 |
| Lead, cents per lb. | 5 00 | 5 00 |
| Nickel, cents per lb. | 40 00 | 40 00 |
| Silver, cents per lb. | 6 45 | 6 40 |
| Tin, cents per lb. | 172 50 | 172 50 |
| Aluminum, 98 to 99 per cent., cents per lb. | 31 00 to 33 00 | 32 00 |

† Government price in 25-ton lots or more f.o.b. plant.

OLD METAL PRICES—NEW YORK

| | May 1 | May 15 |
|---|--------------------|--------------------|
| Heavy copper, cents per lb. | 13 50 to 13 75 | 13 50 to 14 00 |
| Light copper, cents per lb. | 11 00 to 11 25 | 11 00 to 11 25 |
| Heavy brass, cents per lb. | 7 50 to 8 00 | 7 50 to 8 00 |
| Zinc, cents per lb. | 5 25 to 5 50 | 5 00 to 5 25 |
| Yellow brass, cents per lb. | 6 50 to 7 00 | 6 50 to 7 00 |
| Lead, heavy, cents per lb. | 4 00 to 4 25 | 4 25 to 4 37 |
| Steel car axles, Chicago, per net ton | \$23 00 to \$25 00 | \$23 00 to \$24 00 |
| Old carwheels, Chicago, per gross ton | \$21 00 to \$22 00 | \$21 00 to \$22 00 |
| Steel rails (scrap), Chicago, per gross ton | \$17 00 to \$17 50 | \$16 50 to \$17 00 |
| Steel rails (relaying), Chicago, gross ton | \$17 00 to \$17 50 | \$16 50 to \$17 00 |
| Machinshop turnings, Chicago, net ton | \$6 00 to \$7 00 | \$6 00 to \$6 50 |

ELECTRIC RAILWAY MATERIAL PRICES

| | May 1 | May 15 | | May 1 | May 15 |
|--|--------------------|----------------|--|-------------|-------------|
| Rubber-covered wire base, New York, cents per lb. | 20 | 20 | Galvanized wire, ordinary, Pittsburgh, cents per lb. | 3.70 | 3.70 |
| Weatherproof wire (100 lb. lots), cents per lb., New York | 23 00 to 23 25 | 23 00 to 23 25 | Car window glass (single strength), first three brackets, A quality, New York, discount † | 80% | 80% |
| Weatherproof wire (100 lb. lots), cents per lb., Chicago | 23 75 to 37 35 | 23 75 to 37 35 | Car window glass (single strength), first three brackets, B quality, New York, discount | 80% | 80% |
| T rails (A. S. C. E. standard), per gross ton | \$49 00 to \$51 00 | 49 00 to 51 00 | Car window glass (double strength, all sizes A quality), New York discount | 81% | 81% |
| T rails (A. S. C. E. standard), 200 to 500 ton lots, per gross ton | \$47 00 to \$49 00 | 47 00 to 49 00 | Waste, wool (according to grade), cents per lb. | 14 to 17 | 14 to 17 |
| T rails (A. S. C. E. standard), 500 ton lots, per gross ton | \$45 00 to \$47 00 | 45 00 to 47 00 | Waste, cotton (100 lb. bale), cents per lb. | 8 to 13 1/2 | 8 to 12 1/2 |
| T rail, high (Shanghai), cents per lb. | 3 75 | 3 75 | Asphalt, hot (150 tons minimum, per ton delivered) | | |
| Rails, girder (grooved), cents per lb. | 3 75 | 3 75 | Asphalt, cold (150 tons minimum, pkgs. weighed in, F. O. B. plant, Maurer, N. Y.), per ton | \$30 00 | \$30 00 |
| Wire nails, Pittsburgh, cents per lb. | 3 25 | 3 25 | Cement (carload lots), New York, per bbl. | \$2 90 | \$2 90 |
| Railroad spikes, drive, Pittsburgh base, cents per lb. | 3 35 | 3 35 | Cement (carload lots), Chicago, per bbl. | \$3 05 | \$3 05 |
| Railroad spikes, screw, Pittsburgh base, cents per lb. | 8 | 8 | Cement (carload lots), Seattle, per bbl. | \$3 13 | \$3 13 |
| Tie plates (flat type), cents per lb. | 2 75 | 2 75 | Linsed oil (raw, 5 bbl. lots), New York, per gal. | \$1 61 | \$1 59 |
| Tie plates (brace type), cents per lb. | 2 75 | 2 75 | Linsed oil (boiled, 5 bbl. lots), New York, per gal. | \$1 68 | \$1 61 |
| Tie rods, Pittsburgh base, cents per lb. | 3 | 3 | White lead (100 lb. keg), New York, cents per lb. | 13 | 13 |
| Fish plates, cents per lb. | 3 90 | 3 90 | Turpentine (bbl. lots), New York, cents per gal. | 78 | 78 |
| Angle plates, cents per lb. | 3 90 | 3 90 | | | |
| Angle bars, cents per lb. | 3 90 | 3 90 | | | |
| Rail bolts and nuts, Pittsburgh base, cents per lb. | 4 35 | 4 35 | | | |
| Steel bars, Pittsburgh, cents per lb. | 2 35 | 2 35 | | | |
| Sheet iron, black (24 gage), Pittsburgh, cents per lb. | 4 20 | 4 20 | | | |
| Sheet iron, galvanized (24 gage), Pittsburgh, cents per lb. | 5 25 | 5 25 | | | |
| Galvanized barbed wire, Pittsburgh, cents per lb. | 4 10 | 4 10 | | | |

† These prices are f. o. b. works, with boxing charges extra.

Bangor Railway & Electric Company, Bangor, Me.—Work is progressing on the reconstruction of the Center Street line of the Bangor Railway & Electric Company. This is the first of a series of improvements to be made by the local company during the present year, including the reconstruction of its line on Garland Street.

New York Municipal Railway, Brooklyn, N. Y.—Among the first official acts of Lewis Nixon, who was recently appointed Public Service Commissioner for the First District of New York to succeed Travis H. Whitney, Charles S. Hervey and Frederick J. H. Kracke, was the awarding of a contract to Thomas Crimmins Contracting Company, New York, for the installation of tracks in the Sixtieth Street Tunnel portion of the Broadway subway, at \$94,073. This line connects the Brooklyn Rapid Transit subway in Manhattan with the existing elevated lines in the northern portion of Queens over which the Brooklyn Rapid Transit possesses trackage rights in connection with the Interborough Rapid Transit Company. Commissioner Nixon has also urged the Board of Estimate and Apportionment to give its early approval to a contract for the completion of the elevated portion of the Pelham Bay Park branch of the Lexington Avenue subway, which is urgently needed to provide rapid transit for the extreme eastern portion of The Bronx. Commissioner Nixon also directed the beginning of operation of a new portion of the Culver elevated railroad in Brooklyn from Kings Highway to Avenue X.

Richland Public Service Company, Mansfield, Ohio.—A report from the Richland Public Service Company states that it has just ordered 105 tons of 100-lb. A.R.A. type A rail for 3500 ft. of track reconstruction, 600 Inter-land twin steel ties and one left-hand branch-off and one diamond turnout.

Grand River Railway, Galt, Ont.—The Grand River Railway contemplates the reconstruction of $7\frac{1}{2}$ miles of track between Preston and Kitchener with 80-lb. rails.

Power Houses, Shops and Buildings

Arizona Power Company, Prescott, Ariz.—A 4000-volt electric power transmission line will be erected by the Arizona Power Company from its power station near Highball to Phoenix, 70 miles. The purpose of the proposed line is to provide auxiliary power for the system of the Pacific Gas & Electric Company at Phoenix. The company also has other important extensions to its power system under consideration.

Iowa Southern Utilities Company, Centerville, Iowa.—David G. Fisher & Company, Davenport, Ia., who now control the Iowa Southern Utilities Company, plan important improvements to the power plant of that company at Centerville.

Tri-City Railway & Light Company, Davenport, Iowa.—The Moline & Rock Island Manufacturing Company, a subsidiary of the Tri-City Railway & Light Company, has asked for bids on the erection of a \$40,000 concrete stack, 237 ft. high, with an inside diameter at the top of 13 ft. 6 in. Eight steel stacks now serve the boilers at this plant. The concrete stack will replace them.

Springfield (Mass.) Street Railway.—A contract has been awarded to E. J. Pinney by the Springfield Street Railway for the alteration of its carhouse on Bond Street at a cost of about \$15,000.

Grand Rapids, Grand Haven & Muskegon Railway, Grand Rapids, Mich.—Plans have been completed by the Grand Rapids, Grand Haven & Muskegon Railway for the construction of a portable automatic substation at a cost of about \$30,000.

Kansas City & Leeds Electric Railway, Kansas City, Mo.—The Kansas City & Leeds Electric Railway, which proposes to construct a line from Kansas City to Leeds, will erect an interurban station at Thirty-first and Hardesty Streets. The structure will be 300 ft. x 125 ft., six stories and basement, of terra cotta, steel and reinforced concrete with composition roof. The cost will be about \$150,000.

Trade Notes

Ohio Brass Company, Mansfield, Ohio, announces that on May 1, its Chicago office moved from 508 Fisher Building to 1217 Fisher Building, 343 South Dearborn Street.

Capt. J. A. McIntosh, who has been in the service overseas with the Tank Corps, has returned to his former position in the engineering department of the Ohio Brass Company.

Wheeling Condenser & Engineering Company, Carteret, N. J., reports that in the month of April it manufactured and shipped 879,900 lb. of seamless drawn brass and copper condenser tubes.

E. C. Camp has been elected assistant treasurer, assistant to the president, of the Solar Metal Products Company, Inc., Columbus, Ohio. He continues his work as sales manager in charge of sales and advertising.

Railway Improvement Company, New York City, announces that Stone & Webster have placed an order with them through Roscoe Reed, receiver, for a complete equipment of coasting recorders on their Paducah, Ky., property.

Bittman & Battee, Inc., manufacturers' agents, 84 Second Street, San Francisco, have been appointed representatives of the Hazard Manufacturing Company of Wilkes-Barre, Pa., manufacturers of steel and wire rope, electric wires and cables, etc.

Major Rowland Tompkins, A. E. F., formerly associated with Almirall &

Company, Inc., New York City, has become a member of the Shevlin Engineering Company, Inc., 110 West Thirty-fourth Street, New York City, manufacturer and contractor for the installation of boiler-plant equipment.

Ross F. Hayes, for the past twelve years Eastern manager of the Curtain Supply Company, of Chicago, has been appointed general sales manager of the company. Mr. Hayes will make his headquarters at his former office, 30 Church Street, New York, and will also act as Eastern manager of the company.

J. N. Ebling has returned from service with the American Expeditionary Forces in France and has resumed his duties as president of the Railway Specialties Corporation, 30 Church Street, New York City. He announces that D. A. Munro, former secretary of the corporation, is no longer connected with it.

Western Electric Company, New York, N. Y., reports several changes in its organization, to take effect June 1. Among them, J. M. Skinkle, formerly with the engineering department, has been appointed assistant manager of the government department with headquarters at New York; J. A. Pizzini, formerly sales manager at the New York office, has been appointed assistant manager at the same place; W. J. Drury, until recently manager of the Cleveland office, succeeds Mr. Pizzini; A. M. Collins, formerly sales manager of the Detroit office, succeeds Mr. Drury, and A. R. Maynard, until recently with the sales department in Chicago, succeeds Mr. Collins.

William J. Norton of Norton, Bird & Whitman has completed his work as general superintendent of the Aberdeen Proving Ground Contract of the Maryland Dredging & Contracting Company, and, in addition to his offices in Chicago, Baltimore and Boston, has opened offices in the Astor Trust Building, 501 Fifth Avenue, New York City, where he will continue his consulting work on utility rate regulation problems. In addition, in association with The Withington-Roberts-Wright Company, of Cleveland, Ohio industrial architects and engineers, he will engage in general industrial engineering, including certain large construction projects upon which preliminary surveys are now under way. It is of interest that Travis H. Whitney, who has just retired as chairman of the New York City Public Service Commission, will become counsel to Mr. Norton and his associates, occupying offices with them at 501 Fifth Avenue, New York City, and will also be associated with them in projected enterprises.

New Advertising Literature

Trading With China.—The Guarantee Trust Company of New York City has issued a pamphlet entitled "Trading with China," in which are set forth methods found successful in dealing with the Chinese.