

# Electric Railway Journal

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**THE MID-WINTER MEETING PROGRAM** The association is to be congratulated on the program which has been prepared for the Chicago meeting. It is simple, but the topics to be discussed are momentous and the speakers selected are especially well qualified to discuss them. It is not to be expected that these topics can be exhausted in a single day, but the occasion is fitting to take account of stock of present knowledge and temper on the subjects "Valuation," "Rate of Return" and "Governmental Regulation," so that the course of the railways may be sailed by chart rather than by instinct. It is inferred that Senator Underwood will take up certain points in the President's message to Congress bearing upon the point covered in the title of his address, and if so he will open the way for an expression of opinion by the electric railway industry. The Chicago meeting bill of fare promises some nutritive food for thought.

**A SOUND BASIS FOR FREIGHT RATES** In connection with the problem of freight rates, which is growing increasingly important to electric railways because this traffic offers apparently the liveliest opportunity for increased revenue at the present time, it is pertinent to call attention to the excellent guide afforded by existing steam railroad practice. High freight rates do not necessarily mean high freight receipts, and, on the other hand, lowered rates do not involve an inevitable increase in business. A proper adjustment of the rates on the various commodities to be handled is of infinitely more importance in securing maximum freight receipts, and this is something that the steam railroads have been working on for the last fifty years. They have, as a matter of fact, so fixed their rates as to give the maximum return in practically every locality, a feature that is well-exemplified by the experience of a large interurban railway, which at the time of inauguration of its freight business set its rates so that they averaged 20 per cent higher than those of competing steam lines. A readjustment was recently made to meet the steam road rates in all cases, and notwithstanding the reduced charges the revenue per 100 lb. of freight handled was 18.2 cents as opposed to a revenue of 18.1 cents when the rates averaged 20 per cent higher. This might look like a miracle if it was not for the fact that the steam roads, through their many years of experience, have succeeded in adjusting their charges to a point such that each commodity carries all that the traffic will bear, and in consequence their example is something that should not fail to be considered by the infant industry of freight on electric railways.

**REDUCING DAMAGE TO FREIGHT** Freight loss and damage are not only objectionable to the shipper and the carrier but represent an absolute financial loss to the latter. On the average railway the increase in freight claims paid is in direct proportion to the increase in revenue. On steam roads the loss in damage payments represents approximately 1½ per cent of the gross freight revenue. Whether this is a measure of the amount paid in freight claims on electric interurban lines, we are unable to state. We do know, however, that money paid for this purpose amounts to a considerable sum, and that there is room for the application of the safety-first movement to freight handling on interurban lines. Co-operation between the shipper and the carrier is absolutely necessary to obtain tangible results, but that they will accrue is made manifest by the experience on steam roads. During the past year a number of steam roads have exercised extraordinary diligence to prevent damage to freight, with the result that reductions in the amount paid in claims, up to 50 per cent on some roads, have been made. This saving suggests similar action on the part of the freight departments of interurban roads. Perhaps the uniform instructions for packing and marking recommended by the American Railway Association committee on packing, marking and handling of freight would be a valuable aid in this direction. In the same way, the inauguration of a campaign among employees and shippers to reduce damage to freight is certain to produce results. In any event, the co-operation of both the employees and the shippers should be solicited as well as their suggestions for the prevention of freight damage and loss.

**ELECTRIFICATION OF A FREIGHT TERMINAL** The agreement that has been reached by the city of New York and the New York Central Railroad, whereby the latter will have permanent rights to the present tracks on the western shore of Manhattan Island, as outlined on another page, involves the undertaking of an electrification project of very considerable magnitude. The route that is to be reconstructed is only about 12 miles long, but since a large proportion extends through an extraordinarily busy shipping and industrial district and includes several large switching yards, the importance of the plan is by no means measured by the distance that is covered. Electric operation for the entire mileage has been decided on primarily because of the location of part of the line past a residential and park district, from which numerous complaints have arisen through the use of steam locomotives on the present tracks. In addition, much of the recon-

structed line is to be in tunnels of sufficient length to necessitate the banishment of the steam locomotive, so that apparently the question of economical operation has been subordinated in the preliminary considerations. However, it is quite conceivable that the economies which will follow electrification may provide a sufficient return to pay interest and depreciation on the investment for the contact system and locomotives, and if this is the case the installation will have an important bearing upon future proposals for the electric operation of freight terminals. In any event, the new electrification is certain to influence the matter of extending the New York Central electric zone, for the large tonnage of freight moving to the west side yards will necessitate elaborate provisions at some point for the change in motive power. If this is made at Harmon, the northern terminus of the present electrified tracks, so that both freight and passenger trains are electrically operated, an early extension of electric operation to Albany seems to be a foregone conclusion.

#### IMPROVING SHUTTLE SERVICE

Shuttle service on surface lines is a difficult class of traffic to popularize. It is necessary in many cases, however, to the economical feeding of main lines of travel, with the corresponding distribution of passenger flow on the reverse trips. From the passenger's standpoint, a change of cars is usually more or less objectionable, and to minimize this drawback every reasonable effort should be made to provide a quick and comfortable journey over the shuttle line. On account of the low density of traffic, there is a temptation to employ old and often poorly lighted cars in this service, but the latter condition is more often due to oversight than to intention. There is also a tendency to run an infrequent schedule on the theory that even if passengers walk to the main line the company will get their fares, but we see no reason why stimulation of traffic on the shuttle line should not be as beneficial as on other parts of the system. If possible passengers have to walk to the junction they may walk the rest of the way, or the probability that they shall have to walk may deter them from taking the trip. In their knowledge of actual running times rather than of total elapsed times in making trips of various kinds on a system, electric railway men are sometimes prone to overlook the value of close connections to the passenger. Sometimes these connections can be improved on short shuttle lines by the installation of a loop service through a district of comparatively limited area, avoiding layovers at one end of the line and possibly taking advantage of carhouse facilities at the beginning and end of each trip. It goes without saying that cars used in shuttle service should be well cleaned and painted, and provided with comfortable seats and properly maintained trucks and wheels. A low maximum speed is generally feasible, but too much care cannot be taken to see to it that the lighting is good because the ability to read on a shuttle line, even if the running time over it is only ten or fifteen minutes, is an important factor from the public's standpoint.

#### THE BENEFIT OF THE DOUBT

The subject of public relations cannot be settled by passing resolutions and enunciating principles, important as such exercises may be. Good public relations develop like individual character, each consistent effort exerting its influence toward the desired end. An excellent opportunity to make a good impression is furnished whenever a patron has occasion to bring a complaint to headquarters for adjustment. The following example came to our attention recently.

A woman came into a manager's office and claimed that on the preceding day she handed a conductor two \$1 bills, which stuck together so that they looked and felt like one and she received change for only one. She did not discover her error until after she got off the car, when she found that the two bills were missing. She could not remember the badge number of the conductor or the number of the car. This case actually happened within the last few months in the case of a large company.

Later, the incident was discussed by several managers, and three methods of dealing with the case were suggested. The first was to tell the passenger that it was impossible, without the number of the car or of the conductor, to check up the story as no conductor had reported his accounts as being over, and to explain courteously that nothing could be done. The second course suggested was that possibly an exception ought to be made if the complaining passenger was known to be a person of influence in the community. The third plan was to take the passenger's word for the transaction on the theory that she would not have made the visit if she did not believe that the facts were as she had stated, to tell her that the situation was unusual but that the manager's office was the place where unusual matters were straightened out, to thank her for calling and to hand her a \$1 bill.

In the case in question the plan followed was that given as the third in the list just mentioned. It may seem quixotic, but by means of a consistent following of a policy of this kind the company in question has built up a very strong feeling in the community that it is always ready to meet the public more than half way. There is, of course, some danger that unscrupulous persons will impose upon it, but experience has shown that this danger is more imaginary than real. The cases which call for a refund are necessarily rare, but where they are made the refund is accompanied by a railway ticket to cover the cost of sending the letter to the company. A lookout has to be kept, of course, for repeaters, but they can nearly always be detected, and the amount lost through fraud is trifling, not only in comparison to the cases of real injustice corrected but also actually in amount.

Of all the public utilities the urban railway is undoubtedly the one with which a broad and liberal policy of public relations is most important. The service which it gives is more personal in character than that of either a lighting or water company, and it carries the members of the community which it serves more often than do the steam railroad companies. More-

over, it is in more constant evidence than any one of the other utilities mentioned as it uses the public streets. In settling disputes, therefore, it is especially important that the patron be given the benefit of the doubt whenever the matter in controversy deals with the accuracy of fundamental data rather than the infraction of reasonable and well-understood rules.

In one of the New York dailies several columns are being given each week to correspondence with readers regarding their experiences with merchants. The impression given by all of this is that the modern merchant aims to satisfy his patrons even if it is necessary sometimes to grant unreasonable demands. The same procedure will bring good results in selling transportation which, while different from merchandizing in many particulars, is nevertheless a proposition in which every individual in the organization from the conductor up must have the instinct of a salesman.

#### REMOVING THE EMPLOYEE'S GRIEVANCE

Now that the tumult and shouting over young Mr. Rockefeller's trip to the properties of the Colorado Fuel & Iron Company has subsided, it is time that some serious attention should be paid by railway men to the purposes underlying Mr. Rockefeller's visit. His purpose was to establish points of contact with his employees, believing that the absence of such points of contact was the cause of most of the troubles of the company. Whatever the exact form of the organization put into effect as the result of Mr. Rockefeller's investigations on the spot, its aim and purpose is to give employees a chance to tell their troubles. Mr. Rockefeller's expressed opinion, and that of many others who have investigated the Colorado situation, is that most of the difficulties there have arisen from lack of understanding between the men and the management, and this is traced to lack of opportunity for expression. To remove the possibility of such misunderstanding in the future, in so far as it can be removed by giving the men a voice, Mr. Rockefeller is determined that if a man has anything to say he shall have an opportunity to say it.

In one of the big copper mines that had serious labor difficulties a few years ago, the general manager put into effect a rule that every Tuesday his time was to be devoted to receiving employees and members of their families who had anything that they would like to talk to him about, whether this was a personal affair or something connected with conditions of employment. This general manager says that for a few months most of his callers had a grievance of some kind. These grievances were adjusted without any difficulty at all. Soon the calls by employees almost ceased. In other words, the man who had a kick had got it out of his system. Now most of the general manager's callers are members of the families of employees, who bring their troubles, including those of a purely domestic nature, to the general manager for discussion and, if possible, for solution.

It is not true to say that this sort of thing is no part of a general manager's business. If it results, as it

has in this case, in greatly improving the relations between employees and the management, it is about as useful as anything to which a general manager could give his time. It may not be literally true, but it is locally reported at the copper properties in question that another strike would be impossible, for the reason that the women would not allow it. The company has the same general manager that it had during the bitter strike of three years ago. He has now convinced his men and their women folks that everybody can get a square deal from him. This is certainly a big gain, and no one would dispute that it is worth all the time spent in bringing about such a condition of affairs.

Electrical railway labor troubles are nearly always traceable to small causes of discontent. When neglected these afford the labor agitator the opportunity he is looking for to start an organization movement. As a rule it is not until this happens that the management wakens to the fact that it has a labor problem. It is then, however, usually too late to do anything except fight. Evidently here is a fit subject for a good resolution for 1916—namely, for the railway manager to find out for himself how well satisfied his employees are, and what, if any, are their grievances, and to take such steps as are needed to remove these grievances.

It will not answer the purpose to take the opinions of superintendents and others on this question. Public or private opinion among a large body of employees is something that the manager must find out for himself. There is, of course, some risk of disorganization in going over the heads of intermediate bosses directly to the men themselves, but this risk is small in comparison to the risk involved in providing no means of communication between those at the bottom and the man at the top. Nor will occasional attention to this matter suffice. The American working man is determined to have a voice. If he does not get it in one way he will get it in another way. The best means of meeting this situation is to provide some regular and well-recognized means by which the men lower down can at any time communicate with the man higher up in an atmosphere of fair hearing and fair dealing.

This copper mine plan is simple, direct and admirably adapted to electric railway systems, and the more systems on which it is put into effect the fewer will be the labor troubles of the future. It is not to be supposed that the institution of such a scheme means that the general manager will dispose of every petty cause of complaint which arises. The purpose is to provide the employee with a safety valve and to enable the management to find out for itself what is really in the minds of the men it employs. The old formula, "Anyone can see me at any time" is not enough. There must be a definite invitation, with time and place clearly stated, if the kind of relations we are talking about here is to be established between railway managements and their employees. Even if a management thinks that its men have nothing about which they would like to unburden their minds, it can only do good to give them an opportunity to speak out if they have anything to say.

# Load Dispatching at East St. Louis

The Author Describes the Method of Centralizing the Control of Power Distribution for a Network of Electric Railway and Industrial Power and Lighting Lines in a Territory of 280 Square Miles with 200,000 Population

By HAROLD W. CLAPP

Vice-President East St. Louis & Suburban Railway

THE East St. Louis & Suburban Railway, with which is affiliated the East St. Louis Light & Power Company, the Alton Gas & Electric Company, and the Alton, Granite & St. Louis Traction Company, has recently inaugurated a load-dispatching system at East St. Louis, Ill. This serves as a means for making more certain an uninterrupted service for power and light customers and for assuring proper supply of electric current for railway purposes in East St. Louis and the surrounding territory served by these properties, as well as for more economical handling of the generation and transmission of electric energy.

Supervision of load handling is placed in direct charge of three dispatchers, working on eight-hour shifts. These are men of several years' experience as switchboard operators who are thoroughly familiar with the requirements of the system. In order that they might have all necessary information immediately at hand, a dispatching room has been fitted up adjacent to the office of the superintendent of power in the general office building at East St. Louis.

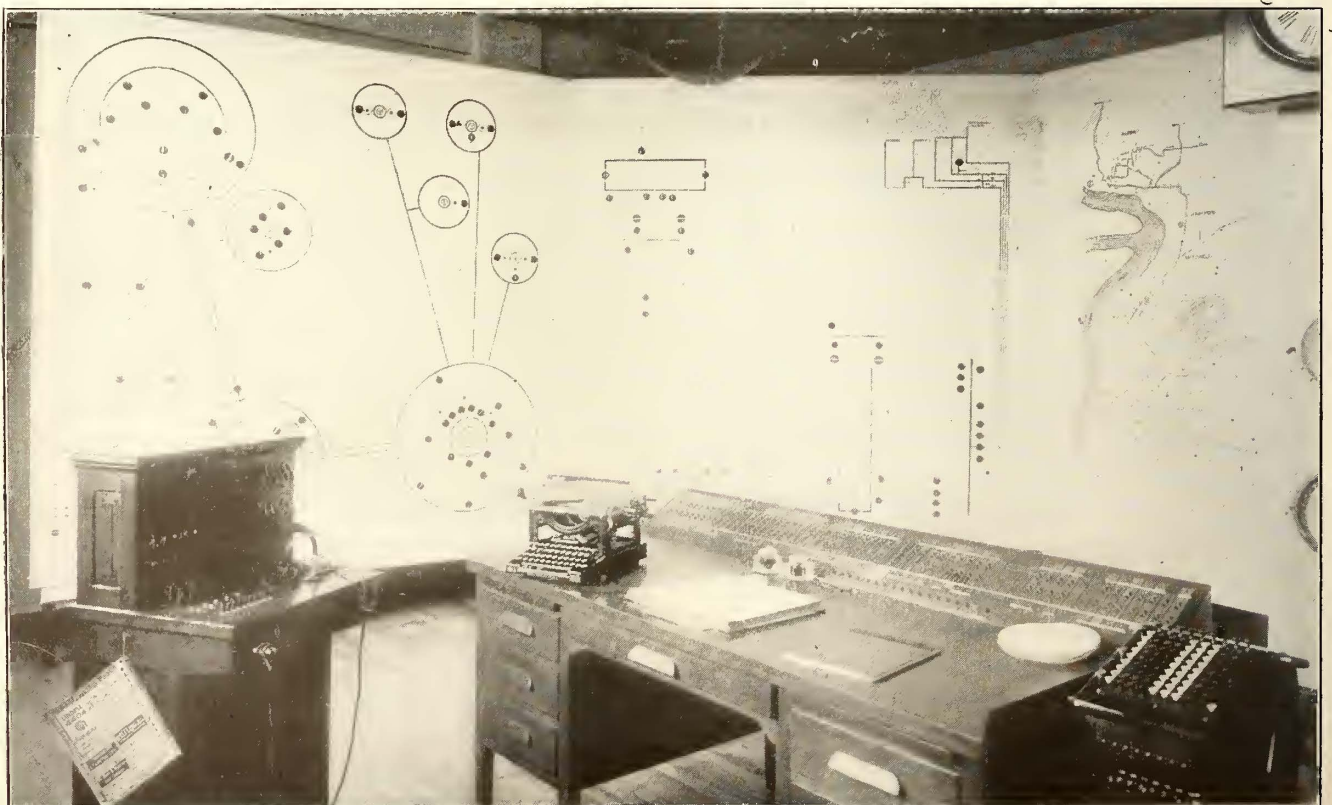
## POWER DISPATCHER'S OFFICE EQUIPMENT

In this office are five large vertical map boards painted white, 8 ft. x 8 ft. in dimensions, these being arranged in a semicircle around a load dispatcher's desk, which stands near the center of the room. Reference to one

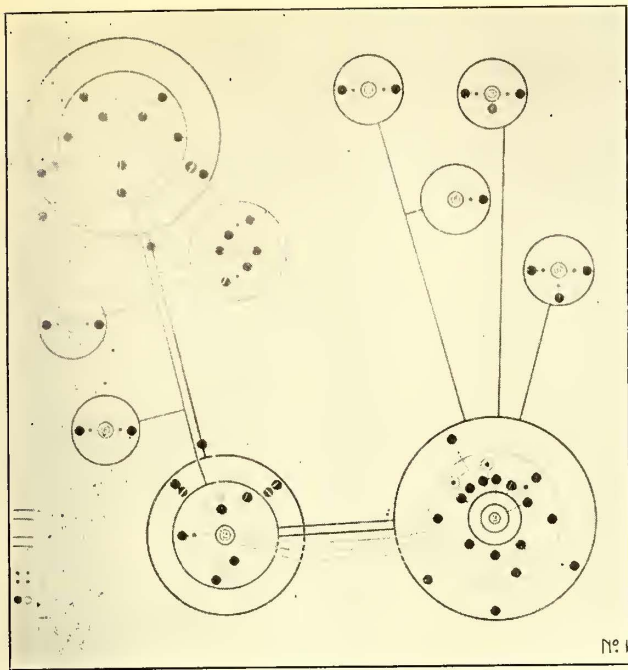
of the accompanying halftones will give some idea of the arrangement, as it gives a full view of the No. 1 and No. 2 boards at the left of the dispatcher, while the No. 3 board is partly exposed at the left of a building column upon which are the recording voltmeters. The No. 4 and No. 5 boards are to the right of the dispatcher.

The No. 1 board shows the power generating system and the main distributing system between stations and substations. On this the power station at Alton is indicated in the upper left-hand corner by the large circles, with the Alton heating plant just to the right and slightly below it. The Winstanley station at East St. Louis is indicated at the lower right-hand corner, and the Lake Avenue substation in East St. Louis at the lower left-hand corner. The lines drawn between these large circles represent station-to-station tie lines. Within the large circles and indicated by small circles are shown the generators, frequency changers, rotaries, motor generators, boosters, synchronous condensers and transformers. Different colors are used to represent the various pieces of equipment and lines of different voltages.

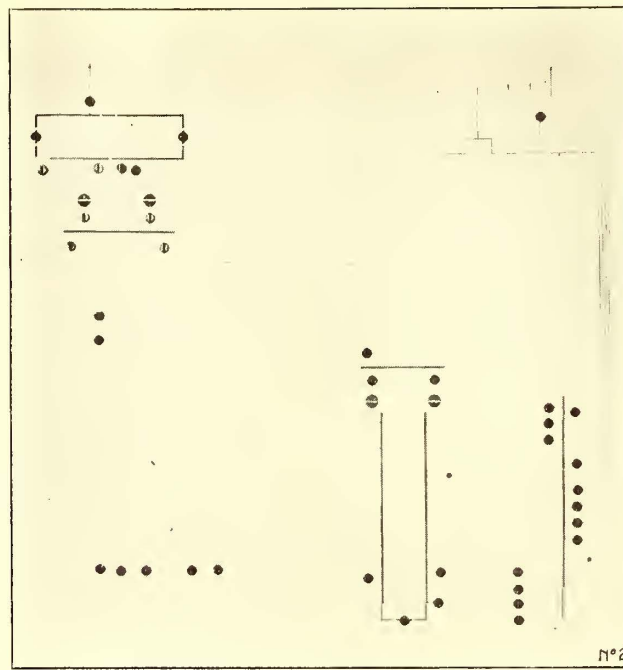
For instance, at the Alton power station, the outside circle is green, representing 66,000-volt, 25-cycle power from the Keokuk hydroelectric station, while the large interior circle is red, indicating 13,200-volt, 25-cycle cur-



EAST ST. LOUIS POWER DISPATCHING—INTERIOR OF DISPATCHER'S OFFICE



EAST ST. LOUIS POWER DISPATCHING—BOARD SHOWING POWER GENERATING AND MAIN DISTRIBUTING SYSTEM



EAST ST. LOUIS POWER DISPATCHING—BOARD SHOWING 25-CYCLE TRANSMISSION SYSTEM DETAILS

rent, either generated at Alton or transformed to that voltage. The two small circles between the exterior circle and the large interior one each represent a 3000-kw. transformer for 66,000-13,200 volts. The circle at the center is in blue, representing 2300-volt, 60-cycle current for power and light purposes. As an example of the method used in showing equipment, between the large blue and the large red circles are shown, at the top, two small circles, or rather groups of three small concentric circles, the inner being in blue, and the two outer ones in red. These represent frequency changers. The straight lines connecting each of these on one side with the large blue circle are in blue, and the straight lines on the other side connecting with the large red circle are in red.

As a further example of the method used in representing machines of different kinds, a 13,200-600-volt rotary for railway service is shown by a red circle with a large yellow dot in the center, and a 13,200-600-volt rotary for commercial power service by a red circle with a large brown dot at the center, red indicating 13,200-volt, 25-cycle power, yellow 600-volt railway power, and brown 600-volt commercial power.

The medium-sized circles at the middle of the left side of the board represent the railway substations at Hartford and Granite City, and the four circles in the upper right-hand section are to indicate the railway substations at O'Fallon, Collinsville, Belleville and Maryville.

OPERATING PROCEDURE

Close to the small circles representing generators, rotaries, etc., are placed small incandescent lamps under lenses corresponding in color to the circles. These lamps are controlled by push-button switches arranged in a double row at the outer edge of the dispatcher's desk. The lighted lamps indicate machines in service, and show by the color of the lenses over them the kind of current being delivered. Whenever a machine is cut in on the line, or is cut off, notification by telephone is given to the dispatcher, who simply presses one of the buttons governing the lamp for that particular machine, and the lamp is lighted or extinguished, as the case may be. Thus there is completed a cycle of operations orig-

inating with the dispatcher's order for a change of machines or the placing of an additional machine on the line; the actual performance of the operation by the station man, and its registry on the map board by the load dispatcher in his office.

On the No. 2 board in the dispatching room is given a detailed outline of the 25-cycle transmission system, which operates at 66,000 volts and 13,200 volts, this showing the connection with Keokuk and with the generating equipment at Alton, Winstanley and Lake Avenue. The locations of control switches on the various lines also are indicated. Lamps under colored lenses for the different machines and corresponding to those on the No. 1 board are also placed on the No. 2 board. In addition to this, lamps under lenses represent the switches, these showing lighted when the switches are closed.

As a further aid in rapid and proper handling of the load, the other three large boards in the dispatching room have proved invaluable for reference. The No. 3 board gives a map of the territory served by the city and interurban lines, indicating the location of double and single trolleys and trolley feeders, each by a different color. Power stations and substations are also indicated. The No. 4 and No. 5 boards show the power and light distributing lines in the cities of East St. Louis and Alton respectively, the largest consumers being located and designated by name. In addition to these, two smaller boards, 4 ft. x 4 ft. in dimensions, are placed just to the rear of the dispatcher, these showing the street arc-lighting systems in East St. Louis and Alton.

In addition to the work of direct supervision of the load handling, the dispatcher keeps a log of all changes affecting the service, such as ordering of lines off for repairs, interruptions from storms or other reasons, and troubles arising from other unusual conditions. From this log a typewritten report is made of all line outages, giving reasons and time of duration. This is sent to all officials directly interested in furnishing service. A book record, alphabetically indexed, is also kept for all lines, and this shows quickly just how much trouble has occurred on any particular line for any given period of time. The system load curves are also made

up in this office from meter readings received daily by telephone from all stations.

The dispatcher is supplied with prints of all bus connections for ready reference. He is also supplied with a full set of maps covering the property and lines, which are mounted on rollers and hung in a map case for easy reference. The recording voltmeters previously referred to give a record of voltages on the 60-cycle, the 25-cycle and the 600-volt d.c. commercial power line.

Just under the push-button switches at the edge of the desk controlling the map-board lamps is a row of small, square plates numbered to correspond to the boilers in the different power stations. Each plate has a hole in it into which is inserted a small wooden button colored to represent the boilers on the line, those banked, those cold but O. K. for service, those out of service for repairs, and those set with kindling or oil in readiness for immediately raising steam pressure for emergency use.

Telephone service is provided to take care of all probable difficulties, direct connection being made to the two plants at Alton, and with the Winstanley Station; also with the substations at Lake Avenue, Hartford and Granite City. Communication may be established with

pany, which supplies electric energy for commercial, residence and street lighting, as well as hot-water heat and illuminating gas in the city of Alton.

The system comprises 196 miles of track in East St. Louis, Alton, Brooklyn, Venice, Madison, Granite City and Belleville, and on the interurban lines extending from East St. Louis to Alton, 25 miles to the north, to Lebanon 22 miles to the east, to Belleville 15 miles to the southeast, and to Edwardsville, via Collinsville, 22 miles to the northeast. This territory is approximately 280 square miles in area, with a population of more than 200,000. At the present time, 7800 customers are supplied with electricity for light and power, more than 76 per cent of the current sold being for power purposes. A supply of current is taken at 66,000 volts, 25 cycles, from the Keokuk Water Power Development of the Mississippi River Power Company over a transmission line 144 miles in length, in addition to the current generated at the power stations of the system.

#### PROVISIONS FOR RELIABLE SERVICE

The region about East St. Louis is peculiarly liable to severe electrical storms, which may cause damage



EAST ST. LOUIS POWER DISPATCHING—BOARDS SHOWING TROLLEY FEEDERS AND POWER STATIONS AND POWER AND LIGHTING CIRCUITS IN EAST ST. LOUIS AND IN ALTON

the other substations and all other departments through the general office operator. The telephone system is so arranged that the dispatcher may hold a telephone conversation simultaneously with the operators at the stations or with all persons involved in making any change, such as one or more linemen, together with the station operator. This considerably reduces the time consumed in making the changes, and introduces an element of safety which might otherwise be lost.

#### SCOPE OF THE SYSTEM

Some idea of the ground covered by the load-dispatching system may be obtained from knowledge of the fact that the activities of seven different properties are included. These are the East St. Louis & Suburban Railway, operating several interurban lines; the St. Louis & Belleville Electric Railway, a coal-carrying road; the East St. Louis Railway, operating the city lines in East St. Louis; the St. Louis & East St. Louis Electric Railway, operating the lines over the Eads Bridge; the Alton, Granite & St. Louis Traction Company, operating the local lines in Alton and the interurban lines between five cities and towns and several villages; the East St. Louis Light & Power Company, which supplies electric energy for general commercial, street and residence lighting, and for power purposes in the East St. Louis district; and finally the Alton Gas & Electric Com-

pany, which supplies electric energy for commercial, residence and street lighting, as well as hot-water heat and illuminating gas in the city of Alton. The system comprises 196 miles of track in East St. Louis, Alton, Brooklyn, Venice, Madison, Granite City and Belleville, and on the interurban lines extending from East St. Louis to Alton, 25 miles to the north, to Lebanon 22 miles to the east, to Belleville 15 miles to the southeast, and to Edwardsville, via Collinsville, 22 miles to the northeast. This territory is approximately 280 square miles in area, with a population of more than 200,000. At the present time, 7800 customers are supplied with electricity for light and power, more than 76 per cent of the current sold being for power purposes. A supply of current is taken at 66,000 volts, 25 cycles, from the Keokuk Water Power Development of the Mississippi River Power Company over a transmission line 144 miles in length, in addition to the current generated at the power stations of the system.

PROVISIONS FOR RELIABLE SERVICE

The region about East St. Louis is peculiarly liable to severe electrical storms, which may cause damage

enough to impair the service. The entire system, however, has been laid out with a flexibility considered proper to supply current for any emergency and to take care of any possible trouble on the line, sufficient station-to-station tie lines being installed with all necessary switching apparatus. In connection with this an interesting feature of the equipment installed for convenience of the load dispatcher is a "storm detector," similar to that used at the Waterside stations of the New York Edison Company. This is an electrical instrument which uses the principles of wireless telegraphy in its operation. Nearly all summer storms are accompanied by electrical disturbances which cover a field much greater than the storm clouds themselves, and it is these disturbances that cause so much damage to transmission lines and result in interruption of service. Some of these radiations may be intercepted by wireless antennae, and the "storm detector" is the instrument which has been devised for use in connection with them to indicate the approach of storms. Several hours before the storm clouds actually reach the city the bell on the storm detector will begin to strike at intervals of several minutes. If the storm is headed direct for the city, these warnings become more frequent, and at its very near approach the bell will ring continuously. When the intervals between warnings have decreased to a certain length, as determined by experience, the load dis-

patcher orders the stand-by boilers fired up and brought up to pressure, thus assuring a supply of steam for the stand-by generators.

In addition to the fact that uninterrupted service is better insured by placing the responsibility for handling the load on the load dispatcher, thus producing on the part of the consumer a feeling of dependence in the assertions and efforts made, it is expected that, by the introduction of the load-dispatching system, many economies will be effected in the production of current. The load dispatcher knows which are the most economical units to operate and he knows what load to expect at different periods of the day, under normal conditions. Handling the load becomes a matter of strict adherence to a certain daily routine, keeping in mind always that only sufficient machines must be operated to carry that load economically. In times of emergency resulting from storms, line trouble or other unexpected occurrences, the experience accumulated in load dispatching will make the dispatcher's movements decisive and certain and will reduce to a minimum the chance for outages.

A notable feature of the company's practice in connection with the new system is that the office of the load dispatcher has been thrown open for inspection by the public. It has been the practice to have those persons in direct charge of any of the numerous and varied industries in the territory served by the railway and power system visit this room when a change to electricity for power is being considered, and it has been their general expression of opinion that the utmost is being done to insure good service. In fact, the visit to the dispatching room has been the clinching argument with several prospective customers. It is considered that the load-dispatching system as graphically displayed in this office is an advertising asset of much value in the campaign for more business which is founded upon a definite policy of giving the consumer absolutely dependable service.

### Electric Railway Statistics

Figures Are Given by States of the Miles of Track and Number of Cars Owned

THE accompanying table gives statistics of the miles of tracks and cars of the electric railway companies in the United States, made up from the August, 1915, electric railway directory of the McGraw Publishing Company. The dates of the reports in this directory average about June, 1915, so that the table may be considered to represent that statistics of the industry at about that time.

A comparison of this table by States with a somewhat similar table published in the issue of Aug. 29, 1914, will show a total of 46,454 miles as compared with 45,004 last year and 99,405 cars as compared with 97,721 last year. A comparison by States, however, will show some decreases in both cars and miles of track, while in the case of other States there are increases of considerable magnitude. These are due principally to two causes. Last year, in the case of interstate railways, an attempt was made to allocate a proportion of the tracks and number of cars between the different States, but as any such allocation is necessarily an estimate, it was considered wiser in the tabulation this year to place all of the mileage and cars in the State in which the greater part of the system is situated. Another reason for the discrepancy lies in the fact that in a number of cases a considerably larger number of "service cars" will be reported than during the following year. This is probably because the official preparing the statement one year will include certain classes of cars, perhaps con-

struction cars, as service cars, whereas in the following year these will not be included by the person making the report. For this reason, the table this year is arranged so as to include the different types of cars reported. Gasoline motor passenger cars are included in the column of motor passenger cars.

In a few cases this year, where the company owns a large number of service cars compared with the number of passenger cars owned, the total number of such service cars has been intentionally omitted from the table. Instances of these are 3000 service cars reported by the Chicago Tunnel Company, 830 freight cars reported by the East St. Louis & Suburban Company, and 498 "other cars" reported by the Fort Dodge, Des Moines & Southern Railroad. In the case of the electrified steam trunk lines only electric locomotives, motor passenger cars and trail passenger cars for use with the multiple-unit system have been included.

TABLE SHOWING STATISTICS OF ELECTRIC RAILWAY COMPANIES IN THE UNITED STATES

States	Number of Companies	Miles of Track	Motor Passenger Cars	Trail Passenger Cars	Electric Locomotives	Express Motor Cars	Freight Cars	Service and Other Cars	Cable and Horse Cars
<i>New England States</i>									
Connecticut	11	1,576	2,102	44	100			73	
Maine	16	583	582	8	4	4	56	133	6
Massachusetts	40	3,188	7,979	314	11	11	1,112	1,112	2
New Hampshire	13	208	264		1	2		28	
Rhode Island	3	436	1,068	47				253	
Vermont	10	124	142				9	11	
Total	93	6,115	12,137	413	116	16	76	1,610	8
<i>Eastern States</i>									
Delaware	3	138	235					76	
District of Columbia	7	403	1,087					444	
Maryland	11	674	2,152		10	1	2	210	
New Jersey	29	1,471	2,756	3	2	13	7	84	21
New York	107	5,447	15,667	1,123	139	11	35	2,398	180
Pennsylvania	123	4,354	8,477	56	3	13	60	661	
Virginia	16	594	906	26			10	184	
West Virginia	24	519	610				3	33	
Total	320	13,600	31,800	1,208	154	38	135	4,099	201
<i>Central States</i>									
Illinois	73	3,683	5,833	631	51		910	1,019	
Indiana	44	2,309	1,956	12		13	86	206	
Iowa	30	878	984	13	17			364	
Kentucky	10	467	996	14			21	76	
Michigan	26	1,658	2,802	8	10	7	10	129	
Minnesota	13	789	1,213	22	4			221	
Missouri	24	1,122	2,474					484	
Ohio	77	4,288	5,374	84	11	6	18	1,198	2
Wisconsin	21	767	892	122			3	57	
Total	318	15,961	22,524	906	93	26	1,048	3,754	2
<i>Southern States</i>									
Alabama	14	366	437	33			2	210	
Arkansas	11	134	230					54	
Florida	7	176	249					49	
Georgia	16	483	722	8				87	2
Louisiana	8	292	647					106	
Mississippi	11	123	163	2				27	
North Carolina	14	286	282		6		2	207	
South Carolina	7	110	152	6		2		12	
Tennessee	14	461	831		1		3	148	
Total	102	2,431	3,713	49	7	2	7	900	2
<i>Western States</i>									
Arizona	4	52	41	1				1	
California	40	3,188	3,611	81	75	4	430	1,739	109
Colorado	13	460	414	157				259	2
Idaho	5	174	58					16	
Kansas	19	449	372	19			12	105	2
Montana	8	271	127	15	17		1	17	
Nebraska	7	234	481		1			52	5
Nevada	2	11	12						
New Mexico	2	10	11						
North Dakota	6	38	76					14	
Oklahoma	16	285	227	27		4		60	
Oregon	10	720	800	47	19	3	146	548	
South Dakota	3	26	31	2				3	
Texas	39	992	1,188	84		14		208	
Utah	5	363	275	8	3	2		197	
Washington	13	1,052	1,007	24	27	429	29	451	49
Wyoming	2	22	12	7				3	
Total	194	8,347	8,743	472	142	456	618	3,673	167
Total, all States	1,027	46,454	79,007	3,048	512	538	1,884	14,036	380

The receipts of the Glasgow Corporation Tramway for the past six months totaled \$2,766,160, or almost \$194,800 more than in the corresponding six months last year. The passengers carried exceeded 177,500,000, an increase of nearly 13,000,000. This remarkable traffic is largely due to munition work at Clydeside.

# The Return Feeder System of the Interborough

This System, While Special in View of the Practically Insulated Nature of the Track and of the Tremendous Traffic Density, Is an Interesting Example of the Application of Return Feeders on a Large Scale

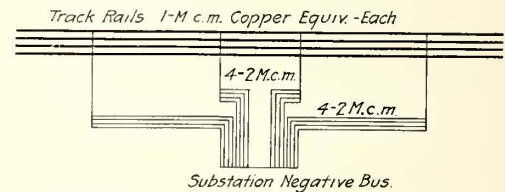
By I. W. GROSS, New York

THE insulated return-feeder system has in recent years been somewhat widely utilized in the attempt to reduce stray currents on railway lines using direct current with grounded track circuits. This system, which has been extensively and interestingly treated in the columns of the ELECTRIC RAILWAY JOURNAL during the last two or more years, is not new, having been installed as early as 1904, when the Interborough Rapid Transit Company of New York first began the operation of its subway lines. It is the purpose of this article to briefly describe the negative layout as used by this company at the present time on its subway lines and to show the benefits derived from this insulated feeder system.

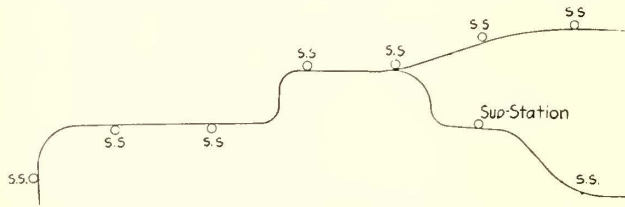
The present system of subway lines operated by the Interborough Rapid Transit Company consists of approximately 55 miles of equivalent single-track line, part of which exists as four-track section, part as two-track section, and a small portion is a three-track

as are the positive feeders. These feeders are distributed to the track in four groups per substation, two long groups and two short ones. The track rails are equalized approximately every 300 ft. by bare cables, of from 250,000 to 1,000,000 circ. mil area, to prevent excessive drop in the rails when cars are starting.

The negative cables run from the substation in underground clay conduits. They are equalized at the track end on a bus which is insulated by fiber from



INTERBOROUGH RETURN FEEDERS—FIG. 2—DIAGRAM OF RETURN FEEDER LAYOUT, PREFERRED PLAN



INTERBOROUGH RETURN FEEDERS—FIG. 1—MAP OF SUBWAY SYSTEM

section which is at present normally operated as a two-track line. The different types of subway lines are divided approximately as follows: four-track mileage, 25; three-track mileage, 7; two-track mileage, 23; total, 55.

Since the above lines are underground and the density of traffic comparatively great, a signal system is absolutely necessary to the safe operation of the trains. For this purpose one of the track rails is utilized for signal purposes to the complete exclusion of its use for return traction current. One running rail per track, therefore, remains for the return current, additional conductivity being supplied by auxiliary cables.

Power is supplied to the line at 625 volts, direct current, from nine rotary converter substations, located approximately 12,000 ft. to 14,000 ft. apart. The average maximum hour winter input to the substations averages about 8600 kw., alternating current, for a substation feeding a four-track line. From this it is apparent that there is a heavy load on the line. This load is about 0.169 kw. per foot of track, or on a four-track line it is 0.676 kw. per foot. Fig. 1 shows the general layout of the system.

### NEGATIVE CIRCUIT LAYOUT

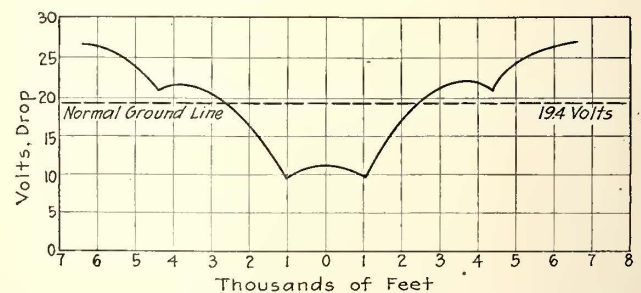
The track-circuit electrical layout is shown diagrammatically in Fig. 2 for a four-track section. All negative feeders are of copper, 2,000,000 circ. mil in size, insulated with paper and covered with lead identically

the bus support, which is bolted to the concrete structural work. From this negative bus heavy, bare copper jumpers connect to the track rails.

To present the voltage characteristics of this negative return system, average data have been taken over the entire subway lines. Following are the data used:

Total length of line fed per substation.....	12,720 ft.
Length of short negatives.....	1,500 ft.
Length between short negatives.....	2,080 ft.
Length between short and long negatives.....	3,400 ft.
Length beyond long negatives.....	1,920 ft.
Average amperes per foot of track.....	1.22

In computing the voltage drop curves a uniform distribution of the load over an entire section was assumed, and this assumption is clearly quite rational considering the heavy load on the line.



INTERBOROUGH RETURN FEEDERS—FIG. 3—VOLTAGE DROP WITH PREFERRED PLAN

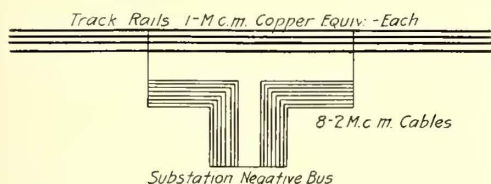
The negative voltage drop curves shown in Fig. 3 were computed from the above data and the four-track layout of Fig. 2. Reference to Fig. 3 shows that no attempt has been made to equalize the drops in the negative feeders. The drop in the short negatives is 9.3 volts, and in the long negatives it is 20.9 volts. The maximum drop at the end of the section is 26.9 volts.

The average drop under the curve, to which the copper loss is proportioned, is 19.4 volts, from which it



appears that the maximum drop affecting electrolytic conditions at the end of the line is 7.5 volts, and at the end of the short negatives, 10.1 volts.

The distribution of current in the cables is as follows: Long negatives, 790 amp. per cable; short negatives, 1150 amp. per cable. From this it will be seen that the current distribution is not equal in short and long feeders. In some cases, in fact, it has been found



INTERBOROUGH RETURN FEEDERS—FIG. 4—DIAGRAM OF RETURN FEEDER LAYOUT, ALTERNATE PLAN

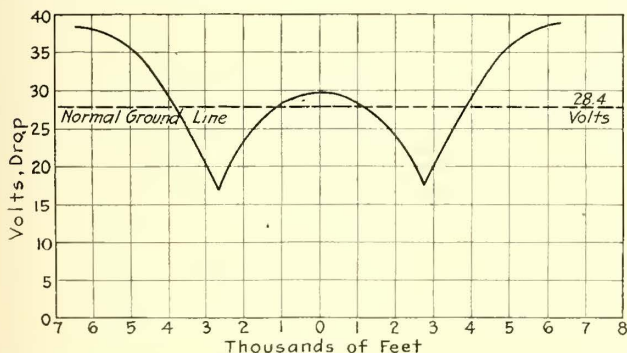
necessary to add another short negative cable to provide sufficient current-carrying capacity in the short negative group.

To compare the above-described insulated feeder system with one having equal distribution of current in all negative feeders the scheme of Fig. 4 is presented, and voltage drops were computed for them as before. This scheme involves two sets of negative feeders, with a total feeder length equivalent to that shown in Fig. 2.

A summary comparison of the two schemes is given in the following table:

DATA FOR NEGATIVE CIRCUITS ONLY		
	Scheme Shown in Fig. 2	Scheme Shown in Fig. 4
Maximum average volts drop.....	26.9	38.0
Maximum average volts drop effecting electrolysis, at end of line.....	7.5	9.6
Maximum average volts drop effecting electrolysis, at the ends of short feeders.....	10.1	11.6
Average volts drop.....	19.4	28.4
Maximum hour copper loss, per cent.....	3.11	4.55
Per cent excess copper loss in one scheme as compared with the other.....	...	46.2

From the above comparison it is obvious that the scheme shown in Fig. 2 is vastly superior to that of Fig. 4, and the additional cost of installing the former



INTERBOROUGH RETURN FEEDERS—FIG. 5—VOLTAGE DROP WITH ALTERNATE PLAN

is merely that of placing two additional sets of track equalizers at the end of negative cables, the duct lines being approximately the same in total length.

INSULATION OF TRACK RAILS

For an ideal layout of a negative track circuit to minimize electrolytic effects it is desirable to keep the ends of all negative feeders at the same potential. In the Interborough subway system, however, this is not essential since the track itself is not inherently a grounded circuit. The rock ballast and ties provide very good insulation between track and ground, so much so, in fact, that extraordinary precautions with paralleling

conducting lines external to the subway have never been found necessary on account of electrolytic trouble.

It should be emphasized in passing that the complete insulation of the negative bus is imperative to obtain the full benefits of the insulated feeder system. Reference to Fig. 3 will show the results of grounding the negative bus. The ground line which would normally be at the 19.4-volt line would now be moved to the zero line, if the negative bus were grounded, rendering the entire length of the line electrolytically dangerous and increasing the maximum drop effecting electrolysis from 10.1 to 26.9 volts.

Where the insulated feeder system exists, there is often the temptation to solidly bond foreign conductors carrying stray current to the negative bus. This is extremely bad practice, as it thus tends to ground the negative bus, giving rise to the destructive voltages shown above. This condition can be avoided, where bonding is found necessary, by inserting a suitable resistance in the bond connection to the foreign conductor.

RESULTS AND CONCLUSIONS

The Interborough Rapid Transit Company has used the insulated feeder return system on its subway lines in New York for the past ten years with marked success. This success is due in part to the insulated feeder system and in part to the relatively high insulation between track rails and ground. This insulation of track rails renders unnecessary the keeping of the ends of the negative feeders at the same potential to produce satisfactory electrolytic conditions with respect to paralleling foreign conductors.

The system of insulated negative feeders as used by the Interborough on its subway system gives better electrolytic conditions, and consumes less energy in copper loss than a similar insulated system using the same total length of cable, with only two negative tapping points per substation, instead of four as in the present system.

Equality in feeder loads in the four-tap-point scheme has been sacrificed for the above-mentioned electrolytic advantages and economy in losses.

Rock Slide Delays Operation Through Cut

Kansas City, Mo., spent five years and \$400,000 digging a canyon 90 ft. wide and 40 ft. to 80 ft. deep through three blocks of hills to furnish an outlet for traffic from the new Union Station to the south residence district. The Metropolitan Street Railway spent much time and money building a double track through the cut, over which certain cars were to be routed by the station, and by which four blocks of travel by the street cars would be saved in getting from the south part of the city to the business district. The water and gas mains had been laid, and the bids for the pavement had been advertised. Cars were to start over the new tracks, the date being fixed, tentatively.

The board of control made a final inspection, however, before ordering cars over the new route, through the cut. P. J. Kealy and Robert P. Woods, the members of the board, saw that the track work was all right, but they decided against operating cars through the cut on account of hanging walls of rock. Two days later a heavy slide carried rock and debris over the tracks, and knocked some of the rails out of alignment. The cars will continue to use the former circuitous route, until the city can force property owners to remove the excess rock and earth from their property abutting Main Street from Twenty-fourth to Twenty-seventh.

## Snow-Fighting Apparatus\*

In a Timely Paper the Author Describes the Methods of Removing Snow from the Tracks and Afterward of Disposing of It

BY H. BATES

Assistant Construction Engineer Connecticut Company

IT is becoming more and more important not only to keep the snow from accumulating on the tracks, but in the cities to remove it promptly from the street adjacent to the tracks for a distance at least equal to the width of the average vehicle. While it seems that the municipalities ought to take care of the prompt removal of the snow from the sides of the street, experience shows that it is not being done. Until more can be accomplished in the line of co-operation with municipalities the railways for their own protection will have to clear the streets to a certain extent. When the railway tracks offer the only pathway through a snow-covered street, the speed of the cars will be measured by that of the slowest wagon upon it, and a big part of the loss from snow is traceable directly to reduced car movement.

The snow-fighting problem resolves itself into three parts: First, to keep the snow off the tracks; second, disposal of the snow thereby thrown up on the side of the street, and third, the opening up of lines on which, for one reason or another, snow has accumulated so that service has been temporarily suspended.

### TO KEEP THE SNOW OFF THE TRACKS

All agree that the best way to fight snow is to have sufficient suitable equipment and power so that the snow is never able to collect upon the rails in any such degree that it cannot be taken care of by the equipment. Some railway men say there should be a plow or sweeper for every 2 miles of track, some for every 5 miles, and so on, but every railway man has to determine for his own system just how often each section of track has to be gone over and figure the necessary equipment, taking into account the speed and other conditions. Owing to the natural reluctance of railway companies to invest to any large extent in equipment that is used only a few times in the year, some companies have experimented along the line of temporarily providing regular equipment with plows or scrapers. It seems as though the most economical plan is to provide a certain amount of regular snow-fighting equipment with the addition of service cars, trolley express cars and the like temporarily equipped with plows or scrapers, or both. Along this latter line are various devices.

The main difficulty with a plow in paved streets seems to be its inability to clean off the snow to the top of the rail. I understand that some trouble was experienced on our lines in the recent storm due to wet snow rolling up under the shear and lifting it so that the centers could not be kept down, and this resulted in interference to the motors. Scrapers will accomplish this to a certain extent, but the best results on paved streets, in the opinion of a number of railways, is realized from sweepers.

### SNOW ON THE SIDES OF THE STREET

As stated, this work in most municipalities falls to the railway companies, therefore many companies are emphasizing the importance of clearing the snow for at least a distance outside of the rails equal to the average width of a vehicle at the same time that the tracks are cleared. With the increases in traffic, the impair-

ment of the service caused by vehicular traffic using the tracks becomes a serious matter. One of the latest developments in equipment for taking care of this trouble is a sweeper used by the New York Railways Company with a 16-ft. outboard rotary broom, which clears a space 12 ft. wide alongside of the tracks. This sweeper was described in the *ELECTRIC RAILWAY JOURNAL* for Feb. 13, 1915. It is stated that heretofore the New York Railways have lost as much as \$30,000 a day during the first day or so of a heavy snow storm.

Some railways use wings and outboard scrapers for clearing the snow on the sides, as in Montreal.

### SNOW REMOVAL

In December, 1911, the American Electric Railway Association collected information from the various companies in regard to their practice in removing snow from highways by means of mechanical devices other than shovels, pungs or carts. The result showed at that time only one road in the country had done anything in the way of the mechanical handling of snow. This was the Lewiston, Augusta & Waterville Railway in Maine, and its device seems to be very similar to the Ridlon snow remover. It is claimed by the manufacturers of this remover that one man with a two-horse snow remover will do more efficient work in one day than fifty men with shovels and five two-horse dump carts. It is operated by lowering the front end of the pan to load and pulling out the bottom, which is a slide, to dump.

At the snow removal conference held in Philadelphia on April 16-17, 1914, a committee was appointed which presented conclusions at a meeting on Dec. 3, 1914, before the American Society of Mechanical Engineers, recommending the use of sewer manholes for dumps and suggesting the following:

"1. The plan of organization and the system to be employed for snow removal should be worked out in advance of the snow season.

"2. The work of removal should commence as soon as the snow had covered the pavements and the indications pointed to the continuance of the storm. This principle is successfully followed by street railways in the removal of snow from their track space and by some cities.

"3. The carrying capacity of the sewer system should be utilized as far as possible to get the snow away from the streets.

"4. When practicable the work should be performed directly by the municipality by day labor.

"5. Co-operation should be sought with the traction companies and use made of adjustable plows and sweepers to open roadways adjacent to \* \* \* street railway tracks at the time that the work of clearing the tracks is being carried on.

"6. Effort should be made to obtain the co-operation of the public and to instruct the householders in the method of the removal of snow from private premises:

"7. The police force of the city should co-operate with the street cleaning force and the services of patrolmen as inspectors should be utilized as far as possible.

"8. A standing committee should be appointed to collect data and report upon such methods or apparatus as may be presented to it." [For further particulars see *ELECTRIC RAILWAY JOURNAL* for Dec. 5, 1914, page 1248.]

The commissioner of street cleaning in New York has stated that "to have every sewer in town available for the disposal of snow as it falls and to secure a sufficient number of men to keep snow moving into the sewer as it falls appears to be the most feasible scheme for the snow-removal proposition." Continuing to quote: "The principal difficulty in snow fighting will be to secure an adequate force of men ready and willing to

\*Abstract of paper read at meeting of the Connecticut company section, New Haven, Conn., Jan. 4, 1916. The author also showed slides of different types of snow fighting apparatus and described their construction and use.

begin work on the first appearance of snow and to start actually removing the snow not less than one hour after the first flake has fallen under conditions which indicate that a continued storm may be expected."

There is the possibility of obviating this difficulty to a certain extent by the development of mechanical devices for loading, moving and dumping snow.

CLEARING BLOCKADED LINES

We now come to the opening up of lines on which, for one reason or another, snow has accumulated so that service has been temporarily suspended.

This work usually means digging through hard, packed snow, and sometimes ice underneath, which completely covers the tracks. At the present time the only method which seems to be in general use is to get out with picks and shovels, following with plows as the tracks are dug out. Suggestions along the line of melting or burning out the snow and ice over the rails electrically or with high power blow-torches have been made, the idea being that if the wheels can obtain tractive effort some type of ice cutter might follow to level off the top of the rails. Another suggestion is that a number of heavy-toothed disks somewhat similar to a circular saw be mounted on a shaft underneath the front sweeper, the action being similar to that of the sweeper broom. In this way the ice might be cut out, but it seems questionable whether the rails could be sufficiently cleaned. Nothing seems to have been very fully developed along this line, although study in this direction is well worth while if the present very slow method of hand digging could be supplanted by a quicker method.

Of course time spent on study in this line may be somewhat of an admission that a railway is not able to keep the lines open. If the first part of this snow-fighting problem can be properly taken care of, that of keeping snow off the tracks, the cause of the existence of the third part of the problem, the unopened track, is eliminated and the effect does not have to be treated. For this reason, I think we all agree very properly, effort has been concentrated in developing methods to keep snow from accumulating rather than dealing with conditions as they exist on an unopened line.

The use of salt helps materially in keeping ice from forming and snow from hardening on the rails. Some railways use salt cars, which are placed in operation when a storm starts and all the tracks freely salted. In some States there are ordinances prohibiting the general use of salt, but in such cases special permission can often be obtained for its use at special places.

CONCLUSIONS

The main purpose of this paper is to present what data on this snow-fighting problem I could collect in the short time available, with the idea of bringing out a discussion which would be beneficial to all. While the last storm was ably handled, any suggestion which will reduce further the large expenditures and losses contingent on snow storms is valuable. The cost to our own company for handling the storms on Dec. 13 and 18 was \$50,700. This is made up as follows:

Keeping tracks open and maintaining service.....	\$25,800
Extraordinary repairs to equipment.....	1,600
Removal of snow.....	9,600
Loss in revenue.....	13,700

Snow-fighting preparations and equipment must be made and bought for much the same reason that a company insures against fire. It is equally necessary to spend time and money to insure against losses from snow storms. Although I have spoken mostly in this paper of the tangible losses, there is always that intangible, inestimable value of favorable public opinion to be protected.

The great question before this country to-day is that of preparedness—preparedness, as I take it, in order to insure this country to the extent that as long as some one else has a weapon of attack he will not dare to attack us. It is preparedness that is essential in successful snow-fighting, with this difference—that we are reasonably sure of being attacked, and this brings out the other essential, that of the ability to get the jump on nature's storm king.

Bridge Failure in Spokane

Wreck Not Due to Unusual Strain on Bridge—Board of Engineers Reports on Causes of Failure

FURTHER details are now available regarding the recent failure of the Division Street Bridge across the Spokane River in Spokane, Wash., as reported in a recent issue. The accident, which resulted in the death of five passengers in one of the two cars of the Washington Water Power Company that were on the bridge at the moment of failure, has been investigated by a board of four engineers who were called upon to examine the wreck before it was disturbed by the operations of cleaning up the debris and before any considerable rusting had taken place. The unanimous conclusion



SPOKANE BRIDGE FAILURE—VIEW SHOWING CAR CAUGHT ON EDGE OF BRIDGE AND SEATS OF SUBMERGED CAR IN WHICH FATALITIES OCCURRED

of this board was that the failure was due to the simultaneous breaking of the bottom-chord eye-bars of the truss because of granulation. No excessive load was on the bridge at the time when it collapsed, and it was considered unlikely that there had ever been put upon the bridge a total load, including pavement, pipes, street cars and other traffic, in excess of that for which the structure was designed. Breaks in the steel work which were caused by the falling of the bridge, and which were plainly not responsible for the failure, showed silky fractures, indicating first-class material. Inspection of the bridge prior to the accident would not have disclosed any defects.

Subsequent to the accident the designer of the bridge, H. L. Cooper, consulting engineer of New York City, stated that the structure had been fabricated at the shops of the Edgemoore Bridge Company in 1892, and he considered that this firm was a leader in high-class constructions of the type in question. His calculations showed that when the bars broke and precipitated the

structure into the river, they were carrying about 7800 lb. per square inch or one-seventh of the load that would normally be necessary to break them. The bridge, however, had been damaged in a flood in 1894. At this time, according to his recollection, a railroad bridge which had been washed out came down the stream and struck the specific bars which broke in the accident under consideration. As a result of this blow the bars were abnormally distorted or broken entirely and they had since been rewelded. He considered that if the bars had been taken out and straightened locally at that time their usefulness must have been reduced because this particular class of high-grade steel required annealing after local heating and there were no annealing furnaces in the West with the necessary capacity. The fact that at the time of the failure the up-stream bar of the fractured pair of eye-bars showed the mark of a heavy blow on the up-stream side in the immediate vicinity of the fracture was a circumstance confirming this conclusion.

### Auto-Bus Line in Seattle

Equipment of Subsidiary of the Puget Sound Traction, Light & Power Company, with Rates Charged

THE Bothell-Seattle service of the Washington Auto Bus Company, a subsidiary of the Puget Sound Traction, Light & Power Company, was inaugurated on Nov. 15, 1915. The cars used have a "street car" body, built by The J. G. Brill Company, mounted on an International Motor Company's 2-ton "Mack" truck chassis. The seating capacity is twenty passengers, with six



SEATTLE-BOTHELL BUS

non-reversing cross-seats, two longitudinal seats of two passengers each, and one four-passenger seat extending the width of the body in the rear. Three hand straps are provided opposite each longitudinal seat. There are five windows on each side, the top being stationary and the bottom being arranged to raise, and there is a rain vision wind shield in front of driver. All windows have Pantasote curtains.

For lighting the cars, four dome lights, aggregating 60 cp., are fed from an 80-amp-hr. storage battery, which is charged from a 20-amp. Appleco generator. The cars are heated by the exhaust from the motor, a valve being provided for turning heat on or off as desired. The front wheels are equipped with 39-in. x 6-in. non-skid pneumatic tires, the rear wheels with 36-in. x 5-in. dual blocks. The governors are set so that the cars can be operated at a maximum speed of 25 m.p.h.

The present service calls for eight round trips every day except Saturday, when nine trips are run. The distance from Bothell to Seattle is 16 miles, and one hour is taken for the trip. The schedule is operated with

two cars, one being held in reserve, and totals approximately 256 miles per day, except Saturday, when it is 288 miles. Transfers are issued to and accepted from the cars in Seattle of the Puget Sound Traction, Light & Power Company.

The following rates are in force:

SCHEDULE OF RATES FROM SEATTLE				
To	Miles	One Way	Round Trip	Ten Rides
Bothell	16.0	\$0.45	\$0.75	\$3.00
Kenmore	13.0	.35	.50	2.00
Lake Forest	11.9	.30	.40	1.75
Briar Crest	10.8	.25	.35	1.50
Lake City	9.0	.20	.30	1.40
Chelsea	8.5	.20	.30	1.40
O'Brien's	8.1	.15	.30	1.25
Morningside	7.1	.15	.25	1.25

### Bay State Substations

Cost of Substation Construction and Equipment Submitted as Evidence to Public Service Commission in Bay State Fare Hearing

A DETAILED analysis of the cost of five substations of the Bay State Street Railway, Boston, Mass., located on the lines south of Boston, is a feature of the recent inventory of the property filed with the Massachusetts Public Service Commission in connection with the pending fare case. The inventory was made by Sloan, Huddle, Feustel & Freeman, Madison, Wis. The investment cost new of the substations was \$411,727, including land, buildings and equipment complete, and the total capacity in rotary converters was 6990 kw., making the average cost \$58.90 per kilowatt. The cost data prepared are based on the company's construction and purchase records, and include stated allowances for fixed charges as indicated. In the following tables are printed the detailed equipment costs of these plants, with particulars of building cost in three cases.

The substations are located at Bridgewater, 900 kw.; Brockton, 3750 kw.; Fall River, 3000 kw.; Rockland, 900 kw., and Taunton, 1700 kw. Including overhead charges their total cost includes, land, \$30,123; buildings, \$82,650; equipment, \$298,954, or, reduced to unit cost, land, \$2.92 per kilowatt; buildings, \$2.25 per kilowatt, and equipment, \$29.20 per kilowatt. Exclusive of land the substation total cost is \$383,768, or \$37.45 per kilowatt. All these plants receive energy at about 13,000 volts, 25 cycles, and deliver direct current at the usual trolley pressures of 550 volts to 600 volts. They were built about ten years ago, and the investment cost new is the total outlay the company had made on Nov. 1, 1914, in the construction of this portion of its system. The fixed charges listed are those incurred during construction, and the figures show, as nearly as may be, the actual investment the company has made in the five substations tabulated.

#### COST OF SUBSTATION BUILDINGS

BRIDGEWATER (900 KW.), 35 FT. 2 IN. x 60 FT. 6 IN.			
Item and Quantity	Unit Price	Total	
Excavation, 476 cu. yd.	\$0.50	\$238	
Concrete foundations, 170 cu. yd.	14.00	2,380	
Concrete—3-in. floors—plain, 1200 sq. ft.	.16	192	
Concrete—6-in. reinforced floor, 417 sq. ft.	.50	208	
Concrete—3-in. reinforced floor, 349 sq. ft.	.25	87	
Concrete—4-in. reinforced floor, 119 sq. ft.	.35	42	
Concrete—10-in. reinforced floor, 984 sq. ft.	.60	590	
Concrete steps, 12 cu. ft.	.35	4	
Brick—walls, 74,000	24.00	1,776	
Brick—coping and pilasters, 9000	26.00	234	
Cut stone, 193 cu. ft.	2.50	482	
Steel and iron—structural steel, 13,531 lb.	.04	541	
Steel and iron—wrought-iron railing		20	
Steel and iron—miscellaneous		260	
Timber—roof sheathing, 7200 bd. ft.	41.00	295	
Timber—miscellaneous		26	
Roofing—slate, 2860 sq. ft.	.10	286	
Millwork—doors, 214 sq. ft.		101	
Millwork—windows, 473 sq. ft.		228	
Screens, 232 sq. ft.	.15	35	
Sheet metal work		517	
Electric lighting		393	
Heating		18	
Pumbing		175	

Item and Quantity	Unit Price	Total
Painting—oil, 383 sq. yd.	\$0.18	\$105
Painting—cold water, 402 sq. yd.	.12	48
Fence		57
		<b>\$9,317</b>

Engineering, interest, insurance and contingencies, 11 per cent 1,025  
 Taxes, organization, 3.5 per cent. 326

Total building cost \$10,668  
 Total building cost per kilowatt \$11.83

Building, brick and concrete, walls being brick and floors plain and reinforced concrete. Roof supported by steel trusses and covered with slate. Present condition good.

**BROCKTON (3750 Kw.), 34 Ft. 8 In. x 78 Ft. 10 In.**

Item and Quantity	Unit Price	Total
Excavation, 599 cu. yd.	\$0.60	\$359
Trenching, 91 cu. yd.	.75	68
Concrete—plain footings, 154 cu. yd.	14.00	2,156
Concrete floor, 6 in., 2733 sq. ft.	.18	492
Concrete curbing, 72 cu. ft.	.30	22
Concrete—3-in. walk, 90 sq. ft.	.16	14
Concrete—4-in. reinforced floor, 209 sq. ft.	.40	84
Concrete—6-in. reinforced floor, 301 sq. ft.	.50	150
Brick—walls, 109,000	24.00	2,616
Brick—pilasters, 53,000	26.00	1,378
Cut stone, 510 cu. ft.	3.00	1,530
Timber		291
Millwork—doors, 381 sq. ft.		173
Millwork—windows, 1263 sq. ft.		622
Millwork—screens, 360 sq. ft.		54
Cast iron, 5113 lb.	.04	205
Railings, etc.		144
Steel, 37,617 lb.	.05	1,891
Slate, 153 sq. ft.	.90	138
Roofing—tar and gravel, 2607 cu. ft.	.07	182
Sheet metal		308
Grating, 266 sq. ft.	.35	93
Ventilators		20
Electric lighting		386
Heating		95
Plumbing		175
Painting—oiling, brick		150
Painting—cold water, 1362 sq. yd.	.12	163
Painting—oil, 498 sq. yd.	.18	90
		<b>\$14,039</b>

Engineering, interest, insurance and contingencies, 11 per cent 1,544  
 Taxes, organization, 3.5 per cent. 492

Total building cost \$16,075  
 Total building cost per kilowatt \$4.29

Building has brick walls, floors plain and reinforced concrete; roof supported by steel trusses, covered with tar and gravel. Plant in good condition.

**TAUNTON (1700 Kw.), 45 Ft. x 88 Ft.**

Item and Quantity	Unit Price	Total
Excavation, 851 cu. yd.	\$0.50	\$426
Concrete—foundations, 295 cu. yd.	10.00	2,950
Concrete—6-in., reinforced floors, 3104 sq. ft.	.50	1,552
Concrete—4-in., plain floors, 2291 sq. ft.	.18	412
Concrete—miscellaneous		38
Brick—walls, 147,000	21.00	3,087
Brick—pilasters, 8400	23.00	193
Cut stone, 317 cu. ft.	2.00	634
Steel—structural, 23,343 lb.	.04	934
Steel and iron—miscellaneous		439
Timber—roof sheathing, 14,000 bd. ft.	42.00	588
Timber—miscellaneous		38
Roofing—slate, 4542 sq. ft.	.10	454
Millwork—doors, 303 sq. ft.		143
Millwork—windows, 962 sq. ft.		470
Screens, 405 sq. ft.	.15	61
Sheet metal		587
Ventilator		74
Electric lighting		513
Heating		54
Plumbing		200
Painting—oil, 929 sq. yd.	.18	167
Painting—cold water, 1101 sq. yd.	.12	132
Fencing		80
Manhole		38
Gravel roadway		538
Slate		122
		<b>\$14,924</b>

Engineering, interest, insurance and contingencies, 11 per cent 1,642  
 Taxes and organization, 3.5 per cent. 522

Total building cost \$17,088  
 Total building cost per kilowatt \$10.00

Building, brick and concrete, with brick walls and concrete floors, all in good condition.

Fall River substation, irregular building, converted power house, about 86 ft. x 146 ft., approximately 12,000 sq. ft.

Rockland substation building, 31 ft. x 60 ft., brick, concrete and steel.

Items	Quantity	Unit Price	Total
Switchboards and wiring			\$7,647
Miscellaneous equipment and tools			195
			<b>\$30,993</b>

Total Engineering, insurance, contingencies, interest, 10.5 per cent 3,254  
 Taxes and organization, 3.5 per cent. 1,085

Grand total \$35,332  
 Grand total equipment per kilowatt \$39.20

**BROCKTON (3750 Kw.)**

Items	Quantity	Unit Price	Total
750-kw. GE rotary converters	3	\$10,085	\$30,255
1500-kw. GE rotary converter	1	10,578	10,578
825-kw. GE three-phase air-cooled transformers	3	3,872	11,616
1575-kva. GE three-phase air-cooled transformers	1	4,393	4,393
12,500-volt GE electrolytic lightning arresters	1	358	358
70-in. Buffalo motor-driven blowers	2	375	750
GE motor-driven air compressor and equipment	1	375	375
Switchboards and wiring			16,292
Miscellaneous equipment and tools			93
10-ton, hand-operated traveling crane	1	1,350	1,350

Total \$76,060  
 Engineering, interest, insurance and contingencies, 10.5 per cent 7,986  
 Taxes and organization, 3.5 per cent. 2,662

Grand total \$86,708  
 Equipment per kilowatt \$23.20

**FALL RIVER (3000 Kw.)**

Items	Quantity	Unit Price	Total
750-kw. GE rotary converters	4	\$10,085	\$40,340
Foundations for above			1,210
825-kw. GE three-phase, air-cooled transformers	4	3,872	15,488
Foundations for above			110
12,500-volt GE electrolytic lightning arresters	1	325	325
70-in. Buffalo motor-driven blowers	2	365	730
GE motor-driven air-compressor and equipment	1	375	375
Oil-testing equipment and filter	1	970	970
Switchboards and wiring			11,440
Miscellaneous equipment and tools			334

Total \$71,322  
 Overhead charges during construction, as above, 14 per cent 9,985  
 Grand total \$81,307  
 Equipment per kilowatt \$27.10

**ROCKLAND (900 Kw.)**

Items	Quantity	Unit Price	Total
300-kw. GE rotary converters	3	\$4,570	\$13,710
330-kw. GE three-phase, air-cooled transformers	4	2,512	10,048
40-in. Buffalo motor-driven blowers	2	165	330
GE motor-driven air compressor and equipment	1	375	375
12,500-volt GE electrolytic lightning arresters	2	301	602
Switchboards and wiring			6,380
Miscellaneous equipment and tools			106

Total \$31,551  
 Overhead charges during construction, 14 per cent. 4,417

Grand total \$35,968  
 Equipment per kilowatt \$39.96

**TAUNTON (1700 Kw.)**

Items	Quantity	Unit Price	Total
500-kw. GE rotary converters	3	\$7,017	\$21,051
200-kw. GE multipolar booster generator	1	3,788	3,788
300-kw. GE four-pole d.c. belted motor for booster	1	4,775	4,775
550-kw. GE three-phase air-cooled transformers	3	3,062	9,186
55-in. Buffalo motor-driven blowers	2	245	490
12,500-volt GE electrolytic lightning arresters	4	295	1,180
GE motor-driven air-compressor and equipment	1	375	375
Switchboards and wiring			11,287
Miscellaneous equipment and tools			183

Total \$52,315  
 Overhead charges during construction, 14 per cent. 7,324

Grand total \$59,639  
 Equipment per kilowatt \$35.00

**COST OF EQUIPMENT  
 BRIDGEWATER (900 Kw.)**

Items	Quantity	Unit Price	Total
300-kw. GE rotary converters	3	\$4,570	\$13,710
330-kw. GE three-phase, air-cooled transformers	3	2,512	7,536
40-in. motor-driven Buffalo blowers	2	165	330
GE motor-driven air compressor and equipment	1	375	375
12,500-volt GE electrolytic lightning arresters	4	300	1,200

**SUMMARY OF SUBSTATION COSTS**

Substation	Kilowatt			Equip-ment	Total, Excluding Land	Grand Total
	Capacity	Land	Building			
Bridgewater	900	\$1,296	\$10,668	\$35,332	\$46,000	\$47,296
Brockton	3,750	2,488	16,075	86,708	102,783	105,271
Fall River	3,000	20,507	28,200	81,307	109,507	130,014
Rockland	900	1,188	12,783	35,968	48,751	49,939
Taunton	1,700	4,644	17,088	59,639	67,727	81,371
Total	10,250	\$30,123	\$84,814	\$298,954	\$383,768	\$413,891
Average per kilowatt.		\$2.92	\$8.25	\$29.20	\$37.45	\$40.37

# American Wood Preservers' Association

Papers Presented Before the Annual Convention Discuss Specifications for Wood-Block Paving, the Foreign Creosote Situation, Use of Zinc Chloride, Timber for Cross-Ties, Butt Treatment of Poles and Wood-Block Flooring

THE twelfth annual convention of the American Wood Preservers' Association was held in Chicago on Jan. 18-20. A number of the papers and reports were of special interest to electric railways, and several of these are abstracted in the following paragraphs.

## REPORT OF COMMITTEE ON WOOD-BLOCK PAVING

The committee on wood-block paving presented a report containing specifications covering the manner in which timber should be selected and treated for this purpose, as well as the method of laying the blocks in the street, the specifications applying particularly to Southern yellow pine, although the committee considered the treatment safe for Norway pine, hemlock, black gum and tamarack. The recommendations provided for blocks cut from sound timber with at least six annular rings to the inch, beginning 1 in. from the center of the heart of the block. Not less than 50 per cent of heartwood was required, and green timber was preferred for treatment, though seasoned timber was not excluded. Blocks from 5 in. to 10 in. long were deemed acceptable, although a length equal to twice the depth was preferred. The report recommended 4-in. block for heavy traffic streets, 3½-in. block for lighter traffic streets and 3-in. block on residential streets where the traffic is light. Blocks 3 in. in depth should be 8 in. long and from 3 in. to 4 in. wide. The width and depth should be different to prevent the blocks from being laid on their sides.

The committee also recommended that blocks be laid in the street as soon as possible after treatment. If this could not be done, provision should be made to prevent the blocks from drying out by packing them in close covered piles. The blocks should be sprinkled with water at intervals to keep them moist, and they should be well sprinkled about two days before being laid, making the wood sufficiently wet to swell to its maximum size. The report recommended concrete foundations preferably 6 in. thick, although on light traffic streets 5 in. was deemed sufficient. A mortar cushion not less than ½ in. nor more than 1 in. in thickness composed of one part Portland cement and four parts of sand, was also specified, to which only sufficient water should be added to insure a proper setting of the cement. The committee recommended that the mortar be spread immediately in advance of the laying of the blocks, and that the concrete foundation be cleaned and thoroughly wet down before placing the mortar bed. Under special conditions, especially where vibration was to be expected, it was recommended that the mortar cushion be omitted and a bituminous coating one or two coats in thickness be spread upon a smoothly finished and thoroughly dry concrete base. A bituminous filler and longitudinal expansion joints ¾ in. wide should be installed on 30-ft. streets. The report also recommended rolling the pavement longitudinally and diagonally with a 5-ton steam roller, and when a mortar bed is used the rolling should be completed before the mortar has set.

## THE FOREIGN CREOSOTE OIL SITUATION

A paper on the foreign situation in regard to the supply of creosote oil was read by G. A. Lembecke. In this the author stated that, during the months immediately

following the outbreak of the European war, it looked as though all shipments of creosote oil from Europe would cease, but that conditions had since so adjusted themselves that Great Britain, during the year 1915, had shipped to this country between 30,000,000 gal. and 35,000,000 gal. This compared with importations of foreign creosote oil during 1912 of approximately 60,000,000 gal., in 1913 55,000,000 gal., and in 1914 43,000,000 gal. Of the creosote received during the year 1915, none had come from Germany or Belgium, which in a large measure accounted for the decrease in the importation of this product. On the other hand, the general business depression and the uncertain supply of creosote caused a number of large railroad systems to abstain for a time from the use of creosote oil. This condition in a measure made the reduced supply received from foreign sources, together with the creosote produced by manufacturers in this country, sufficient to supply the demand.

Although there was a decrease in the total production of creosote oil, the increased demand for coal-tar products in the United Kingdom increased its supply of oil sufficiently to meet the requirements of the United States. The author also stated that the stocks of creosote oil in Germany were entirely exhausted, and that the exportation of creosote oil after the war must of necessity at first be slow and reduced in volume. On the other hand, he said, at the close of the war all of the countries engaged will have an enormous amount of renewal work to do and European consumption of creosote oil will greatly increase. Under these conditions, even though the war should end in 1916, the author deemed it reasonable to suppose that no decided change in price would take place.

## USE OF ZINC CHLORIDE

In a paper discussing the unit quantity of zinc chloride that should be used and the method of determining the true strength of the solution, by W. F. Goltra, it was stated that there was a divergence of opinion among users of the material, regarding the strength of the solution and the quantity of dry salt that should be injected per tie, or per cubic foot of timber to protect the wood thoroughly from decay. The author said that it had been almost the universal custom in this country to specify a certain quantity of dry salt per tie or per cubic foot of timber, without taking into consideration the variable absorbing characteristics of individual pieces of timber in the same charge or different species of wood under treatment. Many experiments have been made to find some way of securing uniform absorption, but none have attained the desired end. Instead of specifying so many ounces or pounds of dry salt per tie or per cubic foot of timber, it would be more rational to base the strength of the solution on degrees Beaumé at a stated temperature. In support of his recommendation the author cited the practice of European railways in which the strength of the solution and the quantity of salt per cubic foot were both specified, and in conclusion he offered the following specification: "The zinc solution must have a strength of 3.50 deg. Beaumé at a temperature of 70 deg. Fahr. The same strength should be used for all

species of wood and for all sizes of ties, and shall be injected into the wood to refusal."

RATING WOODS FOR TIES

In a paper discussing woods suitable for cross-ties R. Van Metre stated that in considering the value of any species, aside from natural durability and capacity for treatment, there are three points of importance: (1) That it be sufficiently strong to withstand the ordinary strains due to center binding, etc.; (2) that it be sufficiently dense to resist spike pulling and lateral pressure on spikes, and (3) that it be sufficiently hard to have a proper resistance to rail wear.

It is desirable that some classification of the mechanical suitability of the different species as ties be established from a comparison of their mechanical properties. The Forest Products Laboratory has been working on this, and has suggested the practicability of basing a classification upon a composite figure involving the following mechanical properties: Static bending, impact bending, compression parallel to grain, compression perpendicular to grain, and hardness.

This would result in the accompanying classification of some well-known species. The figures given are for average forest-grown material, and individual pieces of any of the species may vary as much as 30 per cent above or below the average.

TIMBERS ARRANGED IN ORDER OF THEIR MECHANICAL VALUE AS TIES

Species	Average Composite Value
Black locust	1,666
Sugar maple	1,140
White oak	1,050
Red oak	972
Beech	955
Longleaf pine	914
Red gum	825
Shortleaf pine	800
Western larch	790
Tamarack	740
Eastern hemlock	700
White fir	610
Lodgepole pine	590
Western yellow pine	560
Northern white cedar	420

The author also urged that more consideration be given to the matter of seasoning, which, he said, would make so-called soft woods serviceable and conserve the supply of red oak.

BUTT TREATMENT FOR POLES

Butt treatment under pressure of only those parts of poles and piles especially subject to rapid decay was proposed in another paper by Frank W. Cherrington as a suitable and economical substitute for the treatment of the entire piece. While the author holds that the creosoting of poles and piles in their entirety is an economical investment, he believes that a butt treatment with pressure by means of a vertical cylinder would be effective, whereas dipping or painting are only make-shifts. Until recently engineers have considered it impractical as well as impossible to treat, by the injection of creosote oil under pressure, the butt only of piling or telephone poles. The author, however, understands that there is now in process of development at least one practical means of accomplishing this long-sought end, by providing a vertical cylinder for injecting by any standard process, any required amount of preservative into the butts only of piling or poles, while the upper parts of the timbers are merely surrounded by the compressing medium, or air.

FAVORABLE REPORTS ON WOOD BLOCK FLOORS

Although it is only a few years that creosoted wood blocks have been used for the flooring of factories, warehouses and other buildings, they have already proved their worth, according to a paper by C. H. Teesdale of

the United States Forest Products Laboratory, who summed up the answers to questions submitted to a large number of users of wood-block flooring, as well as to the manufacturers of the creosoted blocks. The results of this investigation indicate that treated wood block makes a desirable type of flooring for many purposes, the records of 160 floors indicating that serious trouble has developed in a very low percentage of cases.

Most of the trouble has come from shrinkage or expansion of the blocks. For dry situations the blocks should be well seasoned before treatment and laid in the floor while thoroughly dry. In wet or alternately wet and dry situations dry blocks would give expansion trouble, hence the timber should be green or only semi-air-dried when laid. Even dry interiors are liable to be accidentally subjected to water, however; hence it would seem desirable as a rule to use bituminous fillers instead of sand filler.

In a few cases it seems likely that wood block should not be used. For example, it should not be used where butter or tobacco products are stored. In some foundries, where hot castings are thrown upon the floor, the blocks have burned through to the foundation. However, wood block has been found to be very satisfactory in many cases where heavy castings are thrown about or where heavy trucks are moved, and it is liked by workmen because it is warm and easy on their feet.

SERVICE TESTS OF CROSS-TIES

There was presented also a report which consisted of a compilation and tabulation of all the data which could be secured on the service tests of ties on both steam and electric roads. In connection with the latter, the following information was given on untreated ties:

1. *Untreated Ties in Interurban Lines.* The following estimates were secured from officials of six companies operating in the Middle West:

Cedar	Untreated	No tie plates	7- 8 years	Michigan
Cedar	Untreated	With tie plates	9-10 years	Michigan
Cedar	Untreated	No tie plates	12-15 years	Michigan
White oak	Untreated	No tie plates	15-16 years	Michigan
White oak	Untreated	No tie plates	11-12 years	Illinois
White oak	Untreated	No tie plates	7- 8 years	Michigan
White oak	Untreated	No tie plates	10-12 years	Michigan
White oak	Untreated	No tie plates	6- 7 years	Indiana

2. *Untreated Ties in Unpaved and Macadam Streets.* Officials of several companies operating in the Middle West supplied the following estimates:

Cedar	Untreated	11-12 years	Illinois
White oak	Untreated	8-10 years	Illinois

Oak and beech. Reported as badly decayed and removed after two years from track laid on gravel ballast in Illinois.

3. *Untreated Ties in Paved Streets.* A third and important condition under which ties are used, is in tracks in paved streets. The situation is complicated not only by lack of authentic data, but by the variety of types of construction in use. Some light is thrown on the service secured from untreated ties in these types of track by the following tabulation of opinions expressed by officials of a number of companies operating in the Middle West:

Locality	Species	Life Un-Treated Years	Remarks
Michigan	White oak	12-15	Life of tie equal to life of rail
Michigan	White oak	20	Life of tie equal to life of rail
Michigan	White oak	10	.....
Illinois	White oak	20-25	Equal to life of rail, provided tie is not disturbed
Indiana	White oak	20	Life of tie equal to life of rail
Illinois	{ Hemlock Tamarack Cedar	.....	.....
		15-20	Life of rail
		.....	.....

All the tramway men of the London County Council Tramways, of military age, have been ordered to submit themselves for medical examination, and if unfit for military service to get a certificate to that effect.

## Electrification of Transportation Lines\*

The Author Discusses the Relative Advantages of the Three Systems Used in this Country

BY N. W. STORER

General Engineer Westinghouse Electric  
& Manufacturing Company

ONE of the things that has been both an advantage and a disadvantage in the electrification of steam railways has been the fact that there have been several systems, each with many variations and all rivals for the great work of displacing the steam locomotive. This has been an advantage because the competition between the different systems has served to stimulate the advocates of each system to a maximum effort. The disadvantage has arisen because no system has had at any time sufficient superiority over the others to win a decisive battle. Consequently, the railways which hope to adopt the best system have felt inclined to delay electrification until the question of superiority can be decided. At the present time there is much less talk, and both sides are now endeavoring to show by results rather than by words which one is the best.

Of the three systems the straight three-phase type should be mentioned, although it has been adopted only in one small installation in this country, because it is used quite extensively in Italy and is standard on the Italian State railways. There the locomotives usually have two constant speeds, secured either by double windings on the motors or by connecting the motors first in cascade and second in parallel. They operate with 3000 volts on the trolley wire and apply this voltage directly to the motors so that no transformers are necessary, making the machine comparatively simple and of a minimum weight and maximum efficiency. The chief reason that has prevented the use of the three-phase locomotive in this country lies in the double overhead trolley wire. American railway men are hard enough to convince of the advantages of electrification where only one overhead wire is used, and they will not consider the double trolley at all on account of the complicated construction in yards and cross-overs. In this country, also, it would be impossible to gain the advantage of simplicity possessed by Italian locomotives because the service in America is so much heavier that higher contact-line voltages must be used. Consequently, it would be necessary to have transformers on the locomotives.

With regard to the direct-current system, it may be said that the range of voltage between 3000 and 5000 puts this system in the heavy trunk-line class. With these high voltages the transmission loss is low and the substations can be placed from 25 miles to 50 miles apart, but although it is undoubtedly possible to operate heavy trains at a voltage of 3000, it would be much preferable to have a higher voltage if this can be secured with safety. That this is practicable is indicated by the operation of the 5000-volt equipment on the Grass Lake line of the Michigan United Traction Company, which shows that this voltage may be used for both multiple-unit cars and locomotives, as the equipment on this line has operated for 14,000 miles since its installation without a breakdown in the insulation or any other troubles due to high voltage. However, it is to be hoped that a standard may be arrived at in the near future so as to avoid the large number of milestones which mark the progress of the direct-current system in its application to heavy railway work.

The advantage of the direct-current system lies largely in the characteristics of the series motor which is universally used. Mechanically, it is simple, rugged

and comparatively inexpensive. Electrically, it has speed and tractive effort characteristics that are especially well suited to the work of rapidly accelerating heavy trains with minimum power consumption, as well as of operating them at full speed afterwards. The steep speed characteristics give an automatic division of load among all the motors in a train, even with maximum variations in wheel diameters. The efficiency of the motor is high, and its reliability and foolproof characteristics make it the most popular of all types of railway motors.

With regard to the single-phase system, it may be said that the advantages center in the high voltage which can be used on the trolley while at the same time ordinary voltages are impressed on the motor and control equipment in the car or locomotive. The high voltage alternating current reduces the cost of the overhead conductor and feeder system to a minimum and enables the railway to use substations without attendants. It has also the advantage of permitting the use of locomotives which have either series characteristics or else induction motor characteristics such as have been installed recently on the Norfolk & Western Railway.

## Recent Pamphlets on Electrolysis

National Bureau of Standards Has Just Issued Two Important Pamphlets on Electrolysis Mitigation

WITHIN the past few weeks two important pamphlets have been issued by the United States Bureau of Standards as follows: Technologic Paper No. 26, on "Earth Resistance and Its Relation to Electrolysis of Underground Structures," and Technologic Paper No. 52, on "Electrolysis and Its Mitigation."

Paper No. 26, which is by Burton McCollum and K. H. Logan, takes up methods of measuring soil resistance, factors affecting specific resistance of soils and the relation of soil resistance to electrolysis. Included are tables of specific resistance of many soils in Philadelphia, Pittsburgh, St. Louis, Washington and elsewhere. A few notes on the application of the principles to electric railways are given, particularly emphasizing the importance of good rail bonding and of well-drained roadbed.

Paper No. 52 was written by E. B. Rosa and Mr. McCollum and it is a most important general treatise on the subject, comprising 143 pages. After a general survey of the subject it takes up three main topics: (1) Methods of mitigation applicable to pipes; (2) methods of mitigation applicable to the railway negative return, and (3) regulations regarding electrolysis mitigation. The methods discussed under the first head include those for keeping the current away from the pipes, those for increasing the resistance of the pipe path, and those for draining current from the pipes. The conclusion reached was that none of the methods tried is suitable as a primary means of preventing electrolysis troubles, but all are to be considered as auxiliary or emergency measures.

For the general mitigation of electrolysis thorough bonding and cross-bonding of track and drainage of roadbed are recommended. Where track is on private right-of-way rails and ties should be kept, as far as possible, out of direct contact with earth. The three-wire system, viewed solely from the standpoint of electrolysis mitigation, promises well, but sufficient operating data are not yet available to show its practicability. The most effective methods of mitigation, according to the paper, involve the use of insulated return feeders with or without boosters. In many cases a limited use

\*Abstract of a paper presented on Jan. 3 before the Pan-American Congress, Washington, D. C.



of insulated joints or pipe drainage may be found advisable.

The authors include the essentials which they think should form the basis of regulations dealing with this subject. These regulations should apply not only to the railway system, but should also define the responsibilities of the owners of underground utilities. They state that under most conditions over-all voltage in railway tracks should be limited to 2 to 4 volts and potential gradients to 0.3 to 0.4 volt per 1000 ft., these being average all-day values. Potential drops on pipe systems should be, roughly, half of these figures.

Copies of the above pamphlets can be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 15 cents for No. 26 and 30 cents for No. 52.

## The Near-Side Stop

Its Advantages as a Time Saver Are Analyzed, and Examples Are Given from Kansas City Practice

BY W. C. HARRINGTON

Assistant General Superintendent Metropolitan Street Railway

WHEN a comparison is made between the value of the near-side and the far-side stop, the thinking individual will be forced to favor the near-side stop. There are a hundred reasons for so deciding, but the most important is made up of the two principal factors in operation—time and safety.

Where the service stop is made at the far side the motorman has to determine when arriving at the near side the possibilities of making the crossing, and every delay encountered there is a total loss of time from an operating standpoint. If he makes only a safety stop at the near side there will nearly always be an ample number of would-be patrons to board the car to hold it from a few seconds to a minute. Again, he cannot always get a clearance for the crossing the instant he arrives even when there is no one on hand to board the car and this time must also be taken into account as a delay to the service. Those who argue in favor of the far-side stop say that it is not always necessary for the car to stop before making a crossing, but the times when such a stop is unnecessary are few compared with those when it is required.

The average service stop of a city line car is from fifteen seconds to one minute. Some of the safety stops are about one second only in duration when no one boards the car, and the longest stops are over a minute in most places. In Kansas City I believe the average stop will total about fifteen seconds, and when fifteen seconds are charged off to stops at both sides of streets where two lines intersect, fully 50 per cent of the stopping time must be considered a complete loss. Our lines, with but few exceptions, are brought downtown, as every line is a through line where the traffic warrants, and this, of course, gives us a large number of lines operating over the downtown trunks. At times during the peak-load period we have a forty-five second headway on three of the trunk lines and a shorter headway on one of the downtown loops.

The central section of all these lines and trunks may be included in an area of five blocks square from Eighth Street on the north to Twelfth Street on the south and from Wyandotte Street on the west to McGee Street on the east. Within this district there are eighteen north and south crossings, or thirty-six stops which of necessity must be made by every car on a round trip north and south through the business section of the city. In like manner there are fifteen east and west crossings, or thirty stops which must be made by every car on a

round trip east and west through the business section. This totals a loss of nine minutes every time the cars operating east and west cross this district, and seven and one-half minutes lost on the lines operating north and south through this section. By dividing this time up between the lines operating east and west on the lines between Eighth and Twelfth Streets we have a loss of time totaling one and four-fifths minutes per car on each trip and one minute on all lines operating north and south between Eighth and Twelfth Streets.

In making the near-side stop universal for the system we eliminate complaints to a great extent from the outlying sections, as the average street car rider at one time or another during the day boards a car in the business section and thereby becomes acquainted with the practice and spreads the knowledge to those who are only occasional riders. The average rider is also much more concerned with the saving of time than he is with his personal safety and the safety of others, and for that reason the uniformity of stops developed when the near-side stop is in practice makes it easier for the trainman to watch the movements of the passengers.

Another feature of the near-side stop, which eliminates accidents to a certain degree, is the fact that the cars are under a fair headway when the far side of the street is reached, and few persons will attempt to board them when they are running at that speed; whereas many men and a few women will endeavor to board the cars when they are operating at a low rate of speed, such as is the case just before a stop is made. This we find is common when the cars are obliged to stop at both sides of the crossing.

Finally, the schedule time is helped because it is possible for the cars to get away promptly after leaving a stop. We find that on level crossings it is possible to get the car under full headway a short time after the rear trucks have passed the last rail of the crossing, even if the controller is thrown off while the car is crossing the rails of the intersecting line.

A comparison of the running time before Aug. 20, 1911, on which date near-side stops were inaugurated, and during November, 1915, in Kansas City, shows that on most runs we have been able to increase the average schedule speed by about  $\frac{1}{2}$  m.p.h. This, on our line, amounts to a large total in both time and money. This increased running time has not materially affected the schedules as the savings have been made at points where otherwise a waste of time would result. While the near-side stop has not been wholly responsible for this saving, it has been the predominating factor in forming a basis for the working out of time-saving methods. When we consider that the increase in population during recent years in Kansas City and the Metropolitan Street Railway territory has been large and that the congested district has been constantly widening, the importance of this improvement becomes increasingly manifest.

## Union Traction of Indiana Awarded Brady Medal

The committee appointed by the American Museum of Safety to award the Anthony N. Brady medal met in New York on Jan. 21 and selected the Union Traction Company of Indiana, A. W. Brady, president, Anderson, Ind., to receive the medal, and the Elevated Railroads of Chicago, Ill., B. I. Budd president, to receive honorable mention.

The committee of award comprised the following: B. J. Arnold, Chicago, Ill., chairman; Frank R. Ford, New York; Will T. French, San Francisco, Cal.; James H. McGraw, New York; George F. Swain, Cambridge, Mass., and W. H. Tolman, New York, secretary.

MIDYEAR MEETING  
CHICAGO  
FEBRUARY 4, 1916

## ASSOCIATION NEWS

MIDYEAR MEETING  
CHICAGO  
FEBRUARY 4, 1916

Power Generation Committee Will Study Machinery Rating, 60-Cycle Apparatus, Smoke Abatement, Purchase of Fuel to Specification, Safety Code and Operating Costs—O. T. Crosby Addressed Washington R. & E. Section on Jan. 10—Capital Traction Section Was Organized on Jan. 13

### Activities of the Committees

#### COMMITTEE ON WAY MATTERS

As this issue goes to press the Engineering Association committee on way matters is meeting in New York with all members present but W. F. Graves, who is recovering from the effects of a surgical operation in a New York hospital. A number of representatives of manufacturers of special work are also in attendance. Minutes of the meeting will be given in a later issue.

#### COMMITTEE ON POWER GENERATION

The first meeting of the Engineering Association's committee on power generation for the current year was held in New York City on Jan. 14, at the association offices. The meeting was devoted to a discussion of the most advantageous methods for handling the various subjects assigned for the committee's consideration by the executive committee of the association, beginning with the matter of reviewing existing standards and specifications. In view of the fact that the standing committees on power generation up to the last year had confined their work to the presentation of a series of papers, there were but few association standards with which the committee was directly concerned, and in consequence no sub-committee was appointed for considering the subject. In regard to the matter of consideration of the new standardization rules of the A. I. E. E. it was decided that the question of ratings and ultimate temperatures was of great importance, and in consequence Chairman J. W. Welsh appointed Messrs. Bromley, Stitzer and Swain from the committee to report upon the subject. To the same sub-committee was also assigned the work of reporting on the advantages

and disadvantages of 60-cycle apparatus, the sub-committee chairman for this subject being Mr. Stitzer.

With regard to the subject of smoke abatement it was decided that a sub-committee composed of Messrs. Rolston, Stott and Freeman should make a report in the form of a review of the most recent developments, and another sub-committee, composed of Messrs. Stott, Freeman and Sinclair, was appointed to report upon the new boiler code of the A. S. M. E., with a view to recommending action in regard to it by the association. The form for specifications for the purchase of fuel, which was submitted by last year's committee, was assigned to a sub-committee composed of Messrs. Freeman, Kelsay and Rolston for consideration in connection with the possible incorporation of provision for the fusing temperature of ash and other additions, and to Messrs. Kelsay, Rolston and Sinclair was assigned the consideration of the new safety code of the National Bureau of Standards.

In the matter of investigating operating costs for railway power systems it was decided to compare actual results from a number of power stations by the standardization method suggested by last year's committee with the idea of determining the extent to which standard comparisons could be carried. This investigation was to be carried out by the committee as a whole owing to the great scope of such a comparison and the work involved in the collection and compilation of the necessary data. Subsequent to an extended discussion regarding ways and means of handling this subject, the committee adjourned to meet again early in the month of May at such place as may be decided upon by the chairman.

### Activities of the Company Sections

#### PUBLIC SERVICE SECTION

The regular meeting of Company Section No. 2 was held in Newark, N. J., on Jan. 20. Papers were delivered by C. F. Bedwell, assistant engineer, on "Construction of Carhouses" and by R. H. Harrison, mechanical department, on "Construction of Car Shops." These papers were illustrated with lantern slides and they aroused much interest. The discussion was led by C. D. Smith, traffic investigator, J. R. Case, division master mechanic and H. H. George, assistant engineer maintenance of way.

#### CONNECTICUT COMPANY SECTION

The regular meeting of this section was held on Jan. 4 at the Hotel Taft, New Haven, with 100 members in attendance. As customary, the meeting was preceded by a dinner during which musical entertainment was furnished.

The speakers at the meeting were J. P. Alexander of the Westinghouse Electric & Manufacturing Company, who gave an illustrated talk on the company's plant at East Pittsburgh, Pa., and Harold Bates, assistant con-

struction engineer of the company, who spoke on "Snow Fighting." An abstract of the latter's paper is given elsewhere in this issue of the *ELECTRIC RAILWAY JOURNAL*. This paper was illustrated with lantern slides.

#### WASHINGTON R. & E. COMPANY SECTION

The regular monthly meeting of the section was held in the offices of the Potomac Electric Power Company on Jan. 10, with more than 100 members in attendance. Charles S. Kimball presided.

Oscar T. Crosby, an early president of the company and instrumental in building up the property, delivered an address on "Peace and Preparedness." He compared the pioneering of peace with that of electric railway development, and contrasted the operating conditions on the early electric railway operated in Richmond, Va., with those existing on the Washington system at present. Col. George Truesdell, former District Commissioner and at present a director of the company, spoke on the early history of the company. Vice-President W. F. Ham also spoke briefly regarding the development of the company-section movement. Some

musical numbers and the serving of a buffet luncheon completed the program.

Thirty members of this section connected with the transportation, accounting and engineering departments have enrolled in a Sheldon School course in the "Science of Business Building." Two members have already completed the course with credit.

CAPITAL TRACTION COMPANY SECTION

The eighth company section of the association was formally organized by the Capital Traction Company in Washington, D. C., on Jan. 13. The program announced in last week's issue was carried out. Addresses were made by Martin Schreiber, E. B. Burritt, Harlow C. Clark, C. C. Peirce, H. C. McConaughy and also by several officials of the Washington Railway & Electric Company.

The following officers and directors were elected: President, R. H. Dalgleish, electrical engineer; vice-president, F. Morrill, roadmaster; secretary, J. Fleming, purchasing agent; treasurer, A. Wilkinson; directors, D. S. Carll, E. Von Culin, C. J. Hoshall and E. L. Grayson.

D. S. Carll, vice-president and retiring general manager of the Capital Traction Company, presided until after the election of officers, and took the opportunity of thanking the employees for their loyal support during his long term of active association with them. George E. Hamilton, president of the company, assured the section of the hearty support of the company. He spoke of the value of association as leading to concentration, resulting in efficiency, which spells power and success for employees and company alike, and emphasized the fact that the success of the company depends in a large measure on the attitude of the platform men, who form the point of contact between the company and its patrons.

Mr. Peirce brought out certain facts affecting the relations between the public and the utility, with particular reference to courtesy. He took as a text "Courtesy Is the First Line of Defense Against Unfair Attack." He said in part:

"Remember that men in the street railway world are all salesmen, simply selling transportation in place of merchandise. There is a splendid opportunity to make friends of one's customers in the street railway business. The electric railway is the great retailer of transportation. All its employees help to sell its product. The public knows that a man named Smith or Brown is the head of the road, but it praises or blames the company from the impression it gets of Jones or Robinson on the car platform. If the conductor or motorman has a twenty-four-hour habit of courtesy, the public thinks that the chief must be a pretty good sort. It knows that every concern partakes of the personality of its head. Business to-day, in every line, depends more and more on friendship. Competition is keen, but where price and quality are anywhere near equal, the man you like gets the order. The basis of friendship is personality. In the last hundred years inventions that have abridged distance have caused civilization to make gigantic strides. But these annihilators of time and space have also tended to efface personality. This is particularly true in great corporations, the organized evidences of these inventions. Now, however, the pendulum is swinging in the other direction. Literally, and by means of making his name and his company widely and favorably known, the big man is emerging from the cloistered seclusion of his private office. His desk is up near the front window so the public can look in and see what kind of a person it is buying from."

Chicago Loop Traffic Analyzed

Chart Showing Number of Passengers Delivered at Different Streets Suggests Changes in Routeing

PEDESTRIAN congestion can be relieved in the Chicago loop during the passenger delivery period by rerouteing of the surface line cars. This, at least, is the conclusion drawn by the Chicago Bureau of Transportation of which R. F. Kelker, Jr., is supervisor, after analyzing the passenger delivery of the surface and elevated lines. The results of this traffic study were plotted on a chart so that they could readily be interpreted by the local transportation committee and the managements of the surface and elevated lines, to whom they were submitted for consideration. This chart, which was accompanied by data relating to the daily distribution of passengers by streets and by divisions, is shown in the accompanying illustration. The data collected cover the distribution of all passengers entering the loop district between 6.30 a. m. and 12.30 p. m. by both the surface and elevated lines. This time interval during which the traffic counts were taken was considered, for all practical purposes, to represent the delivery period of in-bound traffic.

On the original chart passenger delivery to the various streets from the north section of the city is shown in

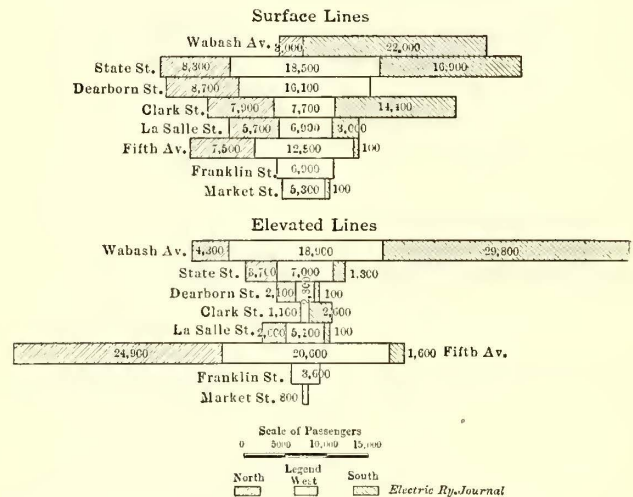


CHART SHOWING PASSENGERS DELIVERED TO DIFFERENT STREETS IN CHICAGO LOOP DISTRICT

red, that from the west in white and that from the south in blue. A unique feature of this chart is that the passenger traffic from the West Side is charted exactly in the center and that from the North Side is shown on the left and that from the South Side on the right. This brings out very strikingly the unequal distribution of traffic delivery which leads to pedestrian congestion on the sidewalks and at street intersections.

The conclusion drawn from this study was that if by rerouteing the delivery of the surface lines could be made more uniform and centered on Clark Street, congestion in pedestrian traffic would be greatly diminished, and the rerouteing of cars would benefit the railway service. In other words, cars would be turned back at Clark Street and thus tend to increase the delivery there and, at the same time, reduce the delivery at the congested points on State Street and Wabash Avenue. This would shorten the car trips, eliminate operation over several congested loop blocks and make it possible to reduce the headway. Similar data were collected to show passenger delivery to the east and west streets and showed that some cars could profitably be turned back before entering the Chicago loop district.

## COMMUNICATIONS

### Delivery of Cars During 1916

LACONIA CAR COMPANY

BOSTON, MASS., Jan. 18, 1916.

To the Editors:

The present market conditions in the steel industry, to which you have given editorial attention recently, so far as they relate to the delivery of cars, are certainly serious, if deliveries are of importance, and also as to prices which must be charged for the cars.

Prices on bars and structural steel have advanced at least 50 per cent during the past six months, and deliveries in many cases are subject to the mills' convenience and rarely inside of five or six months except a few items. Sheet steel has advanced at least 50 per cent and galvanized as well as rust-resisting sheets, used in many cases for roof covering, have almost doubled in price, and some of the mills report they are oversold on these items and will not give any definite promise on deliveries.

Inasmuch as steel is being used in nearly every type of car for the underframes, and in some cases in the car bodies, the inability of the steel companies to make deliveries is in itself a serious proposition. In the past prices have been more or less dependent upon the lumber market, an advance of 5 or 10 per cent having generally been the limit. It will therefore be seen that railway companies can save materially by purchasing cars when the steel mills are able to deliver and prices are low. I will also state that at this time the steel mills are so filled up with orders that they refuse to quote in some cases unless the prospective buyer is considered one of their regular customers.

CORNELL S. HAWLEY, President.

### Maintenance Costs of Coasting Recorders

JACKSONVILLE TRACTION COMPANY

JACKSONVILLE, FLA., Jan. 6, 1916.

To the Editors:

I have followed with interest the numerous articles which have appeared recently in the *ELECTRIC RAILWAY JOURNAL* on results with coasting time recorders, but have been disappointed that all of these articles have neglected the important question of the maintenance and operating cost of the recorders themselves.

Mr. Morse of the El Paso Electric Company has placed the cost of car meter maintenance at about \$2.44 per car per annum, and my experience with some sixty ampere-hour meters indicates that inclusive of calibration this cost is a fair figure. The energy loss in a 100-amp. ampere-hour meter is about 10 watt-hours per eighteen-hour day. The stationery used in the recording and comparison of meter records costs about 80 cents per car per annum, so that the total maintenance and operating cost of ampere-hour meters is about \$3.35 per car per annum.

A similar statement of the cost of coasting time recorders, including repairs and renewals, inspection, adjustment, energy loss, fuse renewals and cost of type ribbon and paper would furnish much needed data.

J. H. VANDER VEER, Engineer.

[NOTE.—The above inquiry was referred to the Railway Improvement Company, which states that so far as it knows none of the users of coasting recorders is keeping the actual mechanical up-keep costs separate owing to their insignificance. At Fort Worth, for ex-

ample, the expense is absorbed in regular shop operations. The same fact holds true of the Third Avenue Railway. This company has 1125 recorders in service, and those which cannot be adjusted by the regular inspectors are sent to the shop for attention by a man who receives \$17.50 a week. At present this man has time for other duties.

Some users have efficiency departments for keeping records, the costs of which department and records appear in their recorder maintenance accounts.

The Railway Improvement Company adds that a fair comparison between the two is impossible because the meter indicates only, but does not print energy consumption; whereas the coasting recorder not only records coasting time, which is the reciprocal of energy consumption, but also running time. This necessitates a duplex printing mechanism and clock movement which are not a part of the meter system cited in the above letter.—EDS.]

### Improved One-Man Operation in Australia

ELECTRIC SUPPLY COMPANY OF VICTORIA, LTD.,

BALLARAT, VICTORIA,

AUSTRALIA, Dec. 10, 1915.

To the Editors:

I have been closely studying your *JOURNAL* of late with regard to the operation of one-man cars, and the experience of the general manager of the Winona (Minn.) Railway, published in your issue of Jan. 30, 1915, and also the article by Mr. Richardson in your last Convention Number on one-man cars in the Seattle division of the Puget Sound Traction, Light & Power Company have been very interesting to me.

We began operating one-man cars about three years ago in our two properties in Victoria, at Ballarat and Bendigo. We had practically nothing to guide us, and therefore worked out the system from our own experience. Owing to the number of men recruiting, we have lately had to extend the operation of one-man cars at Ballarat to our Botanical Gardens and Lake route, which is one of our principal pleasure resorts in the summer months. On busy occasions, particularly on Sundays, there are a large number of people to be delivered at the Gardens 3 miles from the center of the town and picked up from there and brought back into the town. We have placed hinged notice plates at each end of the cars centrally over the top of the dash, one side of which is marked "Pay As You Enter" and the other "Pay As You Leave." On the Gardens routes we normally run as we do on all the other routes with the "Pay As You Enter" sign exposed when cars run into the center of the town, and "Pay As You Leave" when outward bound. On Sundays during the busy time this system is exactly reversed, the hinged notice signs readily advising the public. This avoids a great deal of the congestion that would ensue from a full car load having to pay as they leave when arriving at the Gardens, and another car load waiting to board the car having to pay as they enter. By varying the system in this way we find we are able to deal with this heavy traffic with very little if any loss on our schedule time.

We have made a small improvement in the design of the fare boxes, by installing a strip of looking-glass at an angle of 45 deg. in the upper part of the box, which allows the coins to slide past it, and reflects in a horizontal plane the coins as they are dropped upon the hinged plate. Tramway managers will appreciate the moral check upon passengers making payments in this public manner. It is possible for a passenger or officer to sit in almost any part of the car and note what fare

has been paid into the box. Formerly this could be detected only by those who were in close proximity to the box.

We have now released thirty-seven conductors by the use of the fare box-one man car system. I was somewhat surprised to see no reference made at the recent Municipal Tramway Conference in London to the possibility of running one-man cars, especially in view of the close consideration this subject has received by American operators for the last twelve months.

Our experience of nearly three years has shown that one-man cars can be run quite satisfactorily and deal with loads at times up to sixty or seventy passengers per car, besides greatly reducing the number of accidents. I believe that a careful consideration of this system is worth the while of the majority of tramway managers, the personnel of whose companies may be affected by the war.

P. J. PRINGLE,

Chief Engineer and General Manager.

[NOTE.—In view of the fact that the population of Ballarat, from the latest available census report was 48,607 and that of Bendigo 44,458, as compared with the maximum population of 25,000 for any city in America where one-man cars are operated, according to the recent report of the Transportation and Traffic Association, the above communication shows a practical illustration of the possibility of extending this form of operation to many cities of larger size.—EDS.]

## Car Operation Efficiency

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY  
EAST PITTSBURGH, PA., Jan. 11, 1916.

To the Editors:

A most interesting and valuable contribution to the literature on this subject is found in C. C. Chappelle's article in the issue of the *ELECTRIC RAILWAY JOURNAL* for Jan. 15. From time to time numerous engineering papers and articles have been presented using speed-time curves for the purpose of illustrating the effects of changing operating conditions as well as for determining the correct equipment to apply. The manufacturers of railway equipments have for years endeavored to assist the operating departments of the electric railways in thoroughly understanding the fundamental principles governing efficient operation of cars. In spite of the progress due to these efforts, there is much yet to be desired. Mr. Chappelle's discussion of these principles brings out a point which is frequently overlooked in practical operation, namely, that under a given set of conditions, the power input to the car is determined by what he designates as "time-element factors." Therefore, his article should be of great assistance in securing full appreciation of the possibilities for economy which may result from a careful analysis of operating conditions.

He mentions the large investment in present equipment and the impracticability of obtaining the maximum economy which might be secured by scrapping it and installing new equipment designed to take advantage of all the recent developments in the construction of cars and electrical apparatus. In this connection it is well to note that probably on many roads the rolling stock is being operated at less than its maximum efficiency. In such cases there exists the opportunity for the application of the fundamental principles to decrease operating expenses and improve service without incurring the great expense accompanying a complete change of equipment. A study of the service conditions will bring to light incorrect operating features such as overloaded and underloaded equipments, wrong gear ratios, slow acceleration and braking rates, stops of

unnecessary length, poor arrangements of schedule, headway and layover, etc. It will also furnish the data required for making a logical application of the fundamental principles to correct such defects as may be discovered. Consideration of these facts in conjunction with Mr. Chappelle's article makes it evident that every railway operator should be fully acquainted with all the details of his service conditions in order to get the most economical results from the equipment which is under his control.

In the matter of determining the most economical schedule, only the cost of energy and the platform expense have been considered. Apparently, the maintenance and fixed charges also should be taken into account. However, these are minor factors in comparison with the cost of energy and crew wages, so that the general conclusions will not be affected materially. In the production of the same mileage per car the maintenance and fixed charges would be practically unchanged. If higher schedules are used to produce more car mileage probably the total maintenance would be increased, although that per car-mile might be less. The total fixed charges would not be changed, consequently the fixed charge per car-mile should be decreased. Evidently the total maintenance and fixed charges per car-mile would be decreased, although the value per car annually would be greater. It is important to remember that the benefits to be derived from higher schedules are greater when the platform expense is high as compared with the cost of energy. It is also interesting to note from Fig. 15 that the average per cent coasting for the most economical results is greater for Case "A" than for Case "B." This illustrates the fact that the numerous variables encountered make the problem somewhat different for each railway.

If schedule speeds for different runs and at different times of day are once adjusted to be the most economical in each case, Fig. 15 indicates that approximately equal amounts of coasting should be secured with stops varying in frequency over the range ordinarily found in city service. This being the case, the coasting time alone will indicate directly the relative efficiencies of various motormen. However, it is not always possible to adjust schedules to the most economical value on account of the necessity for maintaining certain headway and meeting competition. For instance, one motorman in all-day service might be 100 per cent efficient when securing 40 per cent coasting. On the same line, the rush-hour service might be such that an extra motorman on a tripper would be 100 per cent efficient with only 20 per cent coasting. Hence it is necessary to have a record of the number of stops and the standing time as well as the coasting time in order to make fair comparisons. A knowledge of the frequency and duration of stops is also necessary in order to satisfactorily analyze a service and determine from the analysis what schedules are the most economical. Such analysis followed by adjusting schedules to the most economical value will be highly profitable to many railways. An instrument for measuring and recording running time, coasting time, standing time and number of stops would make such an analysis a comparatively simple problem and also insure proper operation of the equipments on the economical schedules as determined.

F. E. WYNNE,

Engineer Railway Section, General Engineering  
Division.

A new tramway system at Las Palmas, on the island of Majorca, off Spain, will probably be placed in operation in March. The date of the inauguration has had to be retarded somewhat on account of the war, as the plant has only been retained with difficulty.

# EQUIPMENT AND ITS MAINTENANCE

Short Descriptions of Labor, Mechanical and Electrical Practices  
in Every Department of Electric Railroading

*Contributions from the Men in the Field Are Solicited and Will Be Paid for at Special Rates.*

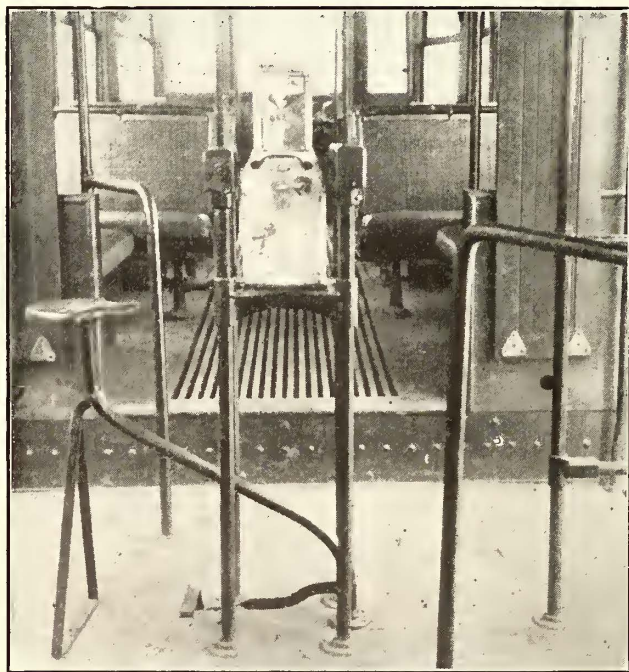
## Combined Conductor's Seat and Register-Operating Mechanism

BY E. C. SHERWOOD

Superintendent of Equipment Manhattan & Queens Traction Corporation, Long Island City, N. Y.

The accompanying illustrations show a conductor's seat and fare-operating device devised by the writer, and tried out on the cars of the Manhattan & Queens Traction Corporation. It is the intention to equip all of the cars with this device later. The equipment has been designed particularly for center-entrance cars or other cars in which the conductor is stationed at a particular point which must be passed by all passengers entering the car. It is designed to make the work of the conductor less arduous.

The removable seat consists of a saddle mounted on the end of a bent pipe, which terminates at the lower



CONDUCTOR'S SEAT INSTALLED IN CAR

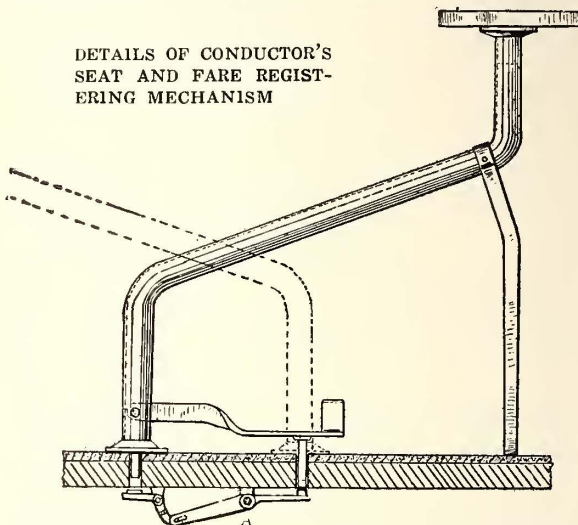
end in a pin. This pin fits loosely in a hole in the car floor, for the purpose of holding the end of the pipe support in place. Projecting from the pipe near the upper end is a triangular strap support. There may be as many holes as desired in the car floor for the purpose of receiving the pin, thus permitting the seat to be moved.

Under the car floor is provided a shaft for operating the register. Simple levers and bell-crank levers are mounted so as to be operated by pins pushed through the floor, rotating the rod *A*. A foot lever is pivoted at a point near the bottom of the pipe stand, by means of which the register rod can be operated.

In designing this arrangement the writer had in mind to provide a restful position for the operator, to arrange the component parts for general convenience, to protect

the operating pin so that it cannot be inadvertently operated by passengers entering or leaving the car, and to keep the perforations through the floor closed to prevent the passage of foreign material which might interfere with the operation of the register-operating mechanism.

DETAILS OF CONDUCTOR'S SEAT AND FARE REGISTER-MECHANISM



The illustrations show one form of the equipment, but obviously the details can be considerably altered. Letters patent have been granted to the writer for the device, and these have been turned over to the Lord Manufacturing Company.

## Friction in Trolley Bases

BY "VULCAN"

A.M.I.C.E., A.M.I.E.E., England

To prevent undue wear of overhead line the upward pressure of the trolley wheel against the wire should be as small as possible consistent with the maintenance of sufficient contact to prevent the wheel from jumping the wire and sparking.

This pressure is not uniform on different electric railways, the value depending chiefly on the type of trolley gear used, curve smoothness and general layout of the overhead line, speed of cars and condition of track. In some cases a tension as low as 15 lb. is found sufficient, whereas in others 30 lb. or more is necessary to obtain satisfactory operation. It is, however, a fact that in many instances the tension is far more than is necessary, resulting in excessive wear of trolley wheels and overhead wire.

In the accompanying figure is shown a diagrammatic sketch of a type of trolley base, commonly used in this country, fitted with plain bearings. A few simple calculations will serve to indicate the conditions in this form of base.

Let the pull of the springs on pin *B* be assumed at 2400 lb. Neglecting friction of bearings this would provide an upward pressure of the trolley wheel of  $2400 \times 2 \div 192$ , or 25 lb. The pressure on pivot pin *C*, allowing for the weight of the pole, is approximately 2500 lb. Taking the coefficient of friction as 0.25, the force of friction on pin *C* is  $2500 \times 0.25$ , or 625 lb. The moment

of friction on pin *C* is  $625 \times \frac{5}{8}$ , or 390 in.-lb. The equivalent force applied at the end of the pole required to overcome pin friction is  $390 \div 192$ , or 2.03 lb.

The latter figure takes no account of the friction on the pin *B*, and on the boss faces, etc. Assuming these to be half of the latter, the equivalent force applied at the end of the pole required to overcome the total friction on the trolley base will be, say, 3 lb.

The friction referred to will cause a reduction in the trolley wheel contact pressure from 25 lb. to 22 lb., when the trolley is caused to move upward by a rising trolley wire; and it will likewise cause an increase in the trolley tension to 28 lb. when the trolley is forced in a downward direction by an overhead line which is falling to a lower level.

The figures show that ordinary friction may cause the wheel contact pressure to vary by 28 lb. — 22 lb. = 6 lb., or a 27 per cent variation from the minimum, and these results are borne out by measurements taken in actual practice. With joints in a worn and dry condition, a difference between the minimum and maximum contact pressures have often been found to exceed 10 lb., both measurements being taken with the trolley wheel at standard height.

For purposes of adjustment, the common method of measuring trolley tension by means of a spring balance fixed to a rope is simple and satisfactory if carried out

overhead wire, and the reading shown is now the "maximum tension" and is entered accordingly. The spring adjustments can then be made properly. The difference between minimum and maximum readings gives an indication of the condition of the lubrication of pins and rubbing faces.

Many of the older trolley-base designs involve an excessive amount of friction to the vertical movements of the pole. In some cases this is due to the fact that the bearings are far larger than is necessary for the work they have to do, and considerable improvement can often be effected in these, by boring out and brass-bushing the holes, and using case-hardened pins of smaller diameter.

With the object of reducing to a minimum the type of friction referred to, certain designs of trolley base, besides following the customary practice of using ball or roller bearings for the center swivel pin, have adopted these also for the vertical motion bearings of the pole. This arrangement undoubtedly meets a long-felt want and constitutes a progressive step of much importance. By reducing friction to a minimum, the design allows a smaller trolley tension to be used than is possible with the older types of trolley base, and is thus advantageous from the points of view of maintenance and operation.

## Economy in Buying Good Shovels

BY CHARLES H. CLARK

Engineer Maintenance of Way Cleveland (Ohio) Railway

Very few contractors or corporations are inclined to buy good shovels. As a rule each laborer furnishes his own shovel, and the varieties and sizes furnished would fill tool boxes, without any two being alike.

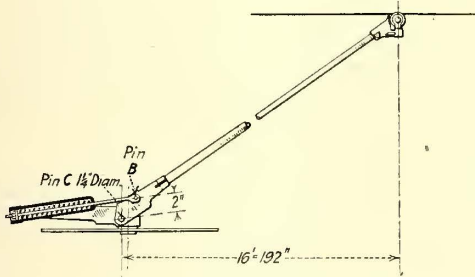
When a man owns his own shovel you cannot expect him to throw it down and do other work. No. He will take his shovel and hide it under his coat, which may be 500 ft. or 1000 ft. from his work. You cannot blame him, but it costs you a lot of money while he is walking around taking care of his tools. Did you ever see some of the shovels the men bring to work? They may have blades 7 in. long and hold about one-half what a new shovel will carry. Now a man will not work any faster with a short shovel than he would with a new shovel. Therefore he should have a full-sized shovel that will stay full-sized and not wear out. The old-fashioned idea of buying cheap shovels is being gradually replaced by buying good shovels cheap.

In my own experience I have used shovels which have cost about 40 cents each, but have long since found that an alloyed steel shovel which will cost about 90 cents will outwear the former at least four or five to one.

I observed one company that had about 200 men working on a job. Of these 200 men at least half had shovels that were just about half-size and certainly not strong enough even with that half to be able to do anything else than to go into the loosest dirt. It is only human nature that the foreman is in sympathy with the workmen and will let them work when they do not have tools that are at all able to give recompense for the \$1.75 per day. This work was costing that company \$350 per day. At an expense of \$200, had they bought shovels for the men, they could have saved \$200 a week in efficiency.

Some superintendents of construction will not allow a man to go to work who has not a good shovel. He is looking at the shovel and not at the man. It is easier for them to furnish the man with a good shovel than it is to furnish the man with a poor shovel. It would seem that the only diploma that a laborer needed was that he have a good-sized shovel.

To avoid losing shovels, we have given each shovel a private mark. We drill three holes in the form of a



FRICION IN TROLLEY BASES—DIAGRAM OF TROLLEY BASE FOR USE IN CALCULATING EFFECT OF FRICTION

properly, but simple though it may seem the writer's experience is that the great majority of workmen do not realize the effect that joint friction has upon the contact pressure of the trolley wheel.

The result is that spring-balance readings taken by different men on the same pole are not in agreement. This causes uncertainty which is often responsible for the adoption of a higher contact pressure than is really necessary.

The following system has been adopted by the author with good results. A rope of a length equal to the normal trolley height, and including a spring balance, is hooked at its upper end to the trolley head. The lower end contains a stirrup which is held in contact with the ground by the workman's foot.

In taking trolley tension readings two values are obtained and duly recorded as follows:

With the foot on the ground and in the stirrup, the rope is grasped above the spring balance and pulled downward about 2 ft. It is then gently released so that the spring gradually takes the tension. The spring balance will now show the value of the contact pressure which would obtain on a rising trolley wire. The readings shown are entered up on the record slip under the heading "minimum tension." The foot holding the stirrup is then lifted, say, 2 ft. from the ground so as to allow the trolley to rise a similar distance. The stirrup is pressed gently downward to the ground. The balance will now indicate a tension equivalent to the trolley contact pressure under conditions where the trolley wheel is running on a downwardly sloping

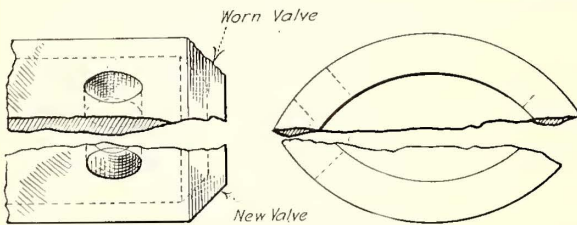
triangle in the blade, about 5 in. on each leg. In this manner we are keeping our shovels. The shovels, of course, are not allowed to be taken from the work, but if they are taken from the work they are easily identified. I have never seen any of these shovels in anybody's hands except those of men working for us.

A good shovel should be made with a very thin blade, very tough and hard, have a good handle and hang so that a man can use it without tiring.

### Hints on Compressor Maintenance

BY R. H. PARSONS  
Electrical Foreman

Ten years ago one of the greatest sources of trouble experienced in the operation of electric railways was the air-brake equipment. Some of the early equipments were so dangerous that even after going to the expense of fitting up a large number of cars with air brakes, some companies discarded them and returned to hand brakes. However, as electrical apparatus generally has

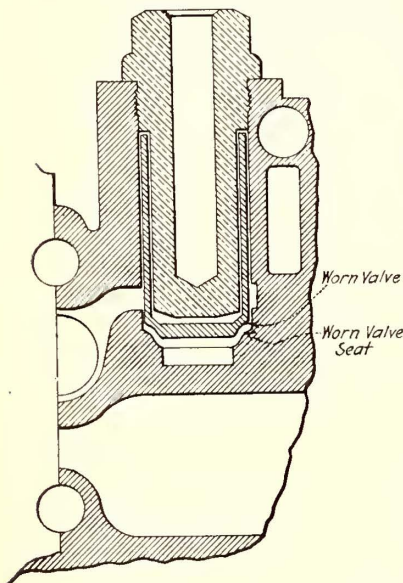


COMPRESSOR MAINTENANCE—FIG. 1—PARTIAL SIDE AND END VIEWS OF NEW AND WORN VALVES

improved, the air-brake parts have been made better until now, with careful inspection and proper general overhauling, they give practically continuous service.

The compressor itself is the largest and most important part of this equipment, and upon it depends the reliability of the service. The choice of the proper period between overhauls of the compressor depends

altogether on circumstances, assuming that proper weekly inspections are made. In some service a compressor will operate three or four years without removal from the car; in others, it must be taken down and overhauled every twelve or eighteen months. When it is overhauled no care should be spared to make it just as good as it was when turned out of the factory. It should be entirely stripped and cleaned, all old oil and dirt should be removed, and the oil grooves and channels should be cleaned.

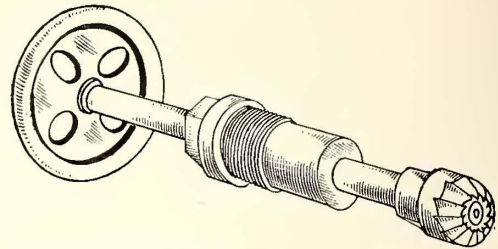


COMPRESSOR MAINTENANCE—FIG. 2—WORN VALVE AND SEAT IN HEAD

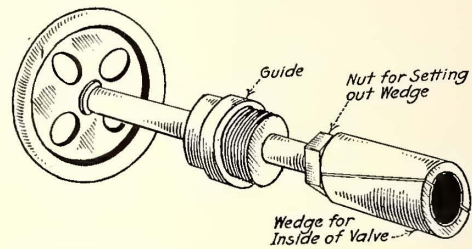
The armatures and fields should be tested and repaired when necessary, as is often the case, for in the best cared-for compressor some oil will be found covering the insulation of the fields, armature, brush-holders and wiring. This oil must be removed and its effects remedied, frequently involving the retaping of the field coils. The commutator must be turned and slotted also,

the shaft straightened if bent, and the bearings refitted.

It has been found in a great many cases that baking of compressor armatures has been caused by slightly bent shafts, throwing a heavy load on the windings. This often will be found to be the cause when other causes have been suspected. The reason for the bending of the shafts is that many of the compressor armatures are fitted with shafts which are too small at the pinion



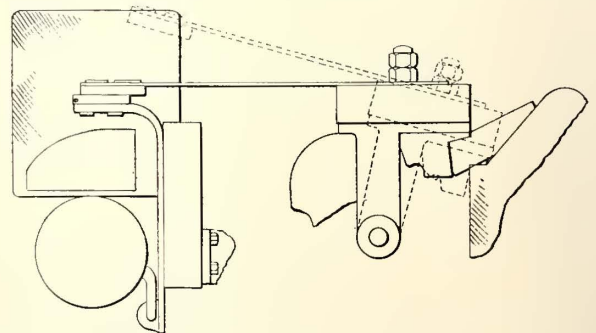
COMPRESSOR MAINTENANCE—FIG. 3—REAMER FOR SURFACING VALVE SEAT



COMPRESSOR MAINTENANCE—FIG. 4—REAMER FOR CYLINDRICAL SURFACE OF VALVE

fit, and which are thus easily bent. If electric welding is available it is advisable to cut off the pinion end of the armature shaft and weld on a new piece of steel of good quality and of diameter large enough to permit turning the bearing fit to the original size, and the pinion fit enough larger to insure its withstanding the shocks which formerly caused it to bend. Then the pinion should be rebored to fit the rebuilt added shaft. The result will be the elimination of 75 per cent of the bent shafts and baked armatures and fields. If not practicable to weld a new piece on the old shaft, larger shafts should be made and the old ones thrown away.

It is not intended here to give instructions for the re-assembling of the compressor, as that is well taken care of by the air-brake companies, but a few points which



COMPRESSOR MAINTENANCE—FIG. 5—CONTACT DEVICE OF O. B. GOVERNOR

have been found of value will be noted. First, it is absolutely necessary that the compressor valves go out of the shop tight, and fitted so they will stay tight for a reasonable time. Fig. 1 shows a valve with a correct face and one with a worn face. Fig. 2 shows a worn valve and seat in head.

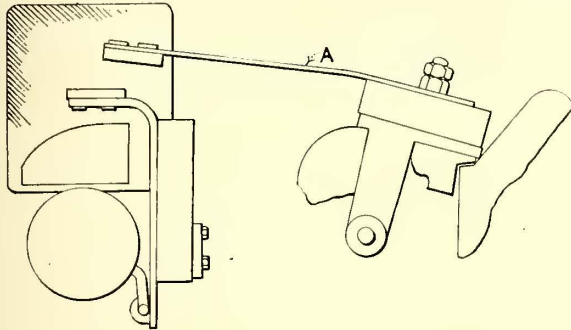
As it would be impracticable to make air-tight joints



of these misfits by grinding only, it is found necessary to face the valve seat in the head, and this can be done quickly and properly by the use of the reamer illustrated in Fig. 3.

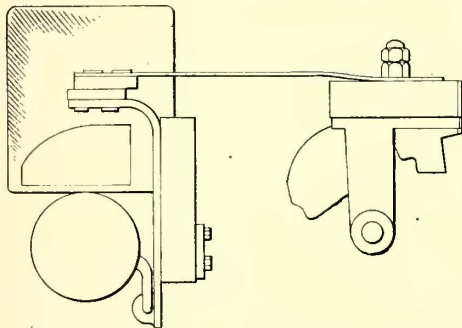
This was made by attaching a reamer, having the same shape as the original valve seat, to a 1/2-in. rod. The rod was fitted with a wheel for turning, and it passes through a guide constructed like a valve cap, screwed into the head in place of the valve cap. This keeps the reamer in perfect alignment, and a new seat of correct shape and size is the result.

The valve itself is worn in the same manner, and the



COMPRESSOR MAINTENANCE—FIG. 6—CONTACT ARM BENT TO IMPROVE CONTACT

irregularities must be filled or cut out in a lathe. If there is metal enough, the old valve can be faced to nearly its original shape, and then ground in. Fig. 4 represents a tool found convenient for grinding in the valves. It is made exactly like that used for the valve seat, except that the lower part is cylindrical outside, the stem inside being tapered. The cylindrical part is placed inside the valve and the nut above is screwed down, causing the lower part to expand and tightening itself inside the valve. This tool is also fitted with a guide for the stem which screws into the head in place



COMPRESSOR MAINTENANCE—FIG. 7—BENT CONTACT ARM IN CLOSED POSITION

of the valve cap. Ground glass and powdered emery mixed in equal proportions will be found excellent for grinding in these valves.

On replacing the head of the compressor it will be found that if the joint, after having been thoroughly cleaned, is shellacked on both sides of the paper gaskets it will be permanently airtight.

A practice which, if carefully followed, will keep compressor armatures on the cars a long time is this: About every three or four months the brush-holder yoke should be removed and cleaned carefully. Then all oil and dust should be wiped from the string band and oil collar with good, clean cheesecloth, after which yoke, brush-holder insulators and string bands should be painted with an oilproof paint, with special emphasis on the word "Oilproof." Oilproof paint costs about \$2 per

gallon, but as a small amount per armature is needed, it is inexpensive to use.

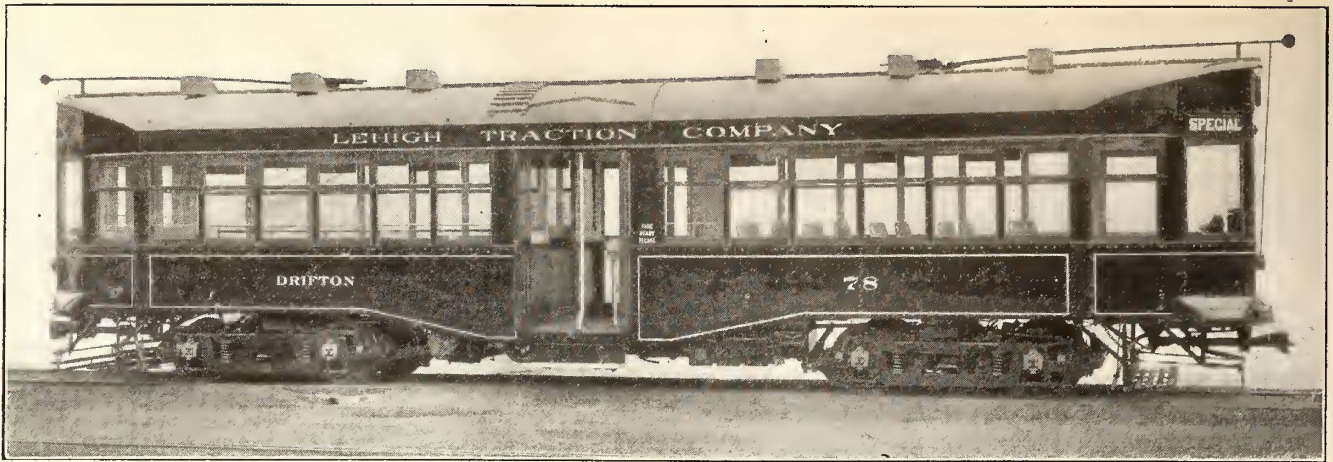
Often very little attention is paid to the air strainer, or the purifier, whichever is used. The purifier is a decided improvement over the old hair strainer, but even this needs attention, a little cleaning out and fresh oil about three times a year being sufficient. If hair strainers are used, they should be opened and the hair removed, picked up and thoroughly blown out at least twice a year.

It will be found advantageous also to use the modern methods of installing and removing pinions, that is to heat them in boiling water, placing them on the shafts while hot, and allowing the shrinkage due to cooling to normal temperature take the place of hammering to make a tight fit. For pinion removal a regular screw puller may be used, and a little heat from a blow torch can be substituted for a very heavy pressure on the end of the shaft and pounding. Heavy pressure of the screw of the puller destroys the armature shaft center, and a very little pounding will spring the shaft. It is most satisfactory practice to keep a set of bearings with each spare armature, and when the shaft becomes worn or bent and must be turned, the bearings can be babbitted and bored to fit. No trouble will be experienced with properly fitted babbitted bearings.

A simple "stunt" which will help to keep the Allis-Chalmers O. B. governor in service is given below. Much trouble has been experienced in the operation of this governor on account of its not keeping its setting, and burning out its contacts. Fig. 5 shows the carrier arm and contact shoe as originally furnished. The arm is straight, and when contact is made it comes up with a slap. At about the end of its travel, when about to cut out, the mechanism which operates the arm begins to move, getting ready for its quick break, but while doing so it raises the arm a little, releasing the spring tension, raising the contact, and causing a small arc. This gradually eats away the surfaces of the contacts until good connection is impossible. Fig. 6 shows the improvement mentioned, namely, the bending of the carrier arm at A, while Fig. 7 shows the contact made with bent arm. This arm gives better service than the straight one because, when making contact, the arm contact hits the stationary contact before the mechanism comes to the end of its travel, and on account of its bend makes a wiping contact. When all the way in, the arm makes a good, heavy contact. When cutting out, as the toggle begins to move with a tendency to open the contacts, the carrier arm slides back but holds its contact until the governor cuts out with a snap, the blow-out taking care of the arc in spite of the lessened distance between the contacts.

### Simplified Adding Machine

A simplified adding machine has recently been placed upon the market by the Mechanical Accountant Company, Providence, R. I. It has been brought out because heretofore all non-listing machines have been designed to perform multiplication, division, square root and, in fact, any arithmetical problem, but more than half of these machines are used merely for addition. With the double-touch method of operation, many keys on the larger machines have been not only useless, but an actual incumbrance. By this double-touch method operators depress the "three" key twice to add six or the "three" and "four" to add seven, thereby increasing the speed and accuracy. Up to the present time the machine has been built in one size only with a capacity of \$9,999.99, but larger sizes will soon be manufactured.



SIDE VIEW OF HAZLETON CAR

## Cars of High Seating Capacity for Hazleton

The Lehigh Traction Company, Hazleton, Pa., has recently had built by The J. G. Brill Company ten all-steel center-entrance prepayment city cars of modern design, shown in the accompanying illustrations, which provide unusual facilities for a remarkably large seating capacity.

The general dimensions of the cars are as follows:

Length over anti-climbers.....	48 ft. 8 in.
Length over vestibule.....	47 ft. 2 in.
Bolster centers, length.....	26 ft. 6 in.
Wheelbase.....	6 ft.
Width over sills.....	9 ft.
Height, rail to sill at bolsters.....	2 ft. 10 1/8 in.
Height, sill to trolley base.....	8 ft. 10 in.
Wheels.....	30 in. dia.

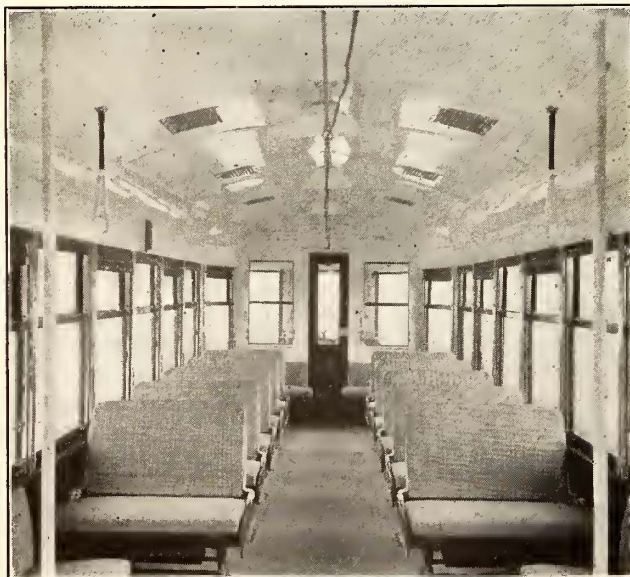
The center-entrance well is equipped with outward folding doors and Stanwood grilled-metal safety-tread folding steps mechanically operated by a lever on a post in the center of the well. The door entrance is 43 in. wide. The height from the ground to the step is 14 in., from step to floor of well 13 in., and from well floor to the interior car floor 10 in.

The chief feature of the car is the varied arrangement and high capacity of the seating plan. The two passages on each side of the center-entrance well are not arranged similarly. The main passage is separated from the wall merely by a riser and a small seat partition with white enameled stanchion at each side. At

this end five Brill Winner cane cross-seats are located on each side with two longitudinal seats at the center entrance end and two seats situated adjacent to the steel bulkheads separating the motorman's compartments, which are V-shaped to conform to the tapering of the car width at this point. The smoking compartment, however, is separated from the center entrance well by a steel bulkhead with a sliding door opening, 3 ft. 4 in. wide. This section is equipped with longitudinal mahogany slat seats instead of cross-seats, together with the unusual addition of a long longitudinal seat, facing one side only, situated in the center of the compartment. This extra bench brings the seating capacity of this section up to forty persons, which, added to that of the main section, makes a total seating capacity of seventy. This compartment is well supplied with straps equipped with Rico sanitary covers and hung from a casting on the ceiling. The motorman's access to his compartment is provided at the end of each passenger compartment by means of an 18-in. swinging door.

The interior flooring of the car is composed of cork covered with linoleum. The interior steel and Agasote material is finished in white enamel. The curtains, equipped with fixtures of the Curtain Supply Company, are of double-faced Pantasote material. The cars are heated by Peter Smith electric heaters. The Consolidated push-button system is used. Ventilation is obtained through the Agasote arched roof by means of six Railway Utility ventilators on each side of the roof.

The car bodies are mounted on Brill 27-M. C. B. 2X



MAIN COMPARTMENT OF HAZLETON CAR



SMOKING COMPARTMENT OF HAZLETON CAR

trucks, equipped with four GE-247-D motors operated by Type MK control. The trucks have Stucki side bearings. Brake equipment includes General Electric straight air brakes and Lord staffless hand brakes.

Other specialties include Tomlinson couplers, General Electric headlights, H. B. lifeguards, Earle trolley catchers, U. S. No. 13 trolley base, Hunter destination signs and Electric Service Supplies Company's pneumatic gongs.

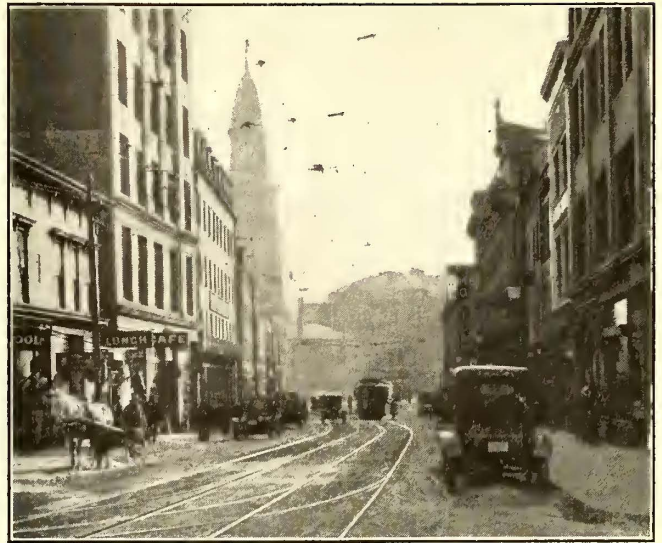
### Electrically-Driven Tower Wagons on the Bay State Street Railway

Two storage-battery emergency wagons for line work are being operated by the Bay State Street Railway, Boston, Mass. They are assigned to the Wakefield and the Quincy line foremen's divisions. In all, there are seventeen foremen's divisions in the system, but all except the two mentioned have horse-drawn tower wagons.

A Lansdowne tower truck was put in service by the Bay State Company about two years ago. This serves the Wakefield division, with 79.1 miles of trolley wire. In September, 1914, the second electric battery vehicle, a 2-ton General Motors Truck Company chassis with a Trenton hand-elevated two-stage steel tower, was put in service on the Quincy division, in which there are 80 miles of wire. This vehicle has been in continuous operation, with scarcely more than a day per month out of service. Its mileage capacity fully meets the requirements, and the operating costs are economical.

The batteries of the vehicle, consisting of sixty Edison A-8 cells, are charged from the exciter busbars, at the Quincy power station of the company. If occasion arises, a boosting charge can be given at any time, while the men are engaged in line repairs, by making an electrical connection by means of a trolley hook and grounding to the rail, the 550-volt railway power being stepped down to 110 volts through grids located directly beneath the battery box. The current is controlled by circuit breakers.

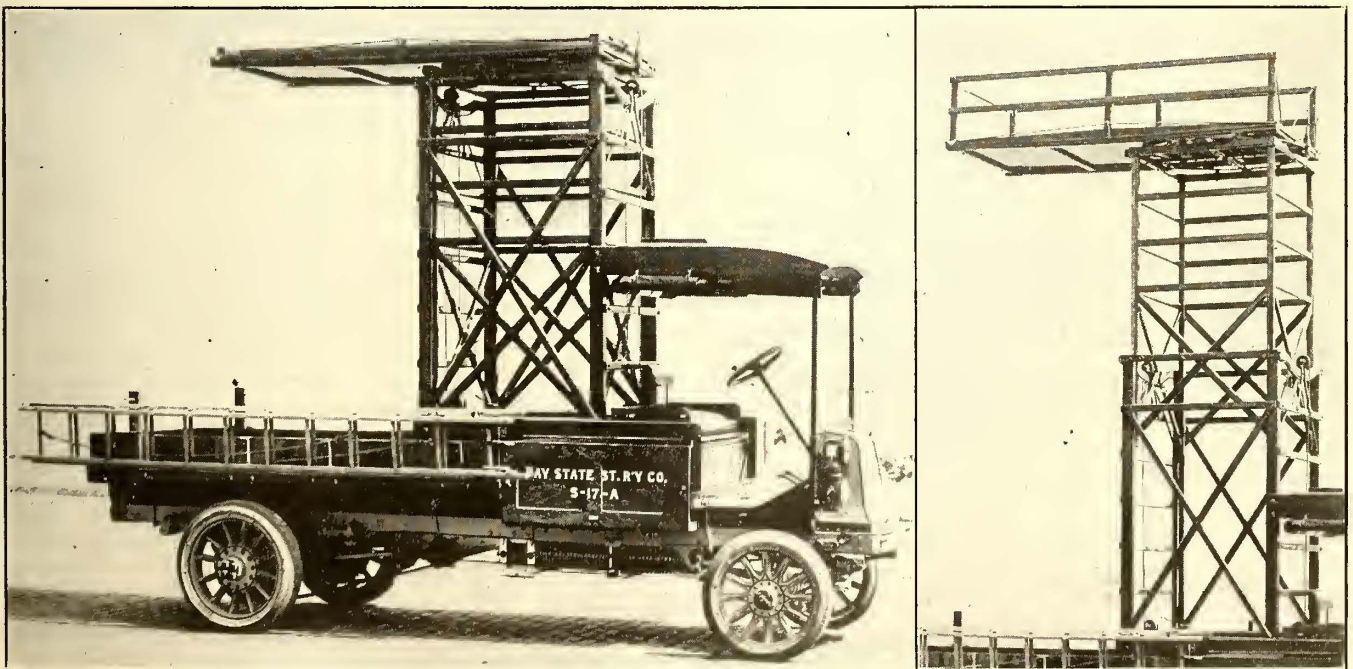
Data on mileage, kilowatt consumption and operating costs of a vehicle of the electric battery type used in emergency work, were published in the *ELECTRIC RAILWAY JOURNAL* of May 23, 1914.



FERRO-TITANIUM RAILS AT FALL RIVER, MASS.

### Titanium-Treated Mayari Rails

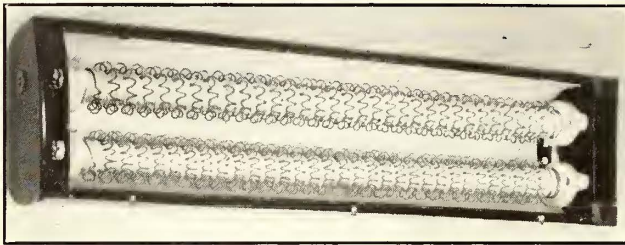
The Bay State Street Railway, of Boston, Mass., has recently purchased 300 tons of 9-in. girder rail, Pennsylvania Steel Company sec. 401, and 50 tons 9-in. guard rail, Pennsylvania Steel Company sec. 291, both treated with 0.1 titanium added in the form of ferro-carbon-titanium, and, in the main, compositions specified by the American Electric Railway Engineering Association. Slight changes were allowed in the carbon content, however, due to the use of Mayari steel, the required percentage range of carbon being from 0.65 to 0.80 instead of from 0.70 to 0.85, as in the A.E.R.E.A. "Grade B" specification. This rail costs about \$2 per ton more than untreated carbon rail. The drop test is about the same as in testing carbon rail, untreated, a 2000-lb. tup falling 12 ft. on a rail suspended 3 ft. between supports being used. The rails arrived late in October and hence cannot be extensively used in heavy work this season, but installations are being made in Fall River and Methuen, Mass.



ELECTRIC TOWER WAGON WITH PLATFORM LOWERED, AND TOWER WITH PLATFORM RAISED

## Most Recent Heater Installation on New York Subway Cars

The Interborough Rapid Transit Company has recently placed an order with the Consolidated Car-Heating Company for electric heaters for 311 cars of the new type. This heater is illustrated herewith. Attention is directed to the glazed porcelain support of the ventilated type, which is designed to furnish ventilation without weakening the porcelain, either mechanically or in its insulating properties. It also ventilates the coil uniformly. The coil is supported on two ridges for its entire length and does not rest down in the

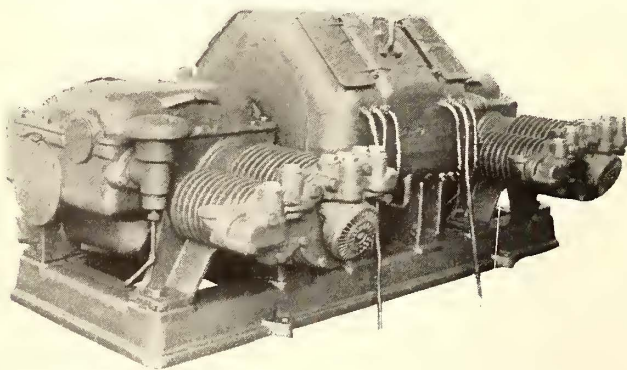


RECENT CAR HEATER FOR INTERBOROUGH RAPID TRANSIT COMPANY

groove in the porcelain as in heaters of the older types. There are also no holes to collect dirt and moisture and eventually short-circuit the coils. The highly-glazed fine-quality porcelain permits of the heater to stay clean longer than does unglazed porcelain. The double-back construction, a feature of Consolidated heaters, is well shown at the top in the illustration, as is also the junction space at the ends of the heater. The end cap is of metal to prevent warping and is lined with fiber to prevent grounds and short-circuits. The heater is extremely light, the metal parts being made entirely of pressed steel. The coils are of Consolidated "Nokoro" wire, which is a non-corrosive alloy of uniform resistance. The heater is a logical development of the old Consolidated features, which have so successfully stood the test of traction operation for many years.

## High-Voltage Air Compressor

For the locomotives of the Chicago, Milwaukee & St. Paul Railway's electric zone, a novel design of two-stage air compressor has been developed. This machine, which was built by the General Electric Company, has a piston displacement of 150 cu. ft. of free air per minute against a working pressure of 135 lb. per square



HIGH-VOLTAGE DUPLEX COMPOUND AIR COMPRESSOR

inch, and in complete form it consists of three units—two compressors and a 3000-volt d.c. motor, all assembled on a common base. Each compressor unit is complete in itself, consisting of one low-pressure and one high-pressure cylinder properly balanced, and the two

compressor units are geared so that their maximum points of load are 90 deg. apart, thus producing a well-distributed load on the motor. This has two sets of armature windings on one core, and there is a 1500-volt commutator at each end, one set of windings being connected to each commutator. The motor is of the series self-ventilated type, with commutating poles, and each set of windings is insulated so that it has an ample margin for successful operation at voltages considerably above normal. This is the largest electrically-driven air compressor yet built for railway service, but it was designed with a special view to incorporating the advantages that have been developed in the smaller sizes of air compressors. Approximately ninety of the machines are now under construction.

## Proposed Extension of Riksgräusen Railway

According to a recent issue of *Engineering*, the Board of the Swedish State Railways has just forwarded a communication to the Government in which the electrification of the remaining portion of the Lapland iron ore railway, the Kiruna-Svartön (Lulea) section is strongly recommended. It is stated that the electrification of the section between Kiruna and Riksgräusen, which was described in an illustrated article in the *ELECTRIC RAILWAY JOURNAL* of Sept. 5, 1914, has fully met, and in some respects exceeded, expectations as to operation. The various difficulties which have arisen have been overcome with one exception, i.e., the disturbances in the telephone and telegraph lines constructed along the railway. This difficulty, which was very serious at first, has been reduced through suitable arrangements, but not yet entirely removed. Investigation as to the most effective manner of overcoming the trouble is still being carried on. Now that sufficient experience is available as to electric iron ore traffic, the State Railway Board considers it particularly desirable that the electrification should be extended so as to include the Kiruna-Svartön section. Such extension would provide uniform operation over the whole of the railway line where iron ore traffic is conducted, thus making possible a more economical use of material and personnel, deriving greater profits on operation, and the advantage of not having to buy foreign coal during these times of high prices. The desirability of uniform traffic arrangement has been further emphasized on account of the conditions at present prevailing as regards the ore traffic between Kiruna and Riksgräusen, this having been materially reduced, while the traffic southward to Svartön, on the contrary, has decidedly increased. The revenue from the Porjus power station would, in addition, be increased by a greater output of energy. Should the Government approve of the State Railway Board's recommendation, the latter will be prepared promptly to forward a report and estimate of the cost of electrification of the Kiruna-Svartön section.

The Portuguese Government has approved the electrification of the railroad between Lisbon and Cascaes, belonging to the Royal Portuguese Railway Company. The company at first proposed to carry out the electrification on its own account, but after examination it was decided to throw open to competition the construction of the section and its electrification on lease. As rental, the sum of \$81,816 is to be paid for the first year of operation, which represents the maximum net receipts hitherto obtained on this line in any year, and the rental will increase to \$87,270 in the succeeding four years, while the Portuguese Railway will also participate in 10 per cent of the gross receipts in future years.

# NEWS OF ELECTRIC RAILWAYS

## NEW YORK INVESTIGATION TURNS TO COMPANIES

Officers of Railway Companies Are Now Being Questioned—  
Inquiry to Close Feb. 1

As previously stated in the *ELECTRIC RAILWAY JOURNAL* there remain no more of the old members of the first district commission to investigate, the sole survivor of the old regime, J. Sergeant Cram, going out of office automatically on Feb. 1. Bent on inquiry, however, the investigators have turned to the regulated companies and have sent letters to the utilities asking for certain information about the personnel of officials, attorneys and others holding positions of trust with the transit corporations. Up to Jan. 17 all the corporations except the Brooklyn Rapid Transit Company had replied to the questions propounded by the inquirers. President Whitridge of the Third Avenue Railway came forward with a reply that provoked Chairman Thompson of the committee to announce that he would subpoena Mr. Whitridge to appear before the committee on Jan. 20. The old order in politics may have changed, but Mr. Whitridge does not seem so sure about it. He said:

"A refusal to answer your inquiries merely because they relate to matters which are none of your business would probably be misconstrued and might subject us to further attacks of the same kind which some public authorities and a portion of the press feel at liberty to launch at street railways.

"In consequence of the misconduct or stupidity of various official bodies special counsel is occasionally necessary. During the last twelve months the Board of Estimate in this town proposed to grant franchises for the operation of omnibuses which, had they been passed, would have constituted, in one street, at least, a most unwarranted and serious competition with the Third Avenue Railway, and in other places were obviously a nuisance to the public. John M. Bowers was employed to appear and oppose the grant of such franchises.

"You may possibly not be aware of it, but there formerly existed in this commonwealth what is generally known as a system of strike legislation, which was a proposal by one person or another to procure legislation inimical to corporations in the hope of terrorizing them into making payments to those interested. I remember upon one occasion urging a Senator to vote against a certain proposition to amend a code of civil procedure, and he replied, 'Oh, you lawyers merely talk; what I am asking is, is there anything in this for Mrs. C. and the six little C.'s,' and later I heard of a member of the Legislature who, commenting upon some reform movement, remarked, 'If I cannot use my opportunities in Albany, I might as well stay at home and attend to my grocery business.' We have some reason to fear a recrudescence of this state of affairs and consider that it is prudent to spend the sum of \$250 a year in order that we may know what is being proposed."

On the same day that Mr. Thompson announced his intention of requiring Mr. Whitridge to appear before the committee he explained in a general way the features of the new bill for the reorganization of the Public Service Commission.

Speaker Thaddeus C. Sweet of the Assembly said on Jan. 20 that the Assembly would not vote the Thompson committee any more money for expenses, giving the committee only that part of the \$30,000 asked by Senator Thompson that is to pay debts already contracted, and would under no circumstances agree to the resolution passed by the Senate extending the life of the committee for another month from Feb. 1. The speaker was quoted as follows:

"Senator Thompson has done all the investigating necessary. Further than that, he has exceeded his authority in spending the State's money, and the Assembly wants to know just what the \$30,000 more asked for is to pay. If it is owed for debts regularly contracted, it will be paid. But there will be no more money appropriated, if I can help it,

for further investigation by this committee. I have no purpose in this stand except the good of the State. I am not trying to block any inquiry that should be made, as I see it. If there is any phase of the situation that has not been looked into, that is the fault of the committee. It has had plenty of time and plenty of money."

Governor Whitman has referred the Thompson committee's charges against Public Service Commissioner Robert C. Wood, now resigned, to District Attorney Swann of New York County.

## NEW YORK CENTRAL IMPROVEMENT IN NEW YORK Company to Expend \$50,000,000 in Reconstructing and Electrifying Its West Side Line

A new agreement has been reached between the city of New York and the New York Central Railroad concerning reconstruction of the Central's right-of-way along the west side of the city and the elimination of tracks at grade along Eleventh Avenue. The agreement provides for covering the tracks under Riverside Park, under Riverside Drive, north of Manhattan Street, and through Fort Washington Park, and provides for a viaduct to give communication with the docks at Dyckman Street. With the carrying out of the improvements the line will be electrified.

These improvements will cost \$50,000,000 and will take six years to complete. The entire cost will be borne by the railroad, except that the city will contribute certain real estate.

Negotiations leading up to this agreement have been carried on by the port and terminal facilities committee of the Board of Estimate, of which Comptroller Prendergast is chairman, and Ira A. Place, vice-president of the New York Central Railroad. Mayor Mitchel and President McAneny of the Board of Aldermen, though not members of the committee, have taken a lively interest in the discussion.

From Spuyten Duyvil to St. John's Park the tracks of the New York Central Railroad at present run at grade, sometimes skirting the river bank, as is the case along Riverside Park; sometimes enlarging into yards, as at Seventy-second and Thirty-eighth Streets, and sometimes occupying city streets, as in Eleventh Avenue. The proposed reconstruction work will get them entirely out of the way—in some places by covering them, and in other places by elevating them on ramps, viaducts or elevated structures.

The work will begin at the city line, where the New York Central Railroad now has small yards. The lines are to be rearranged and a four-track swing bridge is to be thrown across the Harlem, to which tracks approaching from the North and East will have access by means of ramps.

Before entering into the legal agreement between the railroad and the city the Board of Estimate & Apportionment will have made available for a period of thirty days a complete report accompanied by plans, so that the public may have a full opportunity to present their views.

Ernest P. Goodrich, consulting engineer to the Borough President of Manhattan; Charles W. Staniford, chief engineer of the department of docks and ferries, and John F. Sullivan, engineer of the bureau of contract supervision of the Board of Estimate & Apportionment, are serving as consulting engineers to the committee on port and terminals of the Board of Estimate & Apportionment. These engineers, in conjunction with the New York Central Railroad, represented by its engineers, George A. Harwood, chief engineer of electric zone improvements, and H. D. Jewett, designing engineer west side improvements, prepared the plans which have met with the approval of both the city and railroad authorities for the proposed improvement and the extension of facilities of the New York Central lines within New York City, from the city line north of Spuyten Duyvil Creek to a southerly terminal in the vicinity of Canal and West Streets.

### CONSTRUCTION IN MARCH ON BUFFALO-NIAGARA FALLS HIGH-SPEED LINE

The International Railway, Buffalo, N. Y., has become the legal owner of the right-of-way of the Frontier Electric Railway between the Buffalo city line and Niagara Falls, valued at approximately \$1,200,000. The deeds transferring the property from Marshall J. Dodge, New York, to the company have been signed and everything is now in readiness for the construction of the International Railway's double-track high-speed service between Buffalo and Niagara Falls through Tonawanda and North Tonawanda. There were many changes of titles from the time the Buffalo, Thousand Islands & Portland Railroad Company acquired a route for a proposed electric freight service between Buffalo and Niagara Falls. When the freight line was abandoned years ago a holding company, known as the Fairland Realty Company, was incorporated and the property turned over to it. The deed calls for a strip 66 ft. wide from Buffalo to Niagara Falls through Erie and Niagara Counties. It is reported construction work will be started in March.

The Public Service Commission of the Second District has made an order setting out the manner in which the new high-speed line of the International Railway between Buffalo and Niagara Falls shall cross the various streets, highways and other tracks and approving the franchises which have been granted by the cities and towns through which the line will pass. As previously stated, most of the operation will be on private right-of-way. Important roads will be crossed on viaducts, as will all main lines of steam roads. The franchises approved include those from the city of Buffalo and town of Tonawanda for crossing Kenmore Avenue. A condition of the order which the company will have to accept is that if at any time in the future the crossings not provided at grade should be sought to be eliminated, the company will hold itself a party to such proceedings as if it were a steam railroad, and will pay a steam railroad's share of the cost of such a separation of grades, and not plead exemption as a street surface railway under the law. In addition the commission requires the railway to go to the Supreme Court for an order approving these crossings in the village of La Salle and the towns of Tonawanda and Wheatfield, and to accept and file with the commission the agreement with the city of Buffalo whereby the company is bound to pay its share of any future elimination of the crossing of Kenmore Avenue.

### OPERATING AND CONSTRUCTION PROBLEMS BEFORE CLEVELAND COUNCIL

By a vote of seventeen to nine the City Council at Cleveland, Ohio, enacted legislation on the evening of Jan. 17, giving the Cuyahoga County Commissioners the right to build subway approaches to the new Superior-Detroit bridge across the Cuyahoga River. Mayor Harry L. Davis announced that he would give the ordinance close study.

Councilman Schwartz introduced an ordinance requiring all cars to stop on signal at night, regardless of the alternate stop practice. At the same time two resolutions requiring that the Cleveland Railway furnish chairs for conductors were adopted.

An ordinance was introduced by Councilman Sledz providing for the extension of the East Seventy-ninth Street line to Broadway and along East Seventy-first Street to Lansing Road.

Fielder Sanders, street railway commissioner, was instructed to report on the feasibility of issuing free transfers to children on their way to and from school. Commissioner Sanders was asked also to take up the question of having cars stop on the near side of streets, and Councilman Myers fathered an ordinance requiring that all cars going toward the Public Square be operated as pay-as-you-enter cars and all going in the opposite direction be operated as pay-as-you-leave cars. While this custom is observed on some of the lines, it is not universal, because of the difficulty encountered in the use of several different styles of cars.

Common Pleas Judge P. L. A. Lieghley has refused to issue an order enjoining the city of Lakewood from putting into operation the new franchise granted the Cleveland

Railway by referendum vote last November, as asked by City Solicitor R. J. Curren on the request of a taxpayer. The petition urged that the franchise does not comply with the requirements of the new city charter.

The Cleveland, Akron & Canton Terminal Railway is preparing to ask for a number of amendments to its franchise within a few weeks. They deal with the engineering problems met with in the construction of a freight subway under East Fifty-fifth Street.

### REPORT ON PITTSBURGH ORDINANCES

A more adequate system of transfers, the through routing of cars and the ultimate construction of a downtown subway loop were offered as a solution of the transportation problem of Pittsburgh, Pa., by two committees of the Pittsburgh Chamber of Commerce in a joint report read on Jan. 18 at a luncheon in the Fort Pitt Hotel. The report analyzes the twenty-two traction ordinances in the interest of the Pittsburgh Railways introduced for the second time in the City Council on Jan. 17. The report states that, even if amended to conform with the suggestions made in the report, the ordinances would not deal adequately with the transportation problem. One reason given for opposing the ordinances is that they are not specific enough as to what use the company will make of the grants. The report suggests that the matter of service and transfers should be made subjects of separate ordinances embodying an agreement between the city and the various companies.

The ordinances for the traction franchises, which as previously noted were introduced in Council a second time on Jan. 17, came up for consideration in committee on Jan. 18. The Councilmen decided to begin consideration of the grants on Jan. 21. It is expected at that meeting to decide upon hours and days on which the various organizations interested in the ordinances may be heard.

The situation in Pittsburgh with respect to the franchises was reviewed in the *ELECTRIC RAILWAY JOURNAL* of Jan. 8, page 96.

### HAPHAZARD SERVICE IN MEXICO CITY

The Mexico Tramways ever since their seizure about a year ago by the Mexican leaders in power, have been suffering badly from slipshod operation, according to information received at the New York office of the Pearson Engineering Corporation, Ltd., which is purchasing agent for the property. The lack of technical experience of the present street railway officials who were substituted for the former operators, and their inability to require of their motormen employees a skillful and economical operation of the reduced number of cars now in service, are attested by the orders which have been received from time to time by the New York company for new electrical repair equipment, especially motor parts, such as armatures, field coils, commutators to replace those which have been burnt out and injured through carelessness and ignorance in using excessive current. In view of the high maintenance costs, arising from unscientific management, it is not believed that the Mexican officials have any intention of buying any new rolling stock or other equipment, except that required for such repairs as those above mentioned which are necessary to continue the present reduced service.

### TURBINES RATED AT 60,000 KW. BEING CONSIDERED FOR NEW YORK SUBWAYS

Both the General Electric Company and the Westinghouse Electric & Manufacturing Company handed in bids and specifications on Jan. 19 to Henry G. Stott of the Interborough Rapid Transit Company of New York City for two 60,000-kw. steam-turbine units. Each unit will be made up of three separate electric generators driven by one high-pressure and two low-pressure turbines, the latter being connected in multiple. These will be the largest steam turbines in the world, the next largest having been ordered from the General Electric Company recently by the Detroit Edison Company and rated at 50,000 kva. No decision has been reached as yet on the choice of turbines, the Interborough Rapid Transit Company being undecided on single 60,000-kw. units or the equivalent in 30,000-kw. turbines.

### MISSOURI ROAD PLANNING TO BUILD

The Kansas City & Tiffany Springs Railway has received franchises from Clay and Platte Counties, Mo., for building and operating the electric interurban across the county highways. It will soon go before the utilities commission with a request for permission to issue bonds, probably asking for \$35,000 a mile, and for issuance of stock. The company is planning now to build only in Clay and Platte Counties, the main line northward from Kansas City detouring to reach Parkville on the route to Tiffany Springs, a spur extending to Campbellton. The purposes of the spur are to touch the main line of the Quincy, Omaha & Kansas City Railroad at Campbellton, and to open a tract of land between the main line and the town. The granting of the Clay County franchise resulted in the circulation of rumors that the company would build to Liberty, now served by the Kansas City, Clay County & St. Joseph Railway. The Tiffany Springs company, however, does not intend to build to Liberty or St. Joseph, or to parallel any part of the St. Joseph company's line. The Tiffany Springs company had once entertained a tentative proposal to buy the 10 miles of Quincy, Omaha & Kansas City track, not now used, between Gower and Trimble, the latter being about 25 miles north of Kansas City. The railroad company had sought permission from the utilities commission to sell this 10 miles, and it is a possibility that the deal may yet be consummated at a price said to be less than \$5,000 a mile. The Tiffany Springs company is using an old graded right-of-way near Parkville of a road begun forty years ago, the graded portion of the projected steam road extending northeastward from Parkville to Smithville, and thence toward the Iowa line, northward and eastward, touching country not now served electrically and not well served by steam road, as to passenger traffic.

### NEW TRANSIT PROPOSITION IN CINCINNATI

City Engineer Frank Krug has suggested that a tunnel be built under Price Hill in which cars may be operated in connection with the rapid transit loop. The Rapid Transit Commission, through President E. W. Edwards, has been in consultation with a number of steam railroads entering the city and finds that they are ready to proceed with the construction of a new union depot. This information was necessary in order to know just how the loop tracks should be built.

Mr. Edwards intimated at a recent meeting that Eastern interests have begun negotiations for the lease of the loop. Letters favorable to making connection with the loop have been received from all interurban railways except the Cincinnati, Milford & Loveland and the Cincinnati & Columbus, both of which state that financial conditions will prevent them from building their own connections. The commission, however, expressed the belief that the city should not build the connections and that the companies would find a way to do this on account of the advantages it will offer.

A letter was received from Charles L. Henry, president of the Indianapolis & Cincinnati Traction Company, in which he says that all preparations have been made to extend the Rushville line by way of Brookville and Harrison to Cincinnati, if arrangements can be made to have the cars reach the business section of the city. The line would enter the city over the Cincinnati & Westwood road at Queen City Avenue. Mr. Henry wants the city to build a viaduct at that point over the steam railroad tracks to carry both the railway tracks and general traffic.

### REPORT ON AMENDED BUS PETITION IN NEW YORK

The bureau of franchises has presented to the Board of Estimate of New York City its preliminary report upon the amended application of the Fifth Avenue Coach Company for the right to operate motor buses in the Borough of Manhattan. In its summary of conclusions the bureau says:

"1. That any franchise providing for compensation to the city, based on net profits, should also provide for city supervision of all operations in and about such enterprise.

"2. Such provisions would require a technical staff to protect the city's interest, which would probably incur more expense than would be warranted by the return to the city.

"3. A franchise providing for compensation to the city on the basis of gross receipts is generally more advantageous to the city than one based on net receipts.

"4. The contract submitted by the Fifth Avenue Coach Company does not give the city sufficient supervision to insure the collection of any sum in excess of \$75,000 yearly.

"If the board does not deem it advisable to depart from its heretofore fixed policy in this respect, then there is to be determined what action should be taken upon the proposal of the New York Motor Bus Company, Inc. If, however, the board feels that it should consider a franchise providing for compensation to the city on the basis of net receipts, then it would seem that the board should draft a contract which will, in so far as possible, protect the interests of the city, and then request proposals based on that form of contract."

### CHICAGO ENGINEERING BOARD APPROVED BY TRANSPORTATION COMMITTEE

The local transportation committee of the City Council of Chicago has approved the recommendations of the subcommittee in regard to the appointment of Messrs. Arnold, Ridgway and Parsons as a board of engineers to inquire into and report on transit conditions in Chicago. The ordinance covering the appointments has been sent to the Council. Final action upon the measure is expected to be taken during the week ended Jan. 29.

It is estimated that the cost of doing the work intrusted to the engineers will be approximately \$220,000, with \$30,000 for each of the three engineers and \$130,000 for the engineering staff. Although the date for the completion of the report is set for March 1, the ordinance is so worded that the time may be extended. As a matter of fact it is not expected that the report will be ready to submit until perhaps along in the summer or the fall of this year.

### EXPERTS IN NEW DEFENSE PLAN

Details of the plan devised by a committee of the Naval Consulting Board for rendering available in time of war the industrial resources of the United States were announced on Jan. 15 by the Secretary of the Navy.

The scheme of organization, to which public attention was drawn for the first time on Jan. 14 in a letter from President Wilson read at the National Democratic Club, is to be carried out through the American Institute of Mining Engineers, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the Institute of Electrical Engineers and the American Chemical Society.

These societies will be called upon to appoint a board of five members for every State in the Union, which will undertake the task of getting information regarding manufacturing facilities, resources and capacity for the production of military supplies. With the manufacturing plants so enrolled, it is proposed to place small orders which will keep them in touch and trained for use in emergencies.

The purpose as announced by President Wilson is "to assist the Naval Consulting Board in the work of collecting data for use in organizing the manufacturing resources of the country for the public service in case of emergency."

**New Bedford Employees Ask for Increase.**—Representatives of the 500 employees of the Union Street Railway Company, New Bedford, Mass., have asked for a wage increase to a maximum of 35 cents an hour, with changes in working conditions.

**New Working Agreement in Augusta.**—The Augusta-Aiken Railway & Electric Corporation, Augusta, Ga., has signed a three-year contract with its men. The men are to be paid by the hour and there is to be a sliding scale based on the length of service with maximum pay to five-year men.

**Toledo Asks Commission to Rescind Appraisal Action.**—City Solicitor Harry S. Commager of Toledo, Ohio, appeared before the Ohio Public Utilities Commission on Jan. 17 and presented arguments against the postponement of the date on which the Toledo Railways & Light Company is to file its inventory and appraisal. He stated that the city desires action at once. The commission had already postponed the date to July 1.

**Brooklyn Company Objects to Cleaning Paths Between Elevated Tracks.**—A writ of certiorari has been issued by Justice Whitaker of the Supreme Court to the Brooklyn Rapid Transit Company directing the Public Service Commission to produce in court all of the records relating to an order issued by it in reference to the cleaning of the paths between the tracks of the elevated railroad structures. The petitioner said that the order of the commission was unjust, illegal and unnecessary.

**Increase in Wages in Dallas.**—The Dallas Consolidated Electric Street Railway, the Rapid Transit Railway, the Metropolitan Electric Street Railway and the Northern Texas Traction Company have increased the wages of all trainmen approximately 5 per cent. The increase is 1 cent an hour for both motormen and conductors. The old scale of wages ranged from 20 cents to 25 cents an hour; the new scale will range from 21 cents to 26 cents.

**Workmen's Compensation Measure in Kentucky.**—The proposed workmen's compensation measure has been introduced into the Kentucky Legislature, now in session. The measure was drafted during the summer by a volunteer commission on which manufacturers, shippers and labor were represented. No State fund is provided for and employers may, according to the draft as it exists at this time, insure with a commercial company, with a mutual concern, or carry their own insurance if they can show that they are able to do so.

**Railroad Securities Bill Introduced.**—Mr. Miller of Minnesota has introduced into the House of Representatives a bill to regulate the issue of securities by transportation, telegraph and telephone companies engaged in interstate commerce. The Interstate Commerce Commission would receive general supervision over the issue of securities by corporations subject to the terms of the bill, and in every instance the corporation would be required to inform the commission fully as to details of any such proposed issue, the disposition of the proceeds and such other information as the commission might require. Penalties of fine and imprisonment are provided in cases of violations.

**Full Proceedings of Valuation Conference Now Published.**—The Utilities Bureau, 1009 Finance Building, Philadelphia, has just published the January issue of *The Utilities Magazine* containing the complete proceedings of the Conference on Valuation held in Philadelphia on Nov. 10 and 11, 1915. Abstracts of the papers and discussions at this conference were published in the *ELECTRIC RAILWAY JOURNAL* of Nov. 13 and 20. The full report now issued, with the revised discussions, is divided into thirteen parts covering the following topics: Reproduction theory, original cost, franchise values, land values, depreciation, going value, unit prices, financial aspects of valuation and regulation, making and maintenance of priced inventories, valuation by approximation, opinion testimony, constitutional protection in valuation, and valuation and the future of public utilities. The price of this special issue is \$2.

**New York Commission Reports to Legislature.**—The annual report of the Public Service Commission for the First District of New York was submitted to the Legislature during the week ended Jan. 15. It shows the heaviest year's work in the history of the commission. The report states that seventy-three contract sections upon the city-owned lines of the dual system of rapid transit are either completed or under way, leaving only sixteen sections yet to award. Rapid transit contracts awarded during the year 1915 aggregated more than \$26,000,000. During the year the commission held 812 hearings, considered 337 formal cases and held 118 meetings. The reports of accidents on railroads and street railways for the year show a decrease in the total number of accidents and a decrease in the number of persons killed from 292 in 1914 to 237 in 1915.

**New York Transit Improvements Go into Service.**—Several of the improvements in the transit facilities of Greater New York made under the dual contracts have been completed and placed in service since Jan. 1. The third track on the Manhattan Elevated Railway, described and illustrated in the *ELECTRIC RAILWAY JOURNAL* for Jan. 15, was opened for service on Jan. 17. On Jan. 15 the Brooklyn Rapid Transit System placed in service the Fourth Avenue subway extension to Eighty-sixth Street and on Jan. 17 the

same system installed service on the center track which has been installed on the Broadway elevated line. This service, however, applies only to the line below Myrtle Avenue on Broadway across the Williamsburg bridge into the Center Street subway. Work north of Myrtle Avenue is in progress on both the stations and the third track.

**Contract Let for Tunnel Under East River.**—The Public Service Commission for the First District has awarded the contract for the construction of Section No. 3 of Route No. 8, the tunnel portion of the Fourteenth Street-Eastern District rapid transit railroad, to be operated by the New York Municipal Railway Corporation, to Booth & Flinn, Ltd., the lowest bidders, for \$6,639,023, subject to a stipulation to which the bidders have already agreed, that they will complete the tunnel ready for operation in twenty-seven months instead of thirty-four months, as called for in the original draft of the contract. Bids for the construction of this section were opened on Dec. 7, 1915. The section runs from a point under Fourteenth Street, Manhattan, about 80 ft. west of Avenue B, to and under the East River to a point under North Seventh Street, Brooklyn, near Bedford Avenue. The plans call for a two-track railroad.

**Increase in Franchise Valuations in New York City.**—The State Tax Commission of New York announced on Jan. 14 that it had added \$41,970,700 to the special franchise valuation of corporations in New York. The increase is the largest in franchise valuations ever made in one year in New York State. The Brooklyn Rapid Transit system franchise was assessed at \$6,202,600 more than last year. The Third Avenue Railway valuation was raised \$8,016,700. Basing its valuations on the revenue, the commission decreased the franchise valuation of the New York Railways system by \$5,561,000, placing its assessment figure at \$29,439,000. The Manhattan (Elevated) Railway also got a decrease of \$5,367,000. The total increases for New York City were \$53,366,900, and the total reductions \$11,396,200, making a total increase over the 1915 figures of \$41,970,700. The total value of special franchises in New York City for 1916 is placed at \$459,755,850. The special franchise valuations for the rest of the State will be made public soon.

## PROGRAMS OF ASSOCIATION MEETINGS

### United States Chamber of Commerce

The fourth annual meeting of the Chamber of Commerce of the United States of America will be held at Washington, D. C., on Feb. 8-10. The questions to be considered include those of both domestic business and foreign trade.

### Central Electric Railway Association

A four-day cruise is being arranged for the June meeting of the Central Electric Railway Association. The steamer South America of the Chicago, Duluth & Georgian Bay Transit Company will be chartered to leave Toledo, Ohio, at 11 a. m. on June 27, reaching Detroit between 3.30 o'clock on the afternoon of the first day and arriving at the Soo locks at 12.30 p. m. on June 28. The steamer will arrive at Mackinac Island, Mich., at 5 a. m. on June 29, and leave at 10 a. m. for Harbor Springs, where another stop of two hours will be made, following which the boat will proceed to Macatawa Park or Holland, Mich., arriving at 7.30 a. m., June 30, and end the cruise at Benton Harbor, Mich., at 11.30 a. m.

### New England Street Railway Club

The regular monthly meeting of the New England Street Railway Club will be held at the American House, Boston, Mass., on Jan. 25. The meeting will be an innovation. It will be a manufacturers' night, in charge of a committee representing the manufacturing interests in the club. A special program has been arranged. At the close of the dinner the regular meeting will be held, followed by a brief address by Cornell S. Hawley, president of the Laconia Car Company and past-president of the American Electric Railway Manufacturers' Association. Mr. Hawley's subject will be "Relations of the Street Railways and the Manufacturers." After Mr. Hawley's address an entertainment will be given in the form of modern minstrelsy by the New England Street Railway Club jubilee singers.



# Financial and Corporate

## ANNUAL REPORTS

### Lehigh Valley Transit Company

The statement of income, profit and loss of the Lehigh Valley Transit Company, Allentown, Pa., for the years ended Nov. 30, 1914 and 1915, follows:

	1915	1914
Revenue from transportation:		
Passenger revenue	\$1,550,125	\$1,446,694
Other transportation revenue	99,297	78,076
	<u>\$1,649,422</u>	<u>\$1,524,770</u>
Revenue from other railway operations:		
power sales, etc.	407,453	344,235
Total operating revenue	\$2,056,875	\$1,869,005
Operating expenses	1,130,835	1,052,693
	<u>\$926,040</u>	<u>\$816,312</u>
Taxes	73,552	97,961
Operating income	\$852,488	\$718,351
Non-operating income	136,146	122,948
Gross income	\$988,634	\$841,299
Deductions from gross income:		
Interest on funded debt	\$550,279	\$530,894
Rent for leased roads, etc.	64,172	53,341
Interest on unfunded debt	2,035	17,915
Amortization of discount on funded debt	20,441	20,432
Miscellaneous debits: legal expenses, etc.	28,319	10,596
	<u>\$665,246</u>	<u>\$633,178</u>
Net income	\$323,388	\$208,121

Notwithstanding the unsettled business conditions prevailing during the major part of the fiscal year, the company showed the largest earnings in its history. The operating revenue for the year increased \$187,870 or 10.05 per cent. This increase was made up of an increase of \$103,431 or 7.15 per cent in passenger revenue, \$21,221 or 27.18 per cent in other transportation revenues, and \$63,218 or 18.36 per cent in non-transportation revenue. The increase in operating expenses, however, amounted to \$78,142 or 7.42 per cent, while taxes decreased \$24,409 or 24.90 per cent.

As a result of these changes the operating income showed an increase of \$134,137 or 18.67 per cent. The non-operating income increased \$13,198 or 10.07 per cent, but the deductions from income increased to a greater extent, \$32,068 or 5.068 per cent, on account of larger interest and rental payments and legal expenses, etc. Net income finally gained \$115,267 or 55.38 per cent. Out of this amount dividends of \$174,288 or 3½ per cent on the outstanding preferred stock were paid, and the surplus was increased from \$191,374 to \$344,295 or 79.9 per cent.

During the year the freight service of the company was extended to Norristown and Telford, improvements were made to the freight stations at Allentown, Perkasio and South Bethlehem, and two trail cars were built to care for the increasing business. Although the steam roads raised their freight rates during the year, the rates of the Lehigh Valley Transit Company remained the same as originally filed. The surplus from the freight business increased \$2,781 or 22 per cent during the year. The surplus from the Adams Express business increased \$1,101 or 13.5 per cent. The company operates a freight service that connects with the lines of the Philadelphia Rapid Transit Company at Chestnut Hill, Philadelphia.

The company suffered an approximate loss in receipts of \$25,000 on account of jitney competition, which was especially noticeable in April, May and June. It is said that the physical characteristics of the territory served by the company are not favorable to jitney operation on a large scale.

Beginning with the fiscal year 1911, there was credited to maintenance, renewals and depreciation an amount equal to 22 per cent of the gross earnings of the railway lines. All items of maintenance and renewals are charged to this account, the balance being set up to accrued depreciation reserve. This showed a credit of \$229,537 as of Nov. 30, 1915.

### Washington Railway & Electric Company

The statement of income, profit and loss of the Washington Railway & Electric Company, Washington, D. C., and its subsidiary companies for the calendar year 1915 follows:

Gross earnings from operation	\$5,191,627
Miscellaneous income	22,328
Gross income	\$5,213,955
Operating expenses (including taxes and depreciation)	3,009,072
Gross income less operating expenses, taxes and depreciation	\$2,204,883
Fixed charges	1,187,997
Surplus income	\$1,016,886
Preferred stock 5 per cent dividend	\$425,000
Common stock 7 per cent dividend	455,000
	<u>\$136,886</u>
Distribution to conductors and motormen under profit-sharing plan	\$15,527
Sinking fund requirements—Potomac Electric Power Company	105,400
Miscellaneous items—net credit	6,958
Credit to profit and loss	\$22,917

The gross earnings from operation during 1915 showed a material increase of \$143,192 or 2.8 per cent. The miscellaneous income, however, decreased \$11,562 or 34.1 per cent, so that the gross income increased \$131,629 or 2.5 per cent. The operating expenses, including taxes and depreciation, increased \$115,336 or 3.9 per cent, with the result that the gross income less such charges increased only \$16,293 or 0.74 per cent. Fixed charges also increased \$10,880 or 0.92 per cent, and the surplus income gained \$5,413 or 0.53 per cent.

The operating expenses as above indicated included the sum disbursed or set aside for maintenance and depreciation on both the railway and the lighting properties, the amount being \$921,940, an increase of \$68,612 over 1914. With the current credit to profit and loss, the total profit and loss surplus is now \$1,043,346, the balance on Jan. 1, 1915, having been \$1,020,429. During the year the railway carried 65,536,072 revenue passengers and 20,378,525 free transfer passengers, a total of 85,914,597. This was an increase of 442,992 over 1914. A total of 10,701,755 miles was traveled by the cars of the company.

At the annual meeting of the company on Jan. 15 Oscar L. Gubelman was elected a director to succeed William B. Hibbs, resigned. Mr. Gubelman is connected with the New York banking house, Knauth, Nachod & Kuhne.

### Chicago City & Connecting Railways Collateral Trust

The surplus income of the Chicago City & Connecting Railways Collateral Trust, Chicago, Ill., for the year ended Dec. 31, 1915, amounted to \$57,299 after the payment of \$500,000 on participation shares. A statement regarding the non-payment of the full cumulative annual dividend on the preferred participation shares was published in the ELECTRIC RAILWAY JOURNAL of Jan. 15. The financial statement of the company for the year follows:

Dividends	\$1,704,352
Interest	88,855
Other income	21,956
Gross income	\$1,815,163
Interest on bonds	\$1,094,750
Bond redemption	105,000
Interest on bills payable	24,784
General expense	24,557
Taxes	8,772
Total disbursements	\$1,257,864
Net income	\$557,299
Deduct: Dividends on participation shares	500,000
Surplus income	\$57,299

### Louisville Railway

Notwithstanding depression in business, an increased number of privately owned automobiles and competition from jitney buses, the Louisville (Ky.) Railway closed the year 1915 with an increase in surplus earnings, all regular dividends paid and improvements amounting to \$100,000 nearly completed. The increase, not large, was gained by economies, increased efficiency and "safety first." The estimated decrease in gross earnings up to Dec. 31

was \$250,000, while there was a decrease of \$280,000 in expenses. Increased taxes and increased interest charges, however, narrowed the margin. For the city lines and those of the Louisville & Interurban Railway together, the increase in surplus earnings for eleven months was \$4,189. The interurban lines brought most of the increase, the city lines' share being only about \$100.

During the year a reduction was secured in the cost of damage suits, the safety campaign receiving the credit therefor. The fuel bill was reduced by \$24,000 through the use of the new power house at Twentieth and High Streets, while curtailments and reductions in various departments made up the other savings. In regard to revenues, it is said that noticeable improvements in the weekly statements were apparent for more than a month, the last week in November showing daily increases for the first time in a year and a half. An especially encouraging feature is the fact that receipts from lines serving industrial sections are now showing substantial increases.

Trackage improvements have included the reconstruction of a large part of the Market Street line and the extension of the Chestnut Street line to Shawnee Park via Madison Street. These two improvements alone make up virtually the whole of the \$100,000 expended. An additional \$30,000 will be expended this year on the latter extension, which will shortly be in operation.

Jitney competition has not as yet proved so serious a problem for the Louisville Railway as it has in some other sections. At present about forty cars are running under municipal restrictions, while at the most during the last summer not more than eighty were in operation. One company which undertook to operate a line of buses, constructed to carry ten or more passengers, failed, and the cars are now hauling building materials.

#### IMPROVED CONDITIONS IN CENTRAL STATES

Referring to conditions in the market for investment securities, the investment banking firm of Bowman, Cost & Company, St. Louis, Mo., says that a noticeable improvement has been registered in the last month for both long-term and short-term issues of public service corporations. Where theretofore the inquiry converged on the undistributed mortgage obligations of successful companies, the appetite of the public (due to a growing return of confidence as well as the superabundance of idle funds) has unquestionably been whetted by the splendid showings of earnings in many instances. Moreover, it is felt that the broader viewpoints of many public service commissions in the matter of rates, capitalization, competition and other elements of utility operation, must not be overlooked in a consideration of the more favorable conditions. For that matter, the attitude of the public should also be cited, as regards indiscriminate rivalry between municipally-owned and privately-operated plants. The vote at Springfield, Mo., on Jan. 11 against municipal ownership is said to have registered a significant change in public opinion in some of the smaller communities. In general, the firm finds a substantial inquiry for good mortgage obligations and looks for continued improvement in prices, barring the unforeseen. Quotations are yet below the normal in many instances, but this is a condition which will not last indefinitely in view of the consecutive showings of profits by leading utilities.

#### OAKLAND-ANTIOCH EARNINGS IMPROVING

**Report for Five Months Ended Nov. 30, 1915, Shows Encouraging Volume of Business—Freight Earnings Show Big Increase**

A report of earnings for the Oakland, Antioch & Eastern Railway, Oakland, Cal., for November, 1915, and the five months ended Nov. 30, 1915, which has just been made public, shows a volume of business which the management regards as very encouraging. The operating expenses in November amounted, it is estimated, to only 53 per cent of the operating revenue, while the operating expenses for the entire five-month period were 50 per cent of the operating revenue. An interesting feature of the report is that freight earnings for November, 1915, were 68 per cent greater than in November, 1914. Despite the abnormally

heavy travel caused by the exposition, the freight-earning increase for November, 1915, was proportionately larger than the passenger increase. Comparative statements for these periods are as follows:

MONTH OF NOVEMBER			
	1915	1914	Increase
Operating revenue.....	\$65,949	\$40,550	\$25,399
Operating expenses.....	34,518	32,996	1,522
Operating income.....	\$31,431	\$7,554	\$23,877
Deductions, taxes.....	2,240	1,081	1,159
Net income.....	\$29,191	\$6,473	\$22,718
FIVE MONTHS ENDED NOV. 30			
	1915	1914	Increase
Operating revenues.....	\$316,532	\$259,338	\$57,193
Operating expenses.....	174,808	172,905	1,902
Operating income.....	\$141,724	\$86,433	\$55,291
Deductions, taxes.....	11,200	5,763	5,437
Net income.....	\$130,524	\$80,670	\$49,854

Officials of the company have unofficially stated that the volume of business done since the close of the exposition has been considerably greater than was anticipated, and that as a result the financial outlook for the road has materially improved. The company expects to defeat the application for a receivership recently filed in the local courts, as noted in the ELECTRIC RAILWAY JOURNAL of Jan. 8.

**Caldwell (Ida.) Traction Company, Ltd.**—The total receipts of the Caldwell Traction Company, Ltd., for 1915 (December estimated), amounted to \$14,783, while the total operating expenses for the year were \$11,371, leaving a net of \$3,412. The estimated net for 1916, covering the old lines and the Wilder branch, is set at \$17,046. The total reproduction cost of the company's property is fixed at \$173,955.

**Central Arkansas Railway & Light Corporation, Hot Springs, Ark.**—The Central Arkansas Railway & Light Corporation, a subsidiary of the Federal Light & Traction Company, has called for tenders through the Columbia Trust Company for as many of its first lien fifteen-year 5 per cent sinking-fund bonds as may be purchased with \$32,733, now available for the sinking fund.

**Chicago (Ill.) City Railway.**—The Illinois Trust & Savings Bank, the First Trust & Savings Bank and Lee, Higginson & Company are offering at 99¾ and interest \$1,000,000 of first mortgage 5 per cent gold bonds of the Chicago City Railway of 1907 due on Feb. 1, 1927, but redeemable as a whole upon any interest date before maturity, at par and interest, but only in case the property shall be purchased by the city or its lawful licensee.

**Chicago (Ill.) Railways.**—The Chicago Railways has sold to Harris, Forbes & Company an additional \$1,500,000 of first mortgage 5 per cent twenty-year bonds, making the total amount of these bonds outstanding \$54,455,000.

**Cincinnati, Dayton & Toledo Traction Company, Hamilton, Ohio.**—The twenty days of grace within which the Ohio Electric Railway was to pay its rental to the Cincinnati, Dayton & Toledo Traction Company expired on Jan. 14 with the rental unpaid. J. M. Hutton, chairman of the bondholders' protective committee, returned on Jan. 17 from Philadelphia, where he had conferred with Randall Morgan and the interests associated with him in the control of the Ohio Electric Railway. A proposal from that company will probably soon be submitted to the committee. Seemingly the committee is disposed to insist upon the payment of the rental and the continuance of the present basis of settlement. It is said that the committee has plenty of financial backing to warrant it in reorganizing the company to operate its own line. Previous items referring to this case were published in the ELECTRIC RAILWAY JOURNAL of Jan. 1 and 15.

**Columbus Railway, Power & Light Company, Columbus, Ohio.**—The Columbus Railway, Power & Light Company has sold \$3,500,000 of 5 per cent first refunding and extension mortgage bonds to E. W. Clark & Company, Philadelphia, and Kissel, Kinnicutt & Company, New York. In connection with the sale of these bonds the company has called for payment \$2,639,000 of its underlying bonds.

**Dallas (Tex.) Electric Company.**—Stone & Webster and the Old Colony Trust Company, Boston, Mass., are offering at 99½ and interest to yield 6.12 per cent \$750,000 of Dallas Electric Company terminal mortgage five-year 6 per cent coupon notes in the denomination of \$500 and \$1,000. The notes are a direct obligation of the Dallas Electric Company and are secured by a first mortgage on the terminal facilities and office building of the Dallas Interurban Terminal Association.

**Fresno (Cal.) Interurban Railway.**—The California Railroad Commission has authorized the Fresno Interurban Railway to issue \$212,500 of common stock of a par value of \$100 at not less than \$80 a share and \$350,000 of first mortgage 6 per cent twenty-five-year bonds previously authorized at 90 per cent of their face value. The commission has further authorized the company to issue 6 per cent certificates of indebtedness for \$350,000 to net the full face value. These issues are to refund 580 shares of common stock and \$110,000 of bonds previously authorized, the balance to be used as heretofore directed.

**General Gas & Electric Company, New York, N. Y.**—Among the utility properties reporting good earnings for 1915 is the General Gas & Electric Company, which controls various electric, gas and railway properties, including the Rutland Railway, Light & Power Company, Rutland, Vt., and the Northwestern Ohio Railway & Power Company, Toledo, Ohio. Each of the properties showed an increase in gross earnings over 1914, the aggregate being \$227,532 of 10.3 per cent. December earnings increased \$43,016 on the combined properties. Of the earnings of 1915, 66.2 per cent were from electric light and power companies; 19.9 per cent from gas companies, and 13.9 per cent from railway properties. The regular quarterly dividend of 1.75 per cent on the cumulative preferred stock was paid on Jan. 3, together with past accumulations aggregating 0.75 per cent. This pays up all past accumulations and places the stock on a regular 7 per cent basis. The properties of this company are operated by W. S. Barstow & Company, Inc., New York.

**Illinois Traction System, Peoria, Ill.**—The Illinois Public Utilities Commission has authorized the St. Louis, Springfield & Peoria Railroad to issue \$1,000,000 of 5 per cent preferred stock and the Bloomington, Decatur & Champaign Railroad to issue \$500,000 of 5 per cent preferred stock to retire like amounts of general mortgage bonds. The application of these companies, which are subsidiaries of the Illinois Traction System, was noted in the ELECTRIC RAILWAY JOURNAL of Dec. 18.

**Lancaster & York Furnace Street Railway, Millersville, Pa.**—It is reported that the Lancaster & York Furnace Street Railway and the controlled Lancaster & Southern Street Railway have suspended operations owing to financial troubles. An application for a receiver for these companies was noted in the ELECTRIC RAILWAY JOURNAL of Jan. 1.

**People's Street Railway, Wanamie, Pa.**—Q. A. Gates and Charles E. Graham, Wilkes-Barre, Pa., have asked the court in that city to appoint a receiver for the People's Street Railway of Nanticoke and Newport, Pa. They are also seeking an injunction to restrain the majority stockholders from paying to the officers of the company salaries which they claim are excessive. The plaintiffs also charge that the majority stockholders permitted a franchise in Warrior Run to expire through neglect and that the officers have used company funds to build dwellings on land the company does not own.

**Petaluma & Santa Rosa Railway, Petaluma, Cal.**—The California Railroad Commission has authorized the Petaluma & Santa Rosa Railway to issue interest coupons maturing on Oct. 1, 1916, and April 1, 1917, as evidence of the interest to accrue on the outstanding 217 second mortgage bonds. These bonds matured on April 1, 1915, but were extended for two years with the provision that semi-annual interest should be regularly paid. For coupons maturing on Oct. 1, 1915, and April 1, 1916, it was held that commission authorization was not necessary, such coupons falling under the one-year indebtedness clause.

**Portland Railway, Light & Power Company, Portland, Ore.**—Preliminary statements of earnings of the Portland Railway, Light & Power Company show considerable im-

provement during the last quarter of the year. The net earnings were as follows: September, \$196,000; October, \$237,800; November, \$246,300; December, \$268,500. The net earnings for the year are said to be \$2,987,974.

**San Francisco, Napa & Calistoga Railway, Napa, Cal.**—A circular which has been sent to the first mortgage bondholders of the San Francisco, Napa & Calistoga Railway in regard to the favorable showing of the company says in substance that damage claims amounting to \$135,000 from the wreck of June, 1913, have been paid out of earnings and a \$36,000 stock assessment, without abnormally increasing the floating debt. For the year ended Nov. 30, 1915, the company showed net after taxes, etc., of \$79,145. Deducting \$36,000 for bond interest, a balance of \$43,145 remained for corporate purposes.

**Seattle (Wash.) Municipal Street Railway.**—According to the report of A. L. Valentine, superintendent of public utilities, the two municipal railway lines of the Seattle Municipal Street Railway were operated during December at a loss of \$2,713. Loss on the Lake Burien line, Division "C," amounted to \$889, while the loss on Division "A" totaled \$1,824.

**United Railroads of San Francisco, San Francisco, Cal.**—The California Railroad Commission on Jan. 14 authorized the United Railroads of San Francisco to issue 6 per cent interest coupons payable on June 30, 1916, to be attached to 400 outstanding bonds of the Ferries & Cliff House Railway. The United Railroads must call in the interest coupons now attached to these bonds and substitute the new ones. A detailed note regarding the application in this case was published in the ELECTRIC RAILWAY JOURNAL of Jan. 15.

**Washington Water Power Company, Spokane, Wash.**—D. L. Huntington, president of the Washington Water Power Company, in a recent statement to the Council of Spokane, said the company's street railway business was being conducted at a loss, and that he understood that this was also true of the operation of the lines of the Spokane Traction Company, controlled by the Spokane & Inland Empire Railroad. The consolidation of the two local lines has been suggested before, but, it is declared, the absorption of one system by the other has not proved practicable. The organization of a holding company has been advanced as a possible solution of the objections raised to an actual merger. The jitney bus and the increasing number of privately owned automobiles are said to have affected the earnings of the companies materially.

**Waverly, Sayre & Athens Traction Company, Waverly, N. Y.**—The stockholders of the Waverly, Sayre & Athens Traction Company and the Sayre Railway at their recent annual meetings voted to consolidate under the name of the former company. The Sayre Railway, a 1.5-mile line, was formerly operated under a perpetual lease, and all its stock was owned by the Waverly, Sayre & Athens Traction Company.

DIVIDENDS DECLARED

Cities Service Company, New York, N. Y., monthly, one-half of 1 per cent, preferred.

Columbus Railway, Power & Light Company, Columbus, Ohio, quarterly, 1¼ per cent, preferred, Series B; quarterly, 1¼ per cent, common.

Lewiston, Augusta & Waterville Street Railway, Lewiston, Me., quarterly, 1½ per cent, preferred.

Milwaukee Electric Railway & Light Company, Milwaukee, Wis., quarterly, 1½ per cent.

Montreal (Que.) Tramways, quarterly, 2½ per cent.

ELECTRIC RAILWAY MONTHLY EARNINGS

AMERICAN RAILWAYS, PHILADELPHIA, PA.

Period	Operating Revenues	Operating Expenses	Operating Income	Fixed Charges	Net Income
1m., Dec., '15	\$508,830	.....	.....	.....	.....
1 " " '14	480,710	.....	.....	.....	.....
12 " " '15	5,436,895	.....	.....	.....	.....
12 " " '14	5,559,535	.....	.....	.....	.....

PHILADELPHIA (PA.) RAPID TRANSIT COMPANY

1m., Dec., '15	\$2,213,472	\$1,237,668	\$975,804	\$815,497	\$160,307
1 " " '14	2,074,522	1,202,653	871,869	807,016	64,853
6 " " '15	12,416,972	6,959,936	5,457,036	4,895,793	561,242
6 " " '14	11,945,123	6,898,721	5,046,402	4,847,955	198,447

# Traffic and Transportation

## STUDYING ELECTRIC RAILWAY GRADE CROSSINGS

At a meeting of the executive committee of the Syracuse conference for greater safety at electric railway grade crossings, held in the offices of the Second District Public Service Commission at Albany, N. Y., on Jan. 14, definite steps were made toward the study of the problem of protection for both the electric railways and vehicles which the executive committee will later formulate into a possible legislative program. Committees on which will be appointed both automobilists and representatives of the railways, with State officials, were provided for to make recommendations on the various phases of the problem for which the members of each will be best qualified. These committees, six in number, with the character of membership, are as follows:

**Physical surroundings of crossings**—Two railway men, two motorists and Edwin Duffey, State commissioner of highways.

**Fixed signs and signals**—One railway man, one motorist and Mr. Duffey.

**Methods of operation**—One railway man, one motorist and Francis M. Hugo, Secretary of State.

**Car and vehicle signal equipment**—One railway man, one motorist and the Secretary of State.

**Publicity and education**—Twenty-four members from all parts of the State.

**Regulation of urban traffic**—Three motorists, two railway men, Commissioner Duffey and the Secretary of State.

The meeting of the committee on Jan. 14 was called to order by Seymour Van Santvoord, chairman of the Public Service Commission and of this committee. George A. Ricker, consulting engineer of the New York State Automobile Association, was made secretary of the committee. General discussion related largely to the need of publicity and the education of the public as to safety at electric railway grade crossings.

The grade crossing elimination act applies only to steam railroads, and there is at the present time no statutory provision for greater safety at electric railway crossings nor no standard practice in protecting these crossings. With the growing use of the automobile, accidents at these crossings have increased, and it is the hope of this conference that means may be devised to minimize them through better protection, the standardization of signals and operation, and possibly through legislation. The next meeting of the executive committee will be held in Syracuse within two or three weeks.

Those who were present at the meeting in Albany on Jan. 14 were: Seymour Van Santvoord, Charles R. Barnes, electric railway inspector of the commission; Thomas Penney of the International Railway, Buffalo; Peter G. Ten Eyck, third vice-president of the New York State Automobile Association, Albany; James P. Barnes, New York Electric Railway Association, Rochester; B. E. Tilton, New York State Railways, Rochester; George C. Diehl, American Automobile Association, Buffalo; Howard Osterhout, representing the Secretary of State, Albany; George A. Ricker, consulting engineer of the New York State Automobile Association, Albany, and Edwin Duffey, state commissioner of highways.

## UNIFORM REGULATIONS FOR STREET TRAFFIC

Among the important features of the standard code of traffic regulations as compiled by the street traffic committee of the Safety First Federation of America are the following:

Prohibiting the use of the muffler cut-out.

Prohibiting excessive emission of smoke or gases.

Prohibiting the unnecessary use of warning signals.

Providing that all vehicles shall carry lights from one hour after sunset to one hour before sunrise.

Approval of the near-side stop regulation for street cars. Providing car-stop safety zones for persons getting on or off street cars.

Providing for protecting the car-stop safety zones from encroachment by vehicles, either moving or standing.

Requiring that all vehicles must come to a full stop at least 5 ft. behind a street car when stopping or which has stopped to receive or discharge passengers.

Requiring pedestrians to cross the street at the regular crossing, to cross with the traffic and comply with the signals of traffic officers.

Recommending the licensing of all motor vehicle drivers or operators, subject to suspension or revocation by the issuing authority. It is contended that the adoption of this regulation by the various State Legislatures will result in a material reduction of highway accidents. The chief requisite for securing the license shall be proper physical, mental and moral qualifications.

It is proposed further to eliminate the possibility of street accidents by standardizing signs and signals, and the street traffic committee has approved of the mechanical traffic semaphore that has been in successful operation on Fifth Avenue, New York, and adopted in Detroit, Baltimore, Washington, St. Louis, Boston, New Orleans and other cities.

The electric railways were represented on the committee by Joseph A. McGowan, secretary and treasurer of the Terre Haute, Indianapolis & Eastern Traction Company, and F. W. Bacon, vice-president of the Kentucky Traction & Terminal Company, Lexington, Ky.

**Toronto Jitneys Decreased.**—The new regulations that have been enforced by the police authorities of Toronto, Ont., since January have had a marked effect on the jitneys. It is a safe estimate that more than half have been taken off the road.

**Steam Train Hits Illinois Traction Car.**—Ten persons were injured on Jan. 16 when a parlor car in an Illinois Traction System train was struck by an Illinois Central Railroad train at a railroad crossing in the streets of Springfield, Ill.

**Experiment with Felt Curtains.**—Felt curtains which can be rolled up and down, operated by motorman or conductor, will be furnished on the open ends of fifty cars on the Sutter Street line of the United Railroads, San Francisco, Cal. If the experiment proves successful all the open cars of the company will be similarly equipped.

**Scranton Jitney Ordinance Sustained.**—The Court of Common Pleas of Lackawanna County has sustained the jitney ordinance of the city of Scranton, Pa. The court held that the municipal regulation of vehicles used for hire within the corporate limits of the city was a valid exercise of the police power which has been granted to municipal corporations.

**Car Work Planned in St. Louis.**—The United Railways, St. Louis, Mo., expect to continue the work of rebuilding cars, closing the rear platforms and installing the automatic signal system as rapidly as it is possible to put the cars through the shop. In order to expedite traffic it is the intention to equip motor cars drawing trailers with independent air compressors, so that it will not be necessary to stop these cars at charging stations. The equipment of trains with independent compressors will afford great relief to the charging stations.

**Through Service Established.**—With the completion of the extension of the Arkansas Valley Interurban Railway to Hutchinson, Kan., on Dec. 22, through passenger service was inaugurated between that point and Wichita, Kan.; Valley Center, Kan.; Sedgwick, Kan.; Newton, Kan.; Halstead, Kan.; Burrton, Kan., and intermediate points. Physical connections for interchange of carload business with steam lines have been completed at Burrton and Valley Center, and additional connections at Hutchinson and other junctions will soon be provided.

**Appeal to Employees Against Jitneys.**—The Chamber of Commerce of Portland, Ore., has issued a letter to all its employees recommending that they stop patronizing jitney buses. It is pointed out that while the Chamber of Commerce does not desire to interfere with the personal liberty

of its employees, the request is made in the interests of the safety of the employees and the general welfare of the city. Accompanying the request is an explanation of the dangers of patronizing jitneys and the reasons why it is not deemed advantageous to the community that the jitney should receive support.

**Bills Introduced Affecting Washington Lines.**—Mr. Clark of Florida has introduced into the House of Representatives two bills affecting the electric railways in the District of Columbia. One measure would confer police powers on all conductors and motormen on all electric and other street railways in the district. The other measure would require all transportation companies, firms and persons within the district to provide separate accommodations for the white and negro races and to prescribe punishments and penalties for violating its provisions and to provide for its enforcement. Both have been referred to the Committee on the District.

**Physical Connection of Oregon Lines Ordered.**—Physical connection of the tracks of the Southern Pacific Company and the Oregon Electric Railway at Water Street, Albany, within thirty days has been ordered by the Oregon Public Service Commission. The order was issued after an exhaustive investigation by the commission of the business which would result from an interchange of traffic. The commission specifies that the cost of making the trackage connection shall be borne equally by both lines and the freight and cars shall be transferred from one line to another for a reasonable amount without discrimination or unreasonable delay.

**Appeal of Coupler Case to Be Heard Soon.**—A date will be set within the next three weeks for final arguments in the United States Circuit Court of Appeals of the appeal of the International Railway, Buffalo, N. Y., from its conviction two years ago of violation of the federal safety appliance act by not having automatic couplers on its interurban cars. The railway contends it is a street railway only, and is exempt from this provision of the interstate commerce act. The government put in proof of traffic arrangements between the International Railway and steam lines providing for interchange of freight, etc., and it also contended that the International Railway used the old Erie Railroad right-of-way for part of its interurban system. The government is prosecuting this case merely as a test issue upon which to bring actions against other electric railways which are not equipping interurban cars with automatic couplers as provided for under the safety appliance act.

**Plans for Improving Springfield Service.**—C. V. Wood, president of the Springfield (Mass.) Street Railway, says that substantial improvement in the handling of cars through the downtown district will shortly be effected by the diversion of certain lines from Main Street to Dwight Street, the latter being a parallel thoroughfare to the former. Better movement through the city from north to south and vice versa will result from the recent completion of the Dwight Street underpass at the Union Station. Mr. Wood referred to the difficulties of operating 223 cars an hour through a single artery of travel and pointed out that through diversion and consequent extension of minimum headway much freer movement is to be anticipated. No date was set for the opening of the enlarged Dwight Street service. Practically every available car is now in service, and new cars are being added to the equipment as rapidly as possible. An investigation of service conditions has lately been concluded by the Springfield Board of Trade, but no public recommendations have resulted.

**Maine Commission Approves Fender.**—The Public Utilities Commission of Maine has approved the Acme fender of the Eclipse Railway Supply Company for use on the cars of the Atlantic Shore Railway. The law requiring fenders on all electric cars operated in Maine was passed at the legislative session in 1915 to become effective on Nov. 1, 1915. In September, 1915, the Public Utilities Commission called a conference on fenders and in October the railways presented written requests for an extension of time until March 1, 1916, under the fender requirement in order to test various devices. This extension was granted. In passing upon the application of the Atlantic Shore Railway the commission said: "We are not committed in our opinion to

any particular make of fender. We do not wish to be understood as saying that we will or will not approve a particular type of fender. Herein we are doing no more than deciding the application of the Atlantic Shore Railway, giving our reasons therefor and making some general observations, which may or may not be of importance in future matters."

**Recent Work of the Associated Bureaus of the Pittsburgh Railways.**—The continuation by the associated bureaus of the Pittsburgh (Pa.) Railways of its efficiency work has enabled the bureaus to reduce their force and at the same time take over additional work. The associated bureaus are now preparing to handle the workmen's compensation business and with the exception of the medical end of it the bureaus probably will be able to do so without further increase in the number of employees. The company was unfortunate in sustaining a rather severe accident on the night of Jan. 1 when a car was derailed and overturned and forty-three people were taken to the hospital. As evidencing its handling of these matters the associated bureaus of the company finally disposed of fifty-two of the total of 103 injured within forty-eight hours after the occurrence. The members of the bureaus held a dinner at the Fort Pitt Hotel on Dec. 23. Some time ago they issued a safety coin for general distribution at the Pittsburgh Exposition, and the demand was so great that they later distributed several thousand additional coins.

**Employees' Booster Meetings.**—Employees of all departments of the United Gas & Electric Company, which also operates the city lines of New Albany and Jeffersonville, Ind., and of the two interurban lines, have been enrolled in an informal "Boosters' Club," which has begun a program of monthly meetings. The third of these meetings is to be held during the latter part of this month, when some form of entertainment and instruction will be provided. The meetings are held in a public hall in the Carnegie Library, which is directly opposite the main offices of the company. Committees of the members, serving each for three months, are in charge of the programs for the meetings. The first meeting was addressed by Chester P. Wilson, president of the Public Service Company, and there was an eight-piece orchestra and a supper for those who attended. The program for the January meeting has not been announced as yet, the purpose being to hold up interest by the surprise feature. These meetings are designed more to promote goodfellowship among employees than for any other one purpose, the idea being that if those who are engaged in different departments are enabled to get acquainted with each other outside of working hours they can be counted on for better co-operation during business hours.

**Accurate Watches Lead to Increased Business.**—As described in the ELECTRIC RAILWAY JOURNAL for Nov. 20, 1915, by R. B. Hull, general manager of the Conestoga Traction Company, Lancaster, Pa., that company has recently installed a time-inspection system. In addition to a large number of suburban and interurban lines, this company operates in Lancaster itself a number of routes usually on a headway of ten minutes. Mr. Hull reports now that traffic began to increase within a few weeks after the time inspection system went into effect. The residents along the lines noticed that the passing time of cars was more dependable and hence they arrange to ride instead of walk. To encourage this extra travel the company has already issued a separate time-table for the College Avenue Line to show the time the cars leave Penn Square, the center of the city; the time they reach James Street and College Avenue, the approximate center of the line, and the time they reach the suburban terminal. The cars also are operating on seven-minute instead of ten-minute headway. For College Avenue alone the company has printed 30,000 cards for distribution in the cars. It is planning to issue similar time-table cards for other lines. A feature of operation on the Conestoga system is that all cars leave from Penn Square on schedule time invariably. The company appreciates so greatly the value of reliable service that it always has cars ready to take the place of any delayed incoming car. The crews of the incoming and outgoing cars are replaced in accordance with the usual practice which is followed for set-back operation.

## Personal Mention

Mr. Douglas C. Moore has resigned as superintendent of the Duluth division of the Duluth Street Railway, which operates in Duluth, Minn., and Superior, Wis. He has been connected with the company for seventeen years.

Mr. R. B. Campbell has been appointed assistant to Mr. George Theis, Jr., president of the Arkansas Valley Interurban Railway, Wichita, Kan. Mr. Campbell will have supervision of executive detail and will be assigned special duties.

Mr. George E. Towner, for more than three years superintendent of the lines of the Portland, Eugene & Eastern Railway at Eugene, Ore., has tendered his resignation to Mr. T. L. Billingsley, general superintendent of the Southern Pacific Company's system of city lines in western Oregon to take effect on Feb. 1.

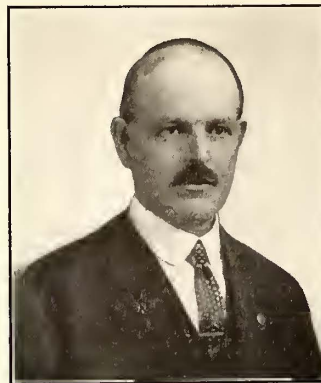
Mr. Harry W. Dowman, for the last two years with the auditing department of the Union Traction Company of Indiana, has been made clerk to Mr. G. H. Kelsey, supervisor of the power of the company, with headquarters in Anderson. Before taking up his work at Anderson Mr. Dowman was with the Cleveland (Ohio) Electric Illuminating Company.

Mr. T. G. Cowan has been appointed superintendent of the Warren-Bisbee Railway, Warren, Ariz., to succeed Mr. Ralph Cadwell, whose resignation from the company was noted recently in the *ELECTRIC RAILWAY JOURNAL*. Mr. Cowan has been manager of the Bisbee Improvement Company and the Douglas Improvement Company and was head of the Courtland Water Company.

Mr. David S. Carll, whose retirement from the office of general manager of the Capital Traction Company, Washington, D. C., was noted briefly in the *ELECTRIC RAILWAY JOURNAL* of Jan. 15, relinquished the position voluntarily, desiring after twenty-five years of continuous service with the company to be relieved of the arduous duties of that office. He continues as vice-president and a member of the board of directors of the company. The board's appreciation of Mr. Carll and its estimate of his worth and service are expressed in the following resolution: "Resolved, that the board of directors of the Capital Traction Company, appreciating the worth and services of David S. Carll, who for a quarter of a century has served this company with unselfish devotion and energy and materially aided in its growth, development and welfare, do now unanimously vote to concur in his wish to be relieved from the arduous and exacting duties and labors of general manager, and are gratified that he will continue as a member of this board, and that he consents to serve as a vice-president, with an assignment of lighter duties, to which office it is our pleasure to elect him."

Mr. H. C. Prather has resigned as assistant general manager of the Empire United Railways, Inc., Syracuse, N. Y., to become connected with the Peter Smith Heater Company, Detroit, Mich. Mr. Prather has been assistant general manager of the Empire United Railways for the last year and a half. Prior to that time he filled various positions on the Buffalo, Lockport & Rochester Railway, rising from master mechanic to general manager. Altogether he has been employed by the Beebe lines about seven years. Mr. Prather has been engaged in electric railway work more than twenty years. His connections other than those mentioned have included the Union Traction Company of Indiana, United Railways of St. Louis, Brooklyn Rapid Transit Company, the Public Service Railway and the Roanoke Railway & Electric Company. Mr. Prather was held in the greatest esteem by both officers and employees of the Empire United Railways, as was indicated on Jan. 8, when twenty-five of the officers and department heads tendered a dinner to him at the Hotel Onondaga, Syracuse. On Jan. 9 Mr. Prather was presented with a beautiful leather bag by the trainmen and employees of the company. On Jan. 10, the wives of officers entertained Mr. and Mrs. Prather at a dinner dance.

Mr. H. O. Butler has been appointed assistant superintendent of transportation of the United Railways, St. Louis, Mo., under Mr. Bruce Cameron, superintendent of transportation of the company, as announced in the *ELECTRIC RAILWAY JOURNAL* of Jan. 8.



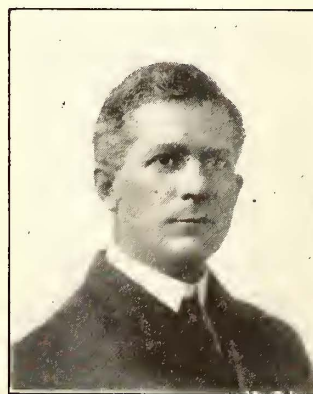
H. O. BUTLER

Mr. Butler was born at Hogsburg, N. Y., on June 7, 1868. He has been in the employ of the United Railways since 1888, when he entered the service as a gripman on the Olive Street line. He has been successively gripman, conductor, foreman, supervisor and division superintendent. His appointment as assistant superintendent of transportation is a mark of the appreciation in which he is held by the United Railways. He is recognized by

the employees and officers of the railway as a persistent, efficient and faithful official, and his appointment will doubtless add greatly to the effectiveness of the official staff of the company. The United Railways controls all the local lines in St. Louis. It operates 441 miles of track, 1438 passenger and 242 other cars.

Mr. Edward Harris Maggard, whose appointment as general manager of the Petaluma & Santa Rosa Railway, Petaluma, Ca., was noted briefly in the *ELECTRIC RAILWAY JOURNAL* of Jan. 8, was born at Meridian, Miss., in 1875. He moved to Texas with his parents in 1877, and was educated in the public schools at Corsicana and Dennison. He entered the service of the Missouri, Kansas & Texas Railway at Dennison, Tex., as call boy in 1889 and served as such until 1893, when he resigned to accept a position with the Southern Pacific at Houston as clerk in the freight office. He served in that capacity until 1900, and then resigned to enter the service of the El Paso & Northeastern Railway at El Paso, Tex., as chief clerk in the freight office. He was promoted to agent of this company, and from agent to superintendent of terminals. In 1907 he resigned from the El Paso & Northeastern Railway and entered the service of the Petaluma & Santa Rosa Railway as general freight and passenger agent. He continued in that capacity until promoted to the office of general manager recently, to succeed the late Elmer M. Van Frank.

Mr. F. W. Brooks, general manager of the Detroit (Mich.) United Railway, has been elected vice-president of that company. Mr. Brooks was born at Waco, Tex., on March 4,



F. W. BROOKS

1865. He was educated in private schools in Waco, the Waco Military Academy and the Texas State College, making a specialty of engineering in the latter institution. He became identified with the construction of the New Orleans & Texas Pacific Railway in 1882, and afterwards with the construction of extensions of the Cincinnati Southern Railway. He was later associated with the engineering and other departments of the Louisville, New Orleans & Texas Railway, which was afterward acquired by the Illinois Central Railroad.

Mr. Brooks went to Detroit in 1895 as general manager of the Rapid Railway, an interurban line operating between Detroit and Port Huron. This was his first connection with the electric railway business. In 1903 the Rapid Railway having come under the control of the Detroit United Railway, Mr. Brooks was made assistant general manager of the latter company, and shortly after he was made general manager.

Mr. George D. Woodside has been elected president of the West Chester (Pa.) Street Railway, succeeding Mr. Meyer Schamberg, who becomes vice-president, taking the place of Mr. Jonas Rice, who will continue with the company as general manager.

Mr. Harry H. Brown has been appointed superintendent of the Duluth division of the Duluth (Minn.) Street Railway to succeed Mr. Douglas C. Moore, whose resignation from the company is noted elsewhere in this issue. Mr. Brown was educated at Colby College in Maine and was connected with the Lewiston, Augusta & Waterville Street Railway for some time. He became connected with the company in Duluth four years ago.

Mr. J. H. Hanna, formerly chief engineer of the Capital Traction Company, Washington, D. C., has been elected vice-president of the company in charge of operation, as noted briefly in the ELECTRIC RAILWAY JOURNAL of Jan. 15. Mr. Hanna was born in Henderson, Ky., in 1871, where he prepared, in the public schools, for Princeton University. At Princeton he entered the engineering courses, and was graduated in 1892 with the degree of civil engineer. For two years after leaving college he engaged in steam railroad engineering work and then entered the service of the Washington & Georgetown Railroad, predecessor of the present Capital Traction Company, Washington, D. C. The following year he was appointed assistant superintendent, and four years later he became superintendent and assistant engineer of the same company, being appointed chief engineer in charge of all construction and maintenance about seven years ago. Mr. Hanna is prominent in technical association affairs. He is a member of the American Society of Civil Engineers and of the American Institute of Electrical Engineers as well as the American Electric Railway Engineering Association, of which last he was president in 1914. He also is a past-president of the Washington Society of Engineers. The Capital Traction Company operates 65.39 miles of underground conduit line and owns 442 motor cars and 251 other cars.



J. H. HANNA

Mr. Arthur F. Blaser, who has been appointed chief engineer in the office of the street railway commissioner at Cleveland, Ohio, was born in Holmes County, Ohio, in 1876. He was graduated from the College of Wooster, Wooster, Ohio, in 1903, and two years later was graduated from the civil engineering department of the Case School of Applied Science, Cleveland, Ohio. Mr. Blaser then spent a few months with the King Bridge Company and afterward taught in an Ohio school for some time. In the autumn of 1907 he went to Berlin and spent a year there in the *Technische Hochschule*. After some time spent in the bridge department of the municipal government at Cleveland and in grade elimination work for the Nickel Plate Railroad, he taught two years in Case School. He then entered the employ of Wilbur J. Watson & Company, consulting engineers, with whom he remained until he accepted his present appointment.

OBITUARY

Harry L. Cooper, son of Thomas Cooper, for a number of years manager of the railway and lighting division of the Westinghouse Electric & Manufacturing Company at Philadelphia, died on Jan. 17 following an operation for appendicitis. The Messrs. Cooper, father and son, were very popular members of the party which took the trip to the San Francisco convention on the "Red Special" train, and to them the news of young Mr. Cooper's death will come as a great shock. Harry Cooper was connected with the sales organization at Philadelphia of the International Motors Company and was twenty-seven years old on Dec. 6, 1915.

# Construction News

Construction News Notes are classified under each heading alphabetically by States.

An asterisk (\*) indicates a project not previously reported.

FRANCHISES

Glendale, Cal.—The Pacific Electric Railway has received a franchise from the Council to build an extension of its line in Glendale and has secured 2½ acres for a terminal. The company has also received a franchise from the Council of San Bernardino to construct, after Feb. 3, a line along Orange Grove Avenue, San Bernardino.

San Diego, Cal.—The San Diego Electric Railway has asked the Council for a forty-eight-year franchise to construct an extension of its line on University Avenue to Euclid Avenue. Construction on the extension will be begun immediately after the granting of the franchise and it is expected that cars will be operating over the new line by March 1.

Santa Barbara, Cal.—R. H. Gaud of the Riviera Company has applied to the California Railroad Commission for permission to transfer to the Santa Barbara & Suburban Railway a franchise on the foothills along the Riviera property.

Kansas City, Mo.—The Kansas City & Tiffany Springs Railway has received a franchise from the County Court to construct its proposed line from Kansas City to Tiffany Springs. [Dec. 25, '15.]

Portland, Ore.—It is reported that the Portland Railway, Light & Power Company has asked the Council for a franchise to operate over the new interstate bridge.

Beaumont, Tex.—The Beaumont Traction Company has asked the Council for a franchise to construct an extension on Doucette Street, eastward from Irving Avenue to the city limits and thence to the Magnolia Refinery, south of the city.

Dallas, Tex.—The Dallas Northwestern Traction Company and the Dallas Southwestern Traction Company have received an extension of time on their franchises until Dec. 31, 1916, in which to begin construction of their proposed lines to Denton on the north and Glen Rose on the south. E. P. Turner, Dallas, president. [Oct. 16, '15.]

Midvale, Utah.—Harry S. Joseph, who proposes to build an electric railway between Bingham Canyon and West Jordan, has received a franchise from the county commissioners to build an extension of the line to Midvale. [Jan. 8, '16.]

Seattle, Wash.—The Puget Sound Traction, Light & Power Company has asked the Council for a franchise permitting the company to abandon its line on Twenty-third Avenue from Louise Street to Jefferson Street.

Morgantown, W. Va.—John Madagan, president of the South Morgantown Traction Company, recently appeared before the Council of Morgantown in relation to an old franchise held by his company. He stated that it is the desire of the company to place its tracks on the South Morgantown Bridge, extend them along Front Street and thence up Walnut Street, completing the loop by a connection with the present terminus on Walnut Street west of High Street.

Waukesha, Wis.—The Milwaukee Electric Railway & Light Company has received a franchise from the Council to erect electric transmission lines through Waukesha.

TRACK AND ROADWAY

Phoenix (Ariz.) Railway.—This company has received an extension of time until Oct. 1, 1917, in which to complete the work of double-tracking its West Washington Street line between Seventh and Seventeenth Avenues.

San Francisco-Oakland Terminal Railways, San Francisco, Cal.—Residents in the district traversed by Cutting Boulevard are considering the construction of a line on that thoroughfare. The plan is to build a line from the main tracks of the San Francisco-Oakland Terminal Railways, crossing the tracks of the Southern Pacific Company by a

viaduct and extending along Cutting Boulevard through the new municipal tunnel to a connection with the municipal wharf. The line would be operated by the San Francisco-Oakland Terminal Railways.

**Tidewater Southern Railway, Stockton, Cal.**—This company has filed a petition asking the Council of Stockton to grant it permission to electrify and operate the Western Pacific Railway Company's line on Hunter Street and Hazleton Avenue.

**Connecticut Company, New Haven, Conn.**—Residents of East Hartford have asked the Connecticut Company to extend its line from the present terminus of the Burnside line through Forbes Street to Silver Street to connect with the tracks on South Main Street, forming a belt between the villages of Burnside and Silver Lane, for which a charter was granted some years ago.

**Pocatello Traction & Interurban Railway, Pocatello, Idaho.**—Final arrangements and settlements for the right-of-way to and through Arbon Valley are being made by this company, and surveys will be made as soon as the weather permits. Plans and specifications will also be made for the 8 miles of railway within the city limits of Pocatello. Bids will soon be advertised for the construction of the first  $3\frac{1}{2}$  miles within the city limits and an extension to the Fales-Houston Packing Company's plant. Clark Gibson, Pocatello, secretary. [Dec. 18, '15.]

**Peoria & Chillicothe Electric Railway, Peoria, Ill.**—The following officers have been elected for this company: A. C. Mitchell, Chillicothe, president; John F. Lynch, Chillicothe, vice-president, and A. C. Black, Peoria, secretary. Charles W. Robinson and A. C. Black were re-elected directors for three years. [Jan. 1, '16.]

**Evansville & New Harmony Traction Company, Evansville, Ind.**—It is reported that construction will be begun next spring on this company's proposed line from Evansville to New Harmony. The line will tap Poseyville, Cynthiana and Owensville. C. J. Seibert, Evansville, general manager. [Sept. 11, '15.]

**Keokuk (Iowa) Electric Railway.**—This company plans to extend its tracks up the hill into the east portion of Warsaw, Ill. Several routes are being considered, the Fourth Street route being favored by the citizens of Warsaw, even if a deep cut is necessary at the top of hill, near Polk Street.

**Boston (Mass.) Elevated Railway.**—Bids will be received until Jan. 31 by Edward Mahler, purchasing agent of the Boston Elevated Railway, for building foundations for Mystic River bridge and viaduct and reconstruction of Malden bridge. The main work consists of building seventeen masonry piers of concrete on pile foundation, faced with granite above low water and thirty-eight small concrete foundations for the viaduct.

**Worcester (Mass.) Consolidated Street Railway.**—Plans are being contemplated by this company for double-track extensions on Pleasant Street from Moreland Street to Mill Street, on Hamilton Street from Grafton Square to Puritan Avenue and on Grafton Street from Rice Square to Turnout No. 43.

**Twin City Rapid Transit Company, Minneapolis, Minn.**—Extensions of two car lines in the western part of the city are asked in ordinances introduced in the Council by Commissioner Keller. One calls for the extension of the Randolph Street line from the present terminus on Snelling Avenue to Montrose Street, and the other for the extension of the St. Clair Street line from the present terminus at Oxford Street to Josephine Street. P. J. Metzendorf, representing the Twin City Rapid Transit Company, told the Council that the extensions would be built if it could be shown the situation demands them.

**\*Morristown, N. J.**—Property owners between Whippany and Caldwell are endeavoring to bring about the electrification of the Morristown & Erie Railroad and through an agreement with the Public Service Railway Company to have through cars run from Newark to Morristown via Montclair, Caldwell and Essex Fells. From Caldwell, the present terminal of the Bloomfield Avenue line of the Public Service Railway, to the eastern terminal of the Morristown & Erie Railroad at Essex Fells three routes are under consideration. The entire distance is about 12 miles.

**New York Municipal Railway Corporation, Brooklyn, N. Y.**—The Public Service Commission for the First District of New York has approved the award by the New York Municipal Railway Corporation of the contract for the construction of the East New York additional tracks and reconstruction of the East New York Yard, to the Crenshaw Engineering & Construction Company, Inc., the lowest bidder, for \$1,237,229.91. The work at East New York includes the alterations and additions to the existing elevated structures, the installation of tracks and special work, the removal and relocation of wires and cables, the construction of three new elevated stations, and the maintenance of existing station facilities during construction. The company provides all the materials for the work, which must be completed within two years from the date of the contract.

**Interborough Rapid Transit Company, New York, N. Y.**—The contract for the construction of the tube connecting Manhattan and Brooklyn in the Fourteenth Street-Eastern District subway has been awarded by the Public Service Commission for the First District of New York to Booth & Flinn, Inc., for \$6,639,023.50. Under the agreement the tunnel will be constructed in twenty-seven months instead of thirty-four months, as was first agreed upon.

**Niagara Gorge Railroad, Niagara Falls, N. Y.**—This company has placed a contract with the General Electric Company for the installation of forty 16-in. projectors with 500-watt General Electric tungsten lamps for illuminating the gorge.

**\*Prattsburg, N. Y.**—Plans are being considered for an electric railway from Prattsburg to Kanona, with possible extensions to Stanley or Branchport. John Kimmel, Wayland, has an option on the Kanona & Prattsburg Railroad, and the Council at a special meeting granted him a franchise to operate such a line and furnish light and power for Prattsburg.

**\*Marion, Ohio.**—It is reported that plans are being considered to build an electric line from Marion to Mount Gilead. George D. Copeland, Marion, is interested.

**Henryetta, Oklahoma & Western Railway, Henryetta, Okla.**—The electrical contractors for this company, which is building a line from Henryetta to Kusa, via Dewar, are A. L. Mitchell Company, 406 Patterson Building, Oklahoma City, Okla. The company plans to build a bridge 400 ft. long. W. T. Croslen, president. [Dec. 18, '15.]

**Guthrie-Edmond Electric Railway, Oklahoma City, Okla.**—Bids will be opened this month by this company for the 16-mile extension of the Oklahoma Electric Railway from Edmond to Guthrie. Guy B. Treat, Oklahoma City, chief engineer. [Jan. 1, '16.]

**Niagara, St. Catharines & Toronto Railway, St. Catharines, Ont.**—The application of this company to the Dominion Parliament for an extension of time to construct a line authorized in 1899 from a point on the Niagara River at or near Fort Erie, and an extension to Toronto via Hamilton will be opposed by the Board of Control.

**Toronto, Niagara & Western Railway, Toronto, Ont.**—The Board of Control has decided to oppose the application of this company to the Dominion Parliament for an extension of time to construct a line authorized in 1914 to extend from Toronto to Hamilton. The company was incorporated in 1903 as the Toronto & Hamilton Railway.

**Lancaster & Berks Electric Railway, Lancaster, Pa.**—Final survey is now being made for this company's proposed railway from Womelsdorf to Kleinfeltersville. The road will be 6 miles long and will connect at Womelsdorf with the Reading Transit Company's line and at Kleinfeltersville with the Ephrata & Lebanon Traction Company. It is expected that it will be completed and ready for operation in the spring. The line will be built by the Philadelphia Construction Company, which is now in the market for 15,000 railroad ties and 1000 35-ft. chestnut poles, to be delivered along the proposed route. [Feb. 6, '15.]

**Nashville & Eastern Electric Railway, Smithville, Tenn.**—Surveys are now being made for this company's proposed line between Lebanon and Smithville, 25 miles. The line will connect with the Nashville, Chattanooga & St. Louis Railway at Lebanon. C. T. Edwards, Smithville, is interested. [Nov. 20, '15.]



**Brownsville (Tex.) Street Railway.**—Operation has been resumed by this company on its 3-mile line in Brownsville, upon which service was suspended last spring.

**Ogden, Logan & Idaho Railway, Ogden, Utah.**—During 1916 this company plans to spend about \$1,000,000 for extensions and improvements to its system. Right-of-way has been purchased for a line from Hot Springs to Brigham City and it is expected that construction will begin soon.

**Salt Lake & Ogden Railway, Salt Lake City, Utah.**—This company plans to double-track its line between Centerville and Wilcox, about 3 miles.

**Norfolk & Western Railway, Norfolk, Va.**—It is reported that this company is considering the electrification of its entire Pocahontas division.

#### SHOPS AND BUILDINGS

**Electric Short Line, Minneapolis, Minn.**—A fire of unknown origin completely destroyed the repair shops, blacksmith shop, oil house, coal dock and chute of the Electric Short Line Railway on Jan. 15. A store room containing a large amount of stock was also a complete loss, as well as one gas-electric motor car, 12,000 gal. of motor spirits and a considerable amount of lubricating oil. The loss is estimated at approximately \$100,000.

**International Railway, Buffalo, N. Y.**—The Broadway car-house of this company caught fire on Jan. 14, in which one car was destroyed with the exception of the motor and trucks, and three others badly scorched. The damage is estimated at \$5,000.

**Ogden, Logan & Idaho Electric Railway, Ogden, Utah.**—The following equipment to be installed at its new shops at Ogden will be purchased by this company within the next thirty or sixty days, for delivery about April: New machine tools, such as 36-in. radial drill, 1½-in. double-head bolt cutter, 24-in. shaper, 24-in. lathe, 14-in. lathe, heavy-duty car-wheel lathe, 36-in. planer, car-wheel boring machine, shears, wood lathe, wood-working machinery, grinders, power-driven hacksaws and all miscellaneous small tools necessary to make the installation complete. All machine tools will be operated by individual motors. The equipment of the shop buildings includes Kinneer steel rolling doors and Kewanee boilers for the heating plant. The three car hoists, which are independently driven by GE-67 railway motors with regular street railway type of controller, are being manufactured locally.

**Salt Lake City, Utah.**—Excavating has been begun by the Salt Lake Terminal Company on the site of the joint terminal station to be erected at the intersection of South Temple and West Temple Streets for the interurban electric lines centering in Salt Lake City.

#### POWER HOUSES AND SUBSTATIONS

**Rochester Railway & Light Company, Rochester, N. Y.**—Plans have been completed by this company for the erection of a new substation between Atlantic Avenue and Leighton Avenue, near the Culver Road. The station will be equipped with two 1400-hp. rotary converters to supply energy for the railway system and 7500 kva. in stationary transformers to furnish electricity for lamps and motors. New equipment, including a 3000-hp. rotary converter, will be installed at No. 6 substation on South Water Street and a 2000-hp. rotary converter in No. 5 substation.

**Southeastern Ohio Railway, Zanesville, Ohio.**—This company, which has been organized to take over the property of the Southeastern Ohio Railway, Light & Power Company, is considering the construction of an additional power plant.

**Montreal Tramways & Power Company, Montreal, Que.**—A decision has been made by the Montreal Tramways & Power Company to increase its Notre Dame steam generating plant from 10,000 hp. to 50,000 hp. The first new unit of 17,000 hp. will be installed at once. The total expenditure to be made on the plant will be between \$2,000,000 and \$3,000,000. The Montreal Public Service Corporation, a subsidiary of the Montreal Tramways & Power Company, is also having plans prepared for a steam generating station of an ultimate capacity of 60,000 hp., the first unit of 15,000 hp. to be installed as soon as possible, and the remaining units as rapidly as called for by the demand for power.

## Manufactures and Supplies

#### ROLLING STOCK

**Seattle (Wash.) Municipal Railway** expects to purchase two flat cars during 1916.

**New York State Railways, Rochester, N. Y.,** have sent out inquiries for forty new cars.

**West Penn Traction Company, Pittsburgh, Pa.,** is in the market for thirteen double-truck cars.

**Morris County Traction Company, Morristown, N. J.,** is considering the purchase of five new cars.

**Electric Short Line, Minneapolis, Minn.,** in a fire on Jan. 15, which destroyed its repair shops, lost a gas-electric car.

**Scranton & Binghamton Railroad, Scranton, Pa.,** expects to purchase during 1916 three milk and express cars, one work car and three closed passenger motor cars.

**Northern Ohio Traction & Light Company, Akron, Ohio,** has ordered ten 53-ft. all-steel interurban cars from the Jewett Car Company, and fifteen 50-ft. semi-steel city cars from the St. Louis Car Company.

**New York Municipal Railway Corporation, Brooklyn, N. Y.,** has ordered 200 additional subway cars from the American Car & Foundry Company. This order was announced in the general news department of last week's issue.

**Chautauqua Traction Company, Jamestown, N. Y.,** has ordered four 62-ft. center-entrance type, all-steel interurban cars from the St. Louis (Mo.) Car Company. Three of these will be combination passenger and smoking compartment cars and the fourth will be arranged with an observation end. This order was placed through the Wendell & MacDuffie Company, New York.

**Salt Lake & Ogden Railway, Ogden, Utah,** noted in the *ELECTRIC RAILWAY JOURNAL* of Dec. 18, 1915, as having ordered six open steel trail cars from the Jewett Car Company, has specified the following dimensions for these cars: length over all, 61 ft. 6¾ in.; length over body corner posts, 50 ft. 4¾ in.; length between bolster centers, 39 ft. 2 in.; width over all, 9 ft. 6 in. These cars are of the one-compartment, passenger type, for trailer excursion service, and will run at a maximum speed of about 60 m.p.h. The general design of these cars is similar to that of the motor cars previously ordered. The underframe is all-steel. The posts are of composite construction, with T-irons and wood fillers. The letterboards will be of steel. The roof is wood, covered with canvas. The floor is of wood, double thickness. Seats are to be Hale & Kilburn walkover with steel oval pedestal base. Curtains are to be made of B. B. striped duck, as manufactured by the Curtain Supply Company. Vestibules will be arranged for through passage for train operation, with swinging door in the center at each end. Wired screens will be installed on each side of the car to protect passengers. Each end will have a Janney radial M. C. B. coupler. Each end of the car is also fitted with a cast-steel spring buffer.

#### TRADE NOTES

**Terry Steam Turbine Company, Hartford, Conn.,** has appointed Maynard D. Church as chief engineer.

**General Railway Signal Company Rochester, N. Y.,** has appointed W. S. Henry as acting resident manager of the company's New York office.

**Woodmansee & Davidson, Chicago, Ill.,** consulting engineers, have changed their address from 1048 First National Bank Building to 784 Continental and Commercial Bank Building.

**Buda Company, Chicago, Ill.,** has appointed R. B. Fisher, chief engineer, also to the position of sales manager of the frog and switch department, succeeding H. S. Evans, resigned.

**Western Electric Company, New York City,** has received orders to equip with standard train dispatching telephonic equipment the stations on five of the large Eastern divisions of the Pennsylvania Railroad.

**Morgan Crucible Company, Ltd., New York City,** announces the appointment of Harry De Steese to its staff as sales engineer. Mr. De Steese has for twenty years been identified with the electric railway and lighting fields.

**Curtain Supply Company, Chicago, Ill.,** has received an order to equip with its Ring No. 88 fixtures and Rex rollers the twenty-five trail cars which were recently ordered by the Long Island Railroad from the Standard Steel Car Company.

**American Car & Foundry Company, Chicago, Ill.,** will appoint James M. Buick, second vice-president, as first vice-president of the company, succeeding Edward S. Carry, recently resigned. Herbert W. Wolff, assistant to Mr. Buick, has been made vice-president in charge of the Chicago sales department.

**Duntley Products Sales Company, Chicago, Ill.,** has organized with headquarters in the Fisher Building. The company will manufacture and sell the Duntley electric cleaners and sweepers, paying particular attention to the apparatus for cleaning and disinfecting passenger coaches. The following are officers of the company: Vice-president, Crawford A. Duntley; secretary-treasurer, William W. Bishop; sales manager, Reuben C. Hallett; manager of the railroad department, W. S. Caspers.

**Hywatt Battery & Electric Company, Cleveland, Ohio,** is putting on the market a flat cell type of storage battery which has the following unusual features: the battery consists of two to eight cells, inclusive. The two-cell battery measures 4½ in. x 6½ in. x 2½ in. The eight-cell battery has the same face measurements, but is 8½ in. in length. There are only two binding posts, irrespective of the number of cells. Each cell has a capacity of 60 amp. as against 30 amp. of the round-cell type at 1½ volts. The batteries are said to be absolutely waterproof, tests having been made during which the batteries were for days totally submerged in water, and were not damaged in the least.

**Standard Underground Cable Company, Pittsburgh, Pa.,** announces the following promotions and rearrangements in its general office and factory staffs: In the general offices P. H. W. Smith, formerly vice-president, with duties of general sales manager, becomes vice-president and assistant general manager under President and General Manager J. W. Marsh, and as such will have general supervision of manufacturing and sales activities of the company. His headquarters will be in Pittsburgh, as formerly. Mr. Smith has been connected with the company since 1893. Charles W. Davis, formerly manager of the central sales department, general superintendent of construction and manager of the accessories department, becomes vice-president and general sales manager. Mr. Davis' connection with the company dates from 1900. Arthur A. Anderson, also for many years connected with the company's sales organization at Pittsburgh, has been made manager of the central sales department in the Pittsburgh district. A. F. Hovey has been made manager of the construction department and J. H. Lytle, manager of the accessories department. In the factory organization C. C. Baldwin, formerly superintendent of the wire and rod mill and weatherproof and magnet wire departments, and of the brass and tubing departments at Perth Amboy, N. J., has been made a vice-president of the company and general manager of the Perth Amboy plant. H. W. Fisher continues as chief electrical engineer and now becomes, in addition, manager of the lead cable works and rubber wire and cable factories, under the assistant general manager and president; he is also made an officer of the company by virtue of his appointment as assistant secretary, but will be located at Perth Amboy, as heretofore. Other advancements at the Perth Amboy plant are: Tracy D. Waring, to be assistant manager of the lead cable works and of the rubber wire factory; Albert C. Meyers, to be superintendent of the rubber wire factory, and E. J. Waring, to be assistant purchasing agent, in addition to his former duties as business manager at the plant. At the Pittsburgh factory Charles Barbour is given the title of manager of the factory and also of the plant of the Standard Underground Cable Company of Canada, Ltd., at Hamilton, Ont., the duties of which positions he has performed for some time. At the Oakland, Cal., factory, H. H. Gribbon continues as superintendent. The above changes,

in practically all cases, are enlargements of previous duties, resulting from the death on Dec. 6, 1915, of W. A. Conner, late vice-president, in charge of the company's manufacturing activities.

#### ADVERTISING LITERATURE

**Joseph Dixon Crucible Company, Jersey City, N. J.,** has issued a bulletin describing its various graphite products, including flake graphite, heavy graphite machine grease, waterproof graphite grease, graphite cup grease, boiler graphite, pipe joint compounds, solid belt dressing, axle grease and silica-graphite paint.

**Westinghouse, Church, Kerr & Company, New York City,** have issued an artistically designed folder announcing their service as specialists in concrete construction. As this company also specializes in consulting engineering, electrical engineering, hydraulic engineering, railroad engineering, factory designs and every form of construction in addition to concrete, its single organization with one responsibility enables it to offer at once all of the services which may be involved in a building enterprise.

**Ohmer Fare Register Company, Dayton, Ohio,** has issued a bulletin entitled "Better Business and Better Methods." The bulletin states that seventy companies whose contracts for Ohmer service expired during 1915 have renewed those contracts for another term of years. The bulletin also contains a special announcement of its new No. 49 type register, which is similar to its No. 39 type, and which is adapted to city service, except that it has a much greater capacity and is designed to meet the requirements of interurban lines where a large number of different denominations of cash and ticket amounts must be considered.

**C. A. Wood-Preserver Company, Inc., St. Louis, Mo.,** has issued a catalog entitled "Conservation by Preservation" which deals with its high boiling wood-preserver oil for treating transmission poles, cross-arms, ties and wood-block floors of carhouses. The catalog contains directions for applying the preservative and shows instances of successful treatment with this material by the Asheville (N. C.) Street Railway, Los Angeles (Cal.) Railway Corporation, Ohio Electric Railway, Galveston (Tex.) Electric Company, Minneapolis (Minn.) Street Railway, Greenville (S. C.) Traction Company and Denver (Col.) City Tramway. The catalog also contains a reprint from the *ELECTRIC RAILWAY JOURNAL* of Oct. 23, 1915, of a report presented at the St. Louis meeting of the American Institute of Electrical Engineers in which it was pointed out that no appreciable loss by evaporation occurred in a case of poles treated with oil distilling above 250 deg.

#### NEW PUBLICATION

**Official Index to State Legislation.** Law Reporting Company, New York. Buckram.

This 1915 index furnishes a ready reference to all State legislation. The arrangement is (a) by subjects, alphabetically; (b) under each subject, by States, alphabetically; (c) under each State, the Senate first and then the Assembly or House; and (d) under each house, the bills first and then the resolutions, numerically, by introduction numbers. The entry for each bill and resolution gives, (1) the bill number, (2) the date of introduction, (3) the name of the member introducing the bill, (4) the subject, (5) the effect of the proposed legislation or the "short title" of the bill, and (6) the position or status of the bill, on the date shown at the head of the column.

In 1916, until June 1, the index will be cumulated and published weekly, and each new issue will contain everything that previous issues have contained, with changes in position of bills and new bills introduced subsequent to the previous issue. Weekly supplements will be issued from June 1 until the publication of the complete annual number, about Aug. 1, in which will be shown the status of bills when the legislatures adjourned. After the issue of the complete annual number, weekly cumulative supplements will be issued when any legislature is in regular or special session.

The subscription to all the weekly numbers and the annual number and supplements, for 1916, will be \$100, and subscribers for 1916 will be furnished the final 1915 number for \$10 additional.