Electric Railway Journal

DAILY EDITION

Published at the Annual Conventions of the American Street & Interurban Railway Association and Its Affiliated Associations

VOL. XXXII NEW YORK—OCTOBER 14, 1908.—ATLANTIC CITY No. 15B

PUBLISHED DAILY BY THE

McGraw Publishing Company

James H. McGraw, President. J. M. Wakeman, 1st Vice-president.
A. E. Clifford, 2d Vice-president. C. E. Whittlesey, Sec. and Treas.

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NEW YORK, 239 WEST THIRTY-NINTH STREET.
ATLANTIC CITY, MILLION-DOLLAR PIER.

CHICAGO: Old Colony Building.
PHILADELPHIA: Real Estate Trust Building.
CLEVELAND: Schofield Building.
LONDON: Hastings House, Norfolk St., Strand.

Cable Address, Stryjourn, New York; Stryjourn, London—Lieber's Code.
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TERMS OF SUBSCRIPTION

Subscription including regular weekly issues and special daily editions published from time to time in New York City or elsewhere, postage prepaid:

United States, Hawaii, Porto Rico, Philippines, Cuba, Mexico and Canal Zone	$3.00 a year
Canada	4.50 a year
To all Countries other than those mentioned above	6.00 a year
Single Copies	.10 each

Application made at the Post Office at New York for entry as mail matter of the second class.

Of this issue of the ELECTRIC RAILWAY JOURNAL, DAILY EDITION, 12,500 *copies are printed.*

Perfecting the Service

Attendance for even a half hour at the meetings of the new Transportation & Traffic Association will show that the work of this organization has been carried out with system and effectiveness during the period of less than eight months' since the organization meeting took place in New York City. The time for organizing the association was well chosen. The election of Mr. Allen as president and of other live men for the other offices and memberships on the executive committee seemed to promise that valuable work would be done. That the program has been arranged so satisfactorily and the discussions planned so as to bring out vital suggestions might, perhaps, have been anticipated, but could not be fully appreciated until the actual meetings took place. Mr. Allen pointed out in his address as president on Monday that the committees which have been formed will have work before them that will "perfect the street railway service for its patrons." This is an auspicious time for the enunciation anew of such a doctrine, and the Transportation & Traffic Association can do no better than to endeavor through its committees to carry out the idea on this subject happily expressed by Mr. Allen.

The Question of Increased Fares

It is not only significant of appreciation of the situation, but it is extremely fortunate for the street railway industry that the question of fares was brought forward with such prominent emphasis during the first day of the proceedings. It may be said that this problem is one for action by the American association because it is a topic of executive policy. While such a claim, if made, would be perfectly just, it is nevertheless true that the topic is one which is increasing so much in importance that the facts respecting it should be placed before every affiliated and allied association. This subject concerns every delegate of each company represented at these meetings. While it is not a topic regarding which all would be expected to take some action, it is nevertheless one which affects all. Fares in general are not now adequate to meet all the expenses of operation, including perfect maintenance, and a satisfactory return on the capital invested. Fares on many roads should be raised. While advances have been possible in certain localities they are just as necessary in other districts where commissions and the public have not yet learned to respect thoroughly the rights of property. It is advisable that there should be full discussion on this topic at the meetings this week.

Training Transportation Employees

It is a happy coincidence that the topics considered in the report of the Committee on Training of Transportation Employees of the Transportation & Traffic Association and those taken up in Chapter I of this year's Convention Souvenir Issue of the ELECTRIC RAILWAY JOURNAL should be almost identical in scope, although differing somewhat in treatment. The committee classifies and tabulates the replies received from 187 roads to the 31 questions contained in its circular of inquiry and presents for the consideration of the association its conclusions as to best practice. In some cases the committee differs from the consensus of opinion of the roads replying, but without going into any extended discussion of the topic. Its conclusions, in the main, will appeal to operating officers as sound, although it may be difficult to convince some dissenters that the recommended practice is better than their own.

In the matter of adherence to the standard code of rules of the American Street & Interurban Railway Association, the replies indicate that these rules do not as a whole appeal to most roads, as less than 25 per cent of the companies replying state that they use this code. Possibly the revised code of rules to be presented at Wednesday's session may be more satisfactory, but it is doubtful whether any so-called standard code will ever meet with the unequivocal approval of enough roads to accomplish the desired end. In one of the conclusions of the Committee on Training of Transportation Employees relating to preference for experienced or inexperienced trainmen occurs a reference to this desideratum. The committee recommends that men with previous experience be employed, provided that such experience was in the same class of service as that applied for and that the previous record is entirely satisfactory, especially after a uniform set of rules has been adopted.

The replies to the question "What form of discipline do you recommend?" do not indicate that cumulative efficiency and deficiency systems of discipline have yet been put into

extended use. Only 26 companies of 141 replying, favor any modification of the so-called Brown system, which was the predecessor of all others similar to it. In spite of this preponderance of opinion favoring the old method of discipline by reprimand, suspension and discharge, the committee in strong terms recommends the merit and demerit system as being the best form of administering discipline. Such a recommendation carries especial weight in view of the fact that at least two members of the committee have had practical experience with the system.

An Accountants' Exhibit

Besides the display on the pier in which the members of the Accountants' Association will be interested, that organization has an exhibit of its own in the headquarters at the Hotel Chalfonte which will prove to be of great interest. For the collection of blanks and forms prepared for this Association in 1904, which has attracted much attention at the meetings, an entirely new collection has been substituted and will be found to be a great improvement over the assortment presented in other years. New developments in the railways and additional accounting requirements compel revision and improvement of existing forms; and in progressive companies new ideas which will facilitate the work of the accounting department, or increase its efficiency, are sought constantly. The collection which is offered for inspection this year was contributed by about 20 per cent more companies than were represented in the 1904 exhibit, and the number of forms is approximately that percentage greater. In the effort to make the collection as valuable as possible, duplications were eliminated. The collection includes many features which concern the transportation and traffic departments and members of the Association which has been formed especially for those connected with these divisions of railway work will find enough of value in the Accountants' collection to make a visit well worth while. If the Accountants' Association can make provision for the time, expense and labor involved, it would be an excellent idea to arrange for more frequent revision of the forms than has been possible heretofore in order that improvements made by the various companies may be presented for inspection within a reasonable period after adoption.

Remuneration for Carrying Mail

The paper by C. H. Hile on carrying mail by street railway companies, which is printed in another column, presents some strong arguments for increasing the present rates of compensation allowed by the Government for this service. The Boston Elevated Railway Company operates 12 postal cars on its system for which it receives 15.9 cents per car mile. Its average operating expenses for cars in all classes of service are 18.6 cents and in addition its other charges against income are 6.8 cents per car mile. While it may be true that the expense of operating a light 16-ft. mail car is less than the average expense for all cars, it is obvious that a remuneration of less than 16 cents leaves no margin of profit. A company which carries mail is afforded some degree of protection against interruption of service during strikes or riots by reason of the Government's stern repressive measures when interference with the carrying of mail is threatened, but the remote value of this protection is not sufficient to justify any company in conducting the service at an actual loss. It is within the rights of a street railway company to refuse to inaugurate mail car service, or to extend such service if already in effect, if the rate of pay fixed by the Government is unsatisfactory. The fixing of fair compensation, however, based on the actual cost of the service if not on the value of it to the Government, ought to be the aim of concerted action on the part of all companies now operating or contemplating such service, since individual negotiations for higher rates or ultimatums of discontinuance of service have little effect on the Government in matters of this kind. Convincing the Post Office Department of the unfairness of the present rates of compensation for carrying mail on street cars can only be accomplished with persistent argument on the lines of Mr. Hile's paper.

First Meeting of the Engineering Association

Contrary to custom, the Engineering Association did not hold the first meeting of the convention this year. To make up for this its session on Friday afternoon will be the last of any of the associations and will close the 1908 convention. Delegates to the Engineering Association have been arriving at Atlantic City in increasing numbers and yesterday afternoon the meetings began with a large attendance from member companies. President Simmons, in his annual address, referred at length to the work of the committees and touched briefly upon the proposed changes in the constitution which had been proposed in a circular letter sent to all company members of the association. He also called attention to the fact that the greater part of the topics to be considered at the present meeting represented the work of committees.

Executive Committee Report of Engineering Association

The report of the Executive Committee of the Engineering Association outlines an important change in regard to the method of appointing standing committees. In all committee work there is a recognized value which comes from familiarity with the work of a previous committee on the same subject; hence the plan to appoint members for three years in most of the committees with terms so arranged that the terms of only one-third of the members of each committee will expire each year. The scheme comprises in all five committees which will take up standards, way, equipment, power generation and power distribution. Of these the Committee on Standards will be the largest and will consist of nine members, of which four will be the chairmen of the other committees. Such a plan should add very much to the efficiency of the committees.

Report of Maintenance and Inspection

The report of the committee on maintenance and inspection of electrical equipment, which was presented at the meeting of the Engineering Association yesterday, is the most voluminous of any of the papers or reports this year, but at the same time is most valuable for the information which it contains. The report, in fact, has such a wealth of statistics and other facts as to make it, in the matters upon which it treats, a compendium of electric railway present practice. The subjects to which the committee gives most of its attention are those connected with the motor, but other parts of the car equipment are not neglected, and the specifications contained in the report and the figures of the percentages of roads following different lines of practice are very instructive. The report concludes with practical rules for the inspection of electrical equipment and descriptions of various devices which have proven useful in maintaining equipment.

Conventionalities

Paul Winsor, chief engineer of motive power and rolling stock of the Boston Elevated Railway Company, was one of the early arrivals.

Dearborn Park is likely to become the favorite lounging spot of the young folks. Its green lawns, flower beds and romantic setting throw an air of charm over the whole utilitarian environment.

Have you seen Elmer P. Morris's happy family, fresh from social triumphs at Schenectady? Let that other Morris of vaudeville fame look to his laurels! There is a wild rumor afloat that Elmer is about to organize Eden Musee wax works for trolley parks.

A novel variation to the souvenir idea has been given by the National Vacuum and Cleaner Company, of Dayton, Ohio, which permits every caller at its booth, No. 878, to take a chance on a very handsome pearl and diamond stick pin. The registration can be effected at the booth through Mr. Green.

"The bar and its moaning," referred to by a famous poet, has recently been identified as descriptive of more than one locality in Atlantic City. According to the local reformers, there was only one bar wide open on Sunday—that at the Inlet. But appearances are sometimes deceptive.

Albany and environs are properly advertised by Edgar S. Fassett, general manager, and H. A. Benedict, electrical engineer of the United Traction Company, together with John G. Phillips, assistant general manager of the Hudson Valley Railway. Mrs. Fassett is a member of the Fort Orange party.

The first ex-president of the American Street & Interurban Railway Association to arrive was John I. Beggs, president of the Milwaukee Electric Railway & Light Company, who reached Atlantic City Sunday evening. Mr. Beggs was accompanied by Charles F. Pfister, of Milwaukee, one of the directors of the Milwaukee Electric Railway & Light Company, and by General Otto H. Falk.

The youngest street railway association in the country, that of Arkansas, is represented at the convention by its president, D. A. Hegarty, general manager of the Little Rock Railway & Electric Company. The Street Railway Association of the State of New York, one of the oldest street railway associations in the country, has also a representative present at Atlantic City in the person of its president, Edgar S. Fassett, general manager of the United Traction Company, Albany, N. Y. Both Mr. Hegarty and Mr. Fassett are accompanied by their wives.

An afternoon has been arranged for the ladies by the Entertainment Committee at the Country Club of Atlantic City, for Wednesday. Sight-seeing automobiles have been provided, leaving the Marlborough-Blenheim at 2 o'clock, calling en route at the Chalfonte. If necessary special trolley cars in addition will leave from the boardwalk and Virginia avenue at 2.30. The official badge secures recognition and entree to this pretty club and grounds, which are well worth the visit, and show the rural side of this neck of sand. The entertainment includes a ladies' clock golf contest, with prizes, tennis, afternoon tea, and Neapolitan musicians, one of whom is said to be a tenor of Caruso-quality. In addition, if any should wish to play regular golf some clubs can be had from the steward, and the course awaits, over 6,000 yards long, with few hills, but plenty of bunkers and hazards. Should there be rain, which seems unlikely, the musical recital by Miss Amy Grant, planned for Thursday afternoon, will be substituted, and the visit to the club will take place on Thursday instead. Everything bids fair for a charming autumnal afternoon on the links.

Secretary Swenson has a fastidious taste in printing and inks, and has thus been the cause of a little harmless perplexity on the part of serious-minded delegates seeking the official program. Some of the copies of the program have the A. S. I. R. A. badge on the cover in full blue and gold. These were not quite satisfactory to the professor, so he had the others done with the badge skeletonized in blue ink. Both styles are quite effective, and the delegate is contented with one until he sees the other—and then he investigates, going through page after page to discover different matter. One result is that the program has been as closely studied as though it were the medium for a missing word contest with prizes.

W. E. Harrington, formerly president of the Pottsville Union Traction Company, and previously general manager of the Camden Suburban Railway Company, is attending this convention in the interests of the Schuylkill & Dauphin Traction Company, of Pottsville, of which he is general manager. Since securing control of this property, which he has done during the last year, Mr. Harrington has greatly improved the service and is planning some very important extensions. During his work in securing right of way and in convincing the residents of the towns on the route that the construction of a trolley system would add to their welfare, Mr. Harrington has had to address various meetings in Pennsylvania Dutch. Two of the directors of the company, Charles G. Shadel and Preston J. Artz, arrived in Atlantic City yesterday.

With the smooth seas that are likely to continue during the week yachting will be an added pleasure for leisure moments. The Ohio Brass Company has provided this typical diversion of the Jersey coast for visiting delegates. It has chartered the two largest and fastest yachts of this vicinity, and will have "personally conducted" sailing parties on Tuesday, Wednesday, Thursday and Friday. The yachts are "well found" in every respect, and ideal as to comfort and safety. They will be sailed by their experienced captains and owners. The parties will leave the Inlet Pier at 2.30 p. m. each day. The pier can be reached by taking any car on Atlantic avenue—two squares west of the boardwalk—cars being marked "Inlet" and stopping at the pier. Any Ohio Brass representative will be glad to give further particulars.

A delegation of generous numbers has descended upon the scene from the fastnesses of the Mohawk Valley, in charge of C. Loomis Allen. Most of them are so capable that they fill several jobs at once, as will be seen from the following list. For the Utica & Mohawk Valley, Oneida Railway & Syracuse Rapid Transit Company: C. Loomis Allen, vice-president and general manager; R. B. Hamilton, secretary to Mr. Allen; W. J. Harvie, chief engineer; Albert Eastman, general passenger and express agent; B. A. Frankel, chief of treasury department. For the Utica & Mohawk and Oneida Railways: R. E. McDougall, claim agent; H. S. Williams, electrical engineer; M. J. French, engineer maintenance of way. For the Utica & Mohawk Valley: J. M. Joel, auditor, and F. J. Gerdon, superintendent of transportation. For the Oneida Railway: E. J. Wright, superintendent. For the Syracuse Rapid Transit Company: J. E. Duffy, superintendent; P. J. Honald,

purchasing agent; Dr. F. J. Ryan, claim agent; F. M. DuBois, master mechanic, and E. P. Roundey, engineer maintenance of way. Messrs. Allen, McDougall, Honald, Duffy, Ryan, DuBois, Joel and Harvie are accompanied by their wives. The entire party is stopping at the Traymore.

The first list of names of those in attendance issued Tuesday morning included no fewer than 400 ladies, whose graceful presence and active participation in many of the social events is keenly appreciated by the entire convention. What would the day be without its sunshine?

The Roller Chair Sub-Committee of the Manufacturers' Entertainment Committee has been renamed the "Transportation and Traffic Committee." Its duties are certainly onerous enough to bring it within the scope of a Public Service Commission, for it has from 75 to 100 cars in continuous operation all the time.

Several representatives of the manufacturers who came to Atlantic City last week to get their exhibits in shape say that they went in bathing on Sunday and that the water was delightful. To those who have been at Atlantic City during the present cool weather only ocean bathing has hardly seemed enticing, but it should be remembered that Atlantic City was very "dry" on Sunday.

No self-respecting entertainment to-day is complete without a Salome Dance. Popular conversation since the summer has been 50 per cent Salome, and 50 per cent something else. At enormous expense the entertainment committee has staged a marvelously beautiful Salome Dance for the amateur vaudeville on Wednesday night. Don't fail to see it! You owe it to your own sense of the æsthetic.

The weather holds fine with a crisp autumn tang in the air that helps greatly in promoting the general cheerfulness and good nature. The atmosphere of the Billion Dollar Pier in the early and late hours of the day is a bit chilly, but the hopes of the trolley supply men who proposed to show their sleet cutters in actual operation have all been disappointed. Nor are the snow sweepers called for, except to remove traces of the confetti used so freely in the Monday Carnival.

The study of modern financial problems is attended with the incessant use of such phrases as "the circulating medium," the "endless chain," etc. It is difficult to form a physical conception of the processes indicated until you watch Messrs. Birdsall and Butler turning over their money faster than any other two men in all Atlantic City—hotel proprietors not excepted. Since Sunday they are said to have handled enough money to pay for the Billion Dollar Pier several times over—and there is the tally to show for it.

A thrill of pleasurable excitement went through the whole big gathering along the shore when the news was noted in the papers that E. H. Harriman had pledged $14,000,000 for the suburban electrification of the Erie, from the Hudson to Suffern. As one of the exhibitors with English antecedents remarked, "That is just what we're suffer'n for; a few orders that size will help business considerably." Electrification is about the last thing that could happen to the Erie—and therefore it may be expected.

A well-known Southern railway man celebrated his birthday on Monday, and received from home a beautiful gold-mounted meerschaum pipe. The incident is unique, souvenirs always being sent away from Atlantic City—never to it. The Boardwalk storekeepers have, however, kindly consented to overlook this incident on the promise that it shall not occur again. The delegate has used the pipe as means for an amusing hoax, showing it to several intimate friends as the special souvenir from a leading exhibitor, and suggesting a very early application. To this exhibitor "very early application" has been made, and he is still puzzling over the origin of the "pipe dream" narrated to him.

It is a rather curious and interesting fact that the only cast iron wheel exhibit is from the South, and from works the third largest of the kind in the world. These wheels, produced in normal good times at the rate of 1,300 daily, have gone all over the world. Yet how few of us, even in the street railway industry, realize the extent of these vast Southern resources and potentialities! Sterling G. Turner, manager of the Atlanta Car Wheel & Manufacturing Company, was at one time in the banking business, and now is an enthusiastic authority on Southern iron and metal making. Capital is still needed by the progressive South, but Mr. Turner states that all the investment in the Atlanta car enterprise is local.

Being believers in thorough publicity, the officials and members of the executive committee of the Transportation & Traffic Association have made special efforts to impress all the delegates to that association with the importance of attending the meetings. A timetable was arranged on Monday allotting to A. W. Warnock, H. C. Page, George L. Radcliffe and N. W. Bolen certain hours in which to sit in the office of Secretary Swenson and call the attention of delegates as they registered to the opening meeting in the afternoon of that day. In order to make this plan of campaign effective, the four exponents of transportation and traffic named took upon themselves personally the duty of receiving the registration cards of delegates and giving out the badges. This plan of campaign proved effective. If you don't believe it, ask Messrs. Page, Radcliffe, Bolen and Warnock.

The St. Louis main contingent came in on Sunday evening by a special train, the arrangements for which were all very effectively carried out from start to finish by Arthur S. Partridge, master of transportation. It was a notable crowd that came along, including from the United Railway Company, John I. Beggs, president; M. O'Brien, master mechanic; E. D. Smith, superintendent power plants; Bruce Cameron, superintendent of transportation; H. P. Taylor, acting auditor; Chas. B. Hardin, claim agent; J. Crafton, assistant superintendent; J. Burgess, superintendent of wire. There were also Chas. E. Hewitt, general manager of the East St. Louis & Suburban Railway; H. F. Merkers, engineer maintenance of way; M. Lloyd, master mechanic; Chas. Macey, manager East St. Louis & Alton Traction Company; S. W. Gunsalus, superintendent transportation for the Western Missouri Railroad, Webb City, Mo.; A. Classen, president Oklahoma City Railway Company; C. H. Bosler, president Enid City Railway Company, Enid, Okla.; Geo. D. Rosenthal, agent General Electric Company, St. Louis; Harold R. Wilson, manager electrical department; Arthur S. Partridge, St. Louis; H. P. Hubbell, agent Cambria Steel Company, St. Louis; J. C. Crawford, More-Jones Brass & Metal Company, St. Louis; E. L. Adrian, Westinghouse Air Brake Company. The party was accompanied by Mesdames Burgess, Classen, Hubbell, Hewitt and Rosenthal. At Philadelphia a large Westinghouse contingent joined for the remainder of the journey.

THE DICTIONARY OF ELECTRIC RAILWAY MATERIAL

The fourth edition of the Dictionary of Electric Railway Material has just been issued from the press of the McGraw Publishing Company and a copy is being mailed to every subscriber to this paper. The pamphlet is larger than in former years and contains 184 pages of definitions of electrical supplies, which are classified under a large number of headings. In each case, the name of the manufacturer of the apparatus mentioned is given. The dictionary also contains an alphabetical list of the manufacturers mentioned and an index of the pages upon which their apparatus is described. By means of this list it is possible for a user of the dictionary to learn readily just what types of electric railway material are manufactured or handled by any concern with which he may contemplate doing business.

EXPERIMENTS WITH COAL

A bulletin prepared by S. W. Parr and C. K. Francis, of the Engineering Experimeut Station of the University of Illinois, descriptive of tests conducted by them to produce a fuel essentially smokeless, has just been issued by the University. The original impetus to the experiments was given by the anthracite strike of 1902, efforts then being made to produce artificially, from Illinois coals, material which would be sufficiently anthracitic in character to supply the demand for that type of fuel. Certain unexpected results were obtaiued in connection with the temperatures at which the oxidation of coal may be effected, and a large part of this work, therefore, is a description of this phase of the subject. The striking interest in these experiments resides iu the fact that the temperatures for rapid oxidation, especially with finely divided coal, are sufficiently low to bring this material within the range of conditions which are frequently met in storage. These results, therefore, have a direct bearing upon the weathering of coal, its spontaneous combustion, and probably, also, to a certain extent, upon the problems involved in mine explosions. Concerning the production of a smokeless fuel from bituminous coals, high in volatile matter, the results are as yet incomplete. At a temperature not exceeding 400 deg. C., a sufficient amount of hydro-carbons may be driven off to leave a substance closely resembling in composition the coals of the Pocahontas type. This material is exceedingly friable, and would need to be subjected to a process of briquetting. It has some of the characteristics of coke, but burns readily, and is especially well adapted for domestic use, being clean and smokeless. The commercial possibilities for the production of a smokeless fuel of this type have not been taken up, since the present work deals only with the scientific principles involved. Copies of the bulletin may be obtained free upon application to the director, Engineering Experiment Station, Urbana, Illinois.

In an article contributed to the October "Stone & Webster Public Service Journal," L. H. Parker presents some comparisons as to investment and operating cost of 50 semi-convertible cars versus a combination of 50 open and 72 closed cars for the same traffic. He concludes that the difference in the cost of power, wages, maintenance, depreciation and fixed charges is $25,173 in favor of the mixed equipment.

ELECTRIC TRAIN LIGHTING

According to the "Electrical Engineer" the London and North-Western Railway has been conducting some experiments with regard to the electric lighting of trains. In the case of five trains (amounting to twenty coaches with 480 cells) which run between Euston and Wolverhampton on day and night services, and on which the coaches are always lighted owing to several tunnels, not one cell had to be removed from the batteries during the twelve months that the cells were in use. Stone's system was in use. Lead-armoured cable is generally used for all the underneath and roof work. The mains on the roof are usually outside all covering, and tappings made to the compartments through junction boxes, which are filled in with bitumen. The lamps are fixed singly iu the roof in different positions, or else in brackets at the back of the seats, so as to get maximum light to the part where the traveler sits. Carbon-filament lamps have been used of 8 candle-power, 10 candle-power, and 12 candle-power. These are of special strength, and little trouble is caused by broken filaments. Recently Osram lamps have been introduced for the purpose with marked success. For dining, sleeping and other special saloons, distributing switchboards are used, giving control over the various compartments. On "corridor" coaches switches are fixed in the end of the coach, which can be operated inside the corridor by a train attendant when traveling, or from outside by the station staff. A "non-corridor" vehicle is fitted with a switch at the end of the coach, which is operated with a bar from either side of the vehicle, similar to the method of turuing "on" and "off" gascocks. When the storage cells of a railway coach electric lightning plant fail, their chief defects are found to be: short-circuiting of plates, due to pieces of paste falling away; abnormally sulphated, caused by over-discharging and buckled plates from overcharging; and leakage to the lead lining of the cases.

THROUGH CARS IN GREAT BRITAIN

The question of through operation of cars is receiving the attention of the British municipal managers and one of the papers at the meeting last month of the Municipal Tramways Association of Great Britain was on this topic. Mr. Blain, the author, quoted the terms of various municipal contracts of this kind. One method employed is that of actually leasing one line to the other. The rental paid is sometimes on the car-mile basis, sometimes on the mile of track basis, sometimes on the plan of paying all of the receipts to the lessor, who rebates a percentage to the lessee to cover expenses; sometimes by the lessee keeping the receipts but paying interest on the cost of the construction, and sometimes the rental agreed upon to a percentage of the receipts of the leased lines. Where rentals are paid the systems are usually very unequal in size. In the case of two operating systems it is a common practice for each municipality to run through cars, which thus use the tracks in both cities. In such instances the receipts may be divided on the car-mile basis, or each city retains all of the receipts taken on its cars. The speaker suggested various points to consider in drawing up a contract of this kind, such as the responsibility for accidents caused by a car when it is not on its own line, conditions under which repairs should be made to a disabled car when on the foreign line, consideration of the possibility of a change in local fares, and the procedure to be followed in case of a strike on one of the lines.

TRANSPORTATION & TRAFFIC ASSOCIATION—TUESDAY MORNING SESSION

The meeting of the Transportation & Traffic Association was called to order at 9.30 a. m. on Tuesday by President Allen.

The report of the Committee on Training of Transportation Employees was read by the chairman, J. W. Brown, West Penn Railways Company. This report is published elsewhere.

President Allen said that after listening to the most excellent report of the committee he thought that if the association were to adjourn now the work of the Transportation & Traffic Association of this year would have resulted in something that would be of great benefit to all the member companies.

W. H. Collins (Fonda, Johnstown & Gloversville Railroad) said that his company was very careful in selecting motormen and conductors, making a special effort to secure the best men possible. The training was started by putting the new men on cars with the regular motormen; after a regular motorman had "broken in" a new man he was placed in the shops for special training. After the master mechanic reported that the new man was quite familiar with the mechanical apparatus, the applicant was examined by the superintendent and also by the claim agent, which was of considerable value to the employee and beneficial to the service.

P. P. Crafts (Iowa & Illinois Railway) discussed the question of education and training of train service employees on his road. The man was selected first for his general appearance and qualifications, and was then put through a medical examination, a very careful vision test, hearing test, etc. The surgeon of the company took a great deal of care, in addition to that taken by Mr. Crafts, respecting mental qualifications. A man might be in excellent physical condition, but in totally unfit mental condition, particularly for high speed interurban service. His sense of perception might not be quick enough. If the man passed all these tests he was put on a car with a certain motorman and conductor. The company had one man who was especially fitted for "breaking in" men. Mr. Crafts believed the indiscriminate "breaking in" of car service employees by various motormen and conductors did not generally result successfully. After the motorman had run for the length of time required by the instructor, he was sent into the shop for a few days to learn the essential points of the equipment. The conductor was examined, to a greater or less extent, as to his knowledge of ticket forms and best ways of handling the public, etc. After those examinations, both classes of employees were put on the extra list; and from the extra list, after the summer season was over, the employees best fitted for the winter list or to go into regular service were selected.

It was Mr. Crafts' belief that a man from the country, who had not acquired some of the habits acquired frequently by some young men who went to a city, was the better man for the service, and that a man who had not had previous electric or steam railway experience was also better for the service. If the company did select men from any railway service, Mr. Crafts preferred the man who had been on a steam road, whose record was clear in every way but who had not been discharged.

It was Mr. Crafts' belief that on a high speed electric road the requirements for employees were as rigid, if not more so, than on the average steam railway service. The high speed cars are operated not only through the country but on the city streets, where the possibilities of accident are much greater than on a high speed steam railroad.

Regarding the separate operation of city and interurban service, he believed experience had shown that it was better to select the highest grade of city men to go into the interurban service, stimulating an ambition on the part of the city men to advance.

Mr. Brown said that the committee recommended that it was inadvisable to promote city men to interurban lines because of the fact that in much of the city service the employees were of the floating class, while the interurban service called for men that stayed, and that the best results, in the opinion of the committee, were obtained by picking the employees, as far as possible, from the country-bred men and making the interurban line a separate branch. The personal experiences of the members of the committee had led to that conclusion.

Mr. Crafts judged that from the fact that a large number of companies did not reply to the inquiry of the committee on this subject that possibly there might be a greater variety of opinion. He had always felt that if the good men in the city service, who really entered into employment to stay, had the possible future opportunity of getting on interurban cars in regular service some of the men would be more liable to remain. Such men knew the rules and general methods of training and would develop into better interurban trainmen than if they had not had previous experience.

Mr. Brown thought that undoubtedly the conditions would be determined very largely by the rates of wages paid in city and interurban service. On some roads the wages were the same, on some different. He thought that conditions on the interurban service would generally be attractive to the city men.

E. E. Potter, Seattle Electric Company, when questioned, said that the situation in Seattle was a little different than usual on account of the distance of that city from other centers. The consequence was that with a floating population it was necessary to pay considerable attention to details on applications. As a rule no men are employed who have had previous experience on other roads. Mr. Potter had found that he got better results by taking a man who seemed to possess all the qualifications necessary as far as physical or mental classes were concerned, and then putting him in the instruction school. On dummy apparatus the new man was taught the necessary rules as to signals, air brakes and stopping and starting of cars, and was then placed on the cars under an instructing motorman or conductor. These instructing men are called "star men" because they are designated by a star, and have had exceptionally clean records and possess the natural qualifications of being able to impart instructions to students. The man after instruction on the car was inspected by an instructor. In fact, all during the student's experience with the "star men" the instructors watch the students' service. Then on the receipt of a report from the "star men" that the student is qualified to operate a car and also has been approved by the instructor, he is placed with other "star men" on other lines to learn the routes to which he may be assigned. After that he is placed on the extra list, and while on the extra list his work is observed for six months by "star men." After that the starters and inspectors make reports of their observations.

If a man was found to be deficient in some particular way which called for nothing more than a comment or verbal instruction from one of the inspectors, he was taken off the car and asked to report to the central station, where

he was placed with a number of other men on a car known as an experimental car and run over the various lines. The operator there acted as motorman or conductor and the new man was put through a series of tests and his work was observed. In a great many cases that appeal led to the sensitiveness of an employee who did not like to be placed with green men. A great deal of good had resulted from the use of daily bulletins commenting in the phrases that the car men use, upon either the good or the bad work of a man. If a conductor was particularly slow in collecting his fare, his name might not be used, but attention would be called in a general way to a certain conductor on a certain line who was a little sleepy and engaged too much in talking politics to attend to the collection of his fares. This had helped considerably, and in addition to that, each of the divisions had been asked to hold a weekly meeting, where the inspectors were obliged to talk to the men regarding the various operations on the division and also to promote discussion if possible. Once a month a general meeting of men was held at headquarters and some one from other departments gave a short, interesting talk. In some cases lantern slides had been used to get the men interested and also to give them a knowledge of the various parts of the system—the mechanical parts of the car, the power stations and the different points of interest on the lines. Short talks were given by the claim attorneys and various inspectors or men from the shops read short papers on some particular difficulty that they had encountered. The whole idea was to see if the men could be kept busy and interested in their work and to get as far as possible a personal relation between one man and his associates, and more particularly, a personal friendly feeling between the men and their immediate superiors. If that point could possibly be reached where there would be a family feeling and the men would have the idea that they were engaged in a business proposition and that instructions were issued, not only for their benefit, but for the benefit of their families and acquaintances something near the ideal would be attained.

Dana Stevens (Cincinnati Traction Company) said the committee unquestionably had given the subject considerable and intelligent thought and had covered it in a very comprehensive manner. On his system it was made a practice when city and interurban lines operated from the same center to promote conductors and motormen from the city to the interurban service, the principal reason being that the city scales of wages were lower than the interurban rates, and that by the time a conductor or motorman had become a proficient city man he had reached, probably, a point where he would want the higher rate of wages paid on the interurban lines. The lowest interurban rate was as high as the highest city rate. The man had the privilege of staying on the city line; but if he wanted to go to the interurban line he could do so at the lowest interurban rate, and have the prospect of advancement for time service on the interurban.

Mr. Stevens thought that there should be considerable difference in certain points in the instructions and qualifications and other requirements demanded of the employes on the interurban and city lines respectively. On the city lines in Cincinnati, the method was as follows: The applicant filled out the ordinary application blank, giving references and previous experience, etc. He then presented himself to the superintendent on a certain day and if it was thought he would be generally satisfactory and the superintendent cared to consider him as a conductor or motorman, the applicant was put through the physical vision and color test. He had already been passed upon regarding weight and age. Generally the company preferred, when it was in a position, to be especially choice in the selection of men, which was not always the case, to get men between 40 and 50 years of age, preferably men with families regardless of whether they were city-bred or country-bred. After the applicant had been considered favorably, in the interview, he was told to report to the company's physician for examination. If the man had lived in Cincinnati his record was looked up. Two men did nothing but look up the records of applicants. If the man gave any local references, they were seen personally. Very much better results could be secured with local references by having one of the men call and make a personal inquiry, because the writer of a reply to an inquiry of this kind did not always know that it would be kept confidential, and he was a little reserved in his reply. Some people received so many of these inquiries that they considered them nuisances. If the applicant, however, was accepted as an employee, he was sent to the instruction school, which is arranged with the different motors, controllers, air brakes, and other devices in use on the local cars. He was kept there until an instructor considered him capable of handling a car. Then the man was sent to one of the different divisions to report to a superintendent. He was then placed on a car to break in. If the man was to be a motorman he was placed in charge of an experienced train motorman, and if he was to be a conductor he was put in charge of an old employee. He worked directly under them until either the motorman or conductor would endorse his card. The company had found that if it kept a man out of service until he had become familiar with the conditions of every line of a large division that he would be needy before he got a paying employment. Therefore, it allowed him to go to work on all the lines after he had broken in successfully on each line.

(Mr. H. C. Page in the Chair.)

Robert F. Goff (Boston & Northern Street Railway Company) said that his company operated 930 miles of track in 95 cities and towns. The territory was too extended to have one central point where an employment office could be established, so that men could be passed on by one man. This task was delegated to the various divisions and the employment of men was put directly in the hands of the division superintendent in each case. There were 16 of these, and aside from a general department in the Boston office in connection with the inspection department, the responsibility of the employment of men is put on the division superintendent.

In relation to the employment of men who have been employed on other branches of public service, police and firemen, and all these other services, Mr. Goff's company has an absolute rule that they shall not be employed except upon the O. K. of his office. If a division superintendent had an application from a stranger that application was referred, with the references, to the inspection department at Boston. The division superintendent took care of everything that was local. The men are placed in service for varying lengths of time. The older men were selected for the inspection service, and as sometimes it might happen that the personality of one man was not such that a beginner would get along properly with him, he might change the beginner from one instructor to another. The men are compelled to cover the route in the territory to which they are assigned. They must be O.K'd on every route, aside from being O.K'd as to general fitness. They must take up the matter of the method of accounting, the matter of fares, etc., with the auditing department representative in each territory. The

same practice is followed in connection with the claim department, but as to the mechanical department his company had not taken up the question of instruction in that department. It had under consideration a special examination, aside from the general examination of the rules, to cover the mechanical end.

Mr. Goff did not agree in general that men having had city service make the best men for interurban service. He thought it to be the general opinion of his company's superintendents that the men on interurban service were better if they were brought up in that class of service, with the high rate of speed, signals and telephones, and various other features.

Mr. C. E. Learned (Boston Elevated Railway Company), said that, in general, the practice of his company was similar to that in Seattle. Instead of taking the extra man and showing up his deficiencies to the other men on the road, they had him instructed by a special instructor. Regarding the bulletins the company did the same as was done in Seattle, with one exception, it posted every week the number of violations that were reported. The desire was to call the attention of the men to rules liable to be violated, men who did not have occasion to be brought into the office for reprimand.

The instructors received 10 cents a day extra for their service the year around, whether they were breaking in men or not.

F. Hardy (Fort Wayne & Wabash Railway), used practically the same method of selecting men as that recommended by the committee. He did not exchange city and interurban men. One could hire a better class of men by hiring direct to the interurban than by hiring for the city and then promoting to the interurban.

In examinations Mr. Hardy used Tripler's Manual, which gave practically the same examination used by the U. S. Army. After the applicant had had a physical examination he was taken in hand by an instructor. After receiving the approval of three inspectors he was turned over to the shop foreman. After being approved by the shop foreman he was next sent to the transportation office, where he was given an examination, both oral and written, on rules, mechanical appliances, etc. The Fort Wayne & Wabash Valley Road used the merit and demerit system of discipline. A merit board met each Monday. The board took up the matters of discipline, both merit and demerit.

When questioned Mr. Hardy said that steam railroad engineers did not prove satisfactory for interurban service. He could say the same thing for a number of neighboring lines.

P. P. Crafts had found that a steam railroad fireman of good standing, who had a clean record, would oftentimes make a good interurban motorman. He did not select any fireman or brakeman that was a floater, but only such men as had families and wanted to stay at home, and preferred to work on the electric line at practically the same wages, because they could stay at home. Those usually taken from a road which had a good high standard of discipline gave good results.

C. Loomis Allen (Utica & Mohawk Valley Railway Company), said that there was a great diversity of opinion as to the methods that were required in training trainmen. The object desired was to obtain the most efficient employees. It seemed to him that the work of this committee would not be complete until in the years to come it had recommended standard forms and standard practice as to which methods were giving the most efficient trainmen.

Dana Stevens, in reply to a question of Bruce Cameron, said he did not allow time for "breaking in" until the references had been investigated. The men were not allowed time, but they did get a limited wage after they were "broken in." They earned possibly half rates at least.

Carl A. Sylvester (Boston Suburban Electric Companies), related his experience in employing men who had been on foreign roads. He had found no more than one in thirty of those who had applied that were able to furnish satisfactory references.

D. A. Hegarty, Little Rock Railway & Electric Company, called attention to the book of rules. He did not use a printed book of rules for the simple reason that it would get into the hands of ambulance-chasing lawyers. He issued a bulletin to serve the same purpose.

W. R. W. Griffith, Rochester Railway Company, thought the question of release to be a very important one. He had found this out in writing to the different steam railroad companies and in answering them. He also found that a great many of the roads always sent the release to him in making an inquiry. That was a very good thing to do.

J. E. Duffy, Syracuse Rapid Transit Railway, had had an interesting experience in promoting men from city service to interurban service, in one of his three companies, one a purely city company, one an interurban company operating for 50 miles between two cities, and the other a city and interurban on the other end. When the interurban line (an electrified steam road of the West Shore Railroad between Syracuse and Utica) was first started, the question of providing men for that service came up. The management decided to take the old men from the two cities and train them for this interurban service—not the oldest men in point of employment entirely, but the old men whose records were clean, who had been with the companies for several years, and were known to be good men. The selection was left to the superintendents of the two city companies. Most of these men had had no previous steam railroad experience. The question of block signals and high speed equipment came up with which they were entirely unfamiliar. They were first placed in the shops when the cars were being assembled. Those men were paid the regular rate of wages while receiving such instruction. There were about 42 men in the first classes of instruction—not all being instructed at one time. It cost the company approximately $7,800 to instruct the number of men that it was necessary to put on that road as regulars and as extras, the extra list being carried on the regular service in each of the terminal cities. The experience was entirely successful in the matter of promoting men from the city service to that class of service mentioned.

R. S. Goff offered the suggestion that a road should get a good lawyer to revise the rule book. He had found it necessary and while his property had been running for several years now with a rule book which originally was satisfactory to the lawyer, that had been submitted to him in typewritten form and passed on by him, he had recently called Mr. Goff's attention to a decision which would result in its revision.

E. F. Peck, Schenectady Railway, thought it highly important that the association go on record as adopting a system of examination. A good deal of stress should be put on the question of written examinations.

Mr. Duffy spoke on the question of examinations. In one city he had about 450 motormen and conductors. The company last year felt that it would be advisable to have upon record the examination of every one of its employees. It paid the 450 employees for the time that they consumed in

making out a written examination. The results were placed with their records and all men hired since that time had been compelled first to pass an oral examination which the instructor verified in writing. The instructor also conducted the written examination which the applicant signed, and which the instructor also signed as having witnessed the examination, which was placed with his record and which was very good as a safeguard.

ADDRESS OF MR. ELY.

I have thought as I stood here this morning that the paper No. 503, which is the report of the organization meeting, and the program of this 1908 convention, including the program of the meetings of all the different associations, constitute the very best evidence of the fact that the American association is finally doing a useful work and a lot of it. The present efficiency of the organization as compared with the efficiency of the association seven or eight years ago could not be better illustrated than by the facility and the speed with which this organization, Transportation & Traffic, was effected. The preliminary resolution was introduced a year ago here and on Jan. 30, five months afterwards, the constitution and by-laws were adopted and the complete working organization effected, and here you are to-day in as good working order, having as instructive a session, as largely attended as any of the other organizations.

I am down on this program for a congratulatory address. When a tall freckled man, very, very slender and over 6 ft. high, marries a short, plump woman about 4 ft. tall, and the ceremony is concluded, everybody gets up and congratulates the bride and the bridegroom. The same thing happens when the woman is 6 ft. tall and the chap is 4 ft. high. Nobody ever criticises either one of them for what they have done. You are to be congratulated upon having formed this organization; but by reason of my age and the friendly feelings which exist between us I may say to you, possibly in confidence, that I think you are to be congratulated upon having formed this association and you ought to be severely pounded for not having formed it long before.

I think that I have never found any more instructive or interesting reading than in reading the biographical sketches of members of Congress and Legislatures in the red books and the blue books and such like publications. I fancy that if we had before us for our inspection biographical sketches of all the men here who are interested in transportation and traffic—that is, members in that branch of the service—we would find a far more diversified origin than could be found in the similar sketches of the accountants, the engineers or even the claim agents. The accountants, for the most part, probably started out as book-keepers; the engineers for the most part had a technical training; and the claim agents possibly had a more consistent training than you because frequently the claim agents of the larger organizations are taken from the legal departments and have had some legal training. Possibly that is the basis of the training of most of the men who are in that department. But you probably have come up from all the different branches of the general business. There is no special training or equipment required for the transportation and traffic departments. Men have been selected, as is evidenced by the men who are here this morning, because of their all around intelligence and ability. Isn't the time at hand when in this particular department some special line of work and training will be, and ought to be required?

When you come right down to the business part of the street railroad business you are more important to your companies than any other kind of employees. The engineers build the road. The financial department finances it or tries to. The equipment is purchased and it is up to you to operate the road and earn enough money to pay operating expenses, interest and, in a few isolated cases, dividends. (Laughter).

If I were to mention the particular thing which I have noticed to be lacking in the operating departments of railroad companies more than in any other, I would say that it was the lack of analytical work, comparative work, the comparison of the results attained in one's particular company by the results obtained in other companies If that is so, then this organization is most important to you. If it is so that you have no technical training for the main part, if it is true that no technical training has been required, then the organization is more important to you than any of the other organizations are to the men who are in them.

I know a lawyer who did not commence to study law until he was over forty years of age. He was a harness maker. He was always hampered by the lack of early training. He told me once that he had this feeling and desire to study law while he was working at his trade as a harness maker, and he made up his mind that although he had a family, he was going to tackle the undertaking. He went to a friend of his, a county judge, a man who for his natural ability and legal attainments was perhaps the equal of almost any lawyer I have ever known, and far superior in his natural abilities to most I have known in the profession, and said to him: "Judge, is it too late for me to begin to study law?" The judge looked at him in a doleful sort of way and said: "No; but you might have commenced earlier."

I think that there is a tremendous amount of good to be obtained by the members of this organization from these meetings and very good work in organization if it is taken up and prosecuted in that way. The path of progress is always onward, ever onward. No man gets ahead unless he moves that way. No man can stand still and be as good to-morrow as he was the day before, because the procession has moved on twenty-four hours. The other fellows have moved up twenty-four hours. You have to work. You have to work with great care; and the emoluments of your work will constantly become greater as you become more efficient. There is a sort of relation between the amount that accountants can get; there is something that just about keeps an equiplibrium there. There is no relation between the wages or the emoluments of the positions of the men that sit here before me. A good transportation man who is recognized to be away up and a splendid man can command almost any price to-day. He can get a better price than a good engineer.

The very fact that these men are trained and technical men and that they come along certain lines together, serves to establish an equilibrium that does not exist in your branch of the business. This business is young; it has only commenced. Why, it is surprising to listen to young men, college graduates, men coming from the technical schools, and the hopeless tone of voice and the hopeless strain in which they talk. You would think this country was built and finished and that the opportunities for good men had about passed away. As a matter of fact the converse of that proposition is absolutely correct.

There was never a time when the opportunities were so great as they are now. Why, this country—we are only on the fringes of it. Look at these pictures here; look at these beautiful pictures of this Inland Empire system. Why, 30 years ago there were no buildings where that Shoshone flyer stands, and to-day there are less than 1,000,000 people in the whole state of Washington.

These desultory remarks I ask your pardon for inflicting upon you; but I do wish in closing simply to say to you that, having due regard for all you have accomplished, for all that you are, and all that has been done and is being done in your branch of the business, I think you ought to get more good out of this association than the men in any other of these affiliated organizations can possibly derive. I wish you the utmost success in this organization and, personally, one and all the utmost success in your life's work.

The paper on "The Carrying of United States Mail on Electric Railways, its Advantages and Disadvantages, and the Compensation Therefor" was then read by C. H. Hile, assistant to the vice-president, Boston Elevated Railway. This paper is published elsewhere.

J. T. Choate, Oneonta & Mohawk Valley, then read a discussion of Mr. Hile's paper. This will be published later.

The meeting was then adjourned, and the program will be resumed at 9.30 o'clock this morning.

In two years time Atlantic City has spent $875,000 for street paving and has contracted for additional paving to cost $200,000.

CLAIM AGENTS' PROCEEDINGS, TUESDAY

The Tuesday morning session of the Claim Agents' Association was opened at 10 a. m. with Third Vice-President Harrison in the chair. President Goshorn was again unable to be present although he had come to Atlantic City the night before to shake hands with the members. Two papers were presented at this session in accordance with the program. The first paper was entitled "The Organization of a Claim Department for a Small or Moderately Large Company, Including a School of Instruction as a Means of Preventing Accidents," by Francis J. Ryan, M. D. Syracuse Rapid Transit Railway Company, Syracuse, N. Y. This paper will be found elsewhere in this issue. At the conclusion of his paper Dr. Ryan produced a set of record books and forms used by him and explained their use.

The discussion on Dr. Ryan's paper referred particularly to securing information from witnesses and educating the trainmen to avoid accidents and turn in good reports.

F. W. Johnson, assistant claim agent of the Philadelphia Rapid Transit Company, explained at length the system of instructing new and old employees at stated intervals. Such instruction had brought about from the start a marked reduction in the number of accidents. He did not think that it was good policy to expect the flustered trainmen to write the names and addresses of witnesses themselves, as in the confusion of accident this easily leads to misunderstandings. Many people, particularly ladies, object to giving oral information about themselves in the presence of others. By having conductors carry a set of blank cards, say eight in number, which can be distributed for the signatures and addresses of witnesses, much better results have been obtained. In Philadelphia, for instance, the number of reliable names per accident has been more than quadrupled since the introduction of this method. Very little, if any objection is offered by passengers toward giving this information.

Referring to the subject of accident instruction, the delegates differed in regard to the number of times a year such instruction should be given, but there was general agreement that the net results of such instruction were decidedly beneficial.

At the conclusion of the discussion, C. B. Hardin, claim agent of the United Railways of St. Louis, moved a vote of thanks to Dr. Ryan, which motion was passed unanimously.

The second paper, which is printed elsewhere in this issue, was entitled: "The Claim and its Disposition," by Peter C. Nickel, claim agent, New York City Railway Company. Mr. Nickel's paper provoked an animated discussion on how to handle the physican who treats the injured claimant. From the experience they had gained in handling claims in large cities, Messrs. Johnson and Nickel were of the opinion that it is not good policy for the railway company to pay physicians' bills. Most of the delegates, however, seemed to believe that it was advisable to protect doctors in such cases, as it would keep them friendly toward the company and give less excuse for exaggerated injury claims from patients. It was apparent from the discussion that the claim agents in the smaller cities have had little trouble with doctors, while in some of the largest cities in the East there exists an unscrupulous class of practitioners who work hand in hand with contingent-fee lawyers.

Prior to adjournment a unanimous vote of thanks was given Mr. Nickel on motion of Mr. Johnson.

AFTERNOON SESSION

The Tuesday afternoon session began at 2:30 o'clock, with Third Vice-President Harrison in the chair. The first of the papers presented was that entitled "Uniformity in Claim Department Records and Accounts," by John J. Reynolds, claim agent of the Boston Elevated Railway Company. Mr. Reynolds showed the form used by his company for the classification of reports. E. C. Carpenter made a brief address commending Mr. Reynolds' paper, after which a motion was carried to refer the subject to the Executive Committee for further consideration at the 1909 convention. The floor was then given to James R. Pratt, claim agent of the United Railways & Electric Company, of Baltimore. Mr. Pratt mentioned the advantages he had received from joining the Alliance Against Accident Fraud, reciting several cases where false claims were detected and the fakirs sent to prison.

The chair then read an invitation from the manufacturers' Association to attend, on Tuesday evening, the entertainment in the solarium of the Marlborough-Blenheim Hotel. Following this, a paper entitled "The Duties of Claim Agents and Other Officials of Quasi-Public Corporations to the Public," by Eugene R. Roberts, claim attorney of the Knoxville Railway & Light Company. In connection with Mr. Roberts' paper, Mr. Pratt, of Baltimore, took occasion to explain how his company had succeeded in getting the Maryland Legislature to pass a barratry law. He said that this favorable action was due in very large measure to the publicity campaign which the United Railways & Electric Company was waging through the newspapers at the time. The law has already proven very effective in reducing accident claims through ambulance chasers.

The chair, after announcing that a meeting of the Executive Committee would be held at 7 o'clock Tuesday evening, appointed the following Nominating Committee: James R. Pratt, claim agent United Railways & Electric Company, Baltimore; S. W. Baldwin, claim attorney The Connecticut Company; E. P. Walsh, claim agent United Railways of St. Louis; William Tichenor, claim agent Indianapolis, Terre Haute & Eastern Railway, and R. E. McDougall, claim agent Utica & Mohawk Valley Railway. As a result of the deliberations of this commmittee, the following ticket was elected: President, C. B. Hardin, claim agent United Railways Company of St. Louis; First Vice-President, E. C. Carpenter, claim agent Indiana Union Traction Company; Second Vice-President, J. S. Harrison, claim agent Jacksonville Electric Company; Third Vice-President, Dr. F. J. Ryan, Syracuse Rapid Transit Company; Secretary and Treasurer, B. B. Davis, claim adjuster of the Columbus Railway & Light Company.

Great progress is being made in Berlin to create new transportation lines. On September 8 the Council of Schoneberg, a suburb of Berlin, almost unanimously consented to a scheme for the construction of an underground electric railway which is to connect the heart of Schoneberg with Nollendorf Platz, where there is already a station of the existing elevated electric railway. On the following day work on this new line was commenced. The existing underground electric railway is also being steadily extended, and the first official trip on the newest completed extension, which runs beneath the busiest part of the city from Potsdamerplatz to the Spittelmarkt, took place on Sept. 22. This extension, which is 2 km. (1.24 miles) long and cost $5,000,000, is to be continued from the Spittelmarkt beneath the River Spree. The distance from the Spittelmarkt, which is in the middle of the town, to the underground station, Reichskanzler Platz, on the outskirts, is 10¾ km. (7.27 miles). It includes 14 stations, and will be traversed in twenty-six minutes.

MEETING OF THE AMERICAN ASSOCIATION

The first meeting of the American Street & Interurban Railway Association was held Tuesday afternoon at the Greek Temple. The meeting was called to order at 3 p.m. by Vice-president Shaw, who acted as chairman of the meeting in the absence of President Goodrich. About 75 delegates were present.

Mr. Shaw, in opening the meeting, read a letter from President Goodrich in which he expressed his regrets at being unable to be in attendance at the Atlantic City conventions and wished all of the associations most successful meetings.

The first order of business was the presentation of the Report of the Executive Committee, which was read by the secretary and approved. The secretary then presented his annual report, an abstract of which appears elsewhere in this issue.

Mr. Shaw then read from manuscript the annual address of President Goodrich, which, among other topics, contained suggestions as to the future policy of the association in appointing separate times and places for holding the annual conventions of certain of the affiliated associations. This suggestion was discussed by the members present, but it was decided inadvisable on account of the importance of the matter to take immediate action on the subject. The following resolution was then introduced by W. G. Ross, of Montreal, and adopted:

That a discussion be held at Thursday's session with the idea of appointing a committee to study the question, this committee to make a report which is to be distributed among the members.

The president then called for the report of the Committee on Badges. The report was read by the secretary and stated that the committee had adopted a badge for associate members somewhat resembling that which appears on the outside of the official program for the year. The committee stated that solid gold blue enamel badges of this design would cost about $3 and recommended that the secretary furnish these badges to associate members and officials of member companies at a price sufficient to reimburse the association for their cost. The report was adopted.

The next business was that of the report of the Committee on Membership, of which H. H. Vreeland, of New York, is chairman. The committee reported the efforts made during the year to secure members and associate members for the association with the satisfactory results contained in the report of the secretary and treasurer published elsewhere. The report was adopted.

The next report was that of the Committee on Subjects, of which T. E. Mitten, of Chicago, was chairman. This report was also read by the secretary and gave the programs which have been followed by the different associations.

The final business of the meeting was the report of the Committee on State and Federal Regulations, of which Gen. G. H. Harries, of Washington, is chairman. This report was presented in person by Gen. Harries. After he had finished reading the report, the convention decided to postpone the discussion of the report until to-morrow afternoon, at 2:30 o'clock. A. W. Brady, second vice-president of the association, who occupied the chair, announced that the meeting would be called to order promptly.

Atlantic City is planning a boulevard 1½ miles long, running from the Public Library to the Inlet, with a circle around the Absecon lighthouse. This new drive will cost $3,500,000.

ANNUAL REPORT OF THE SECRETARY AND TREASURER OF THE AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION*

In presenting this, the third annual report of the secretary-treasurer since the re-organization of the Association, it has seemed wise to make a somewhat general report of the work which has been accomplished during the past year, and to follow this up by a more detailed report, showing the exact status of the membership and finances of the Association at the close of the fiscal year.

REPORT OF SECRETARY

At a meeting of the executive committee held in New York City on Oct. 19, 1907, the day following the close of the convention, the Secretary was authorized to secure the services of an office man experienced in electric railway statistical work, to take the place of the then office assistant. After carefully looking the field over, H. C. Donecker, of Brooklyn, N. Y., was selected for this position.

Mr. Donecker has had considerable experience in both the operating and manufacturing sides of the electric railway business, and at the time he came with the Association, on Dec. 15, 1907, was employed in the statistical department of Ford, Bacon & Davis, of New York City, in which work he had been engaged for the two previous years.

While considerable work of a statistical nature has been carried on in the office of the Association from the time it was established in the fall of 1905, the statistical department of the Association work has become of much more importance and value to the member companies during the past year. We have issued seven confidential bulletins to the member companies since Jan. 15, and expect to issue five more before the close of the calendar year. That this work has been greatly appreciated by the member companies is evidenced by the many commendatory letters which the officials of these companies have written to the Secretary.

Immediately after the 1907 convention the work of placing the 1907 proceedings of the different associations in book form was pushed as rapidly as possible, with the result that paper-covered copies of the reports of the various associations were completed and sent to the various member companies before Jan. 1, 1908, and the cloth bound copies of the proceedings were ready for distribution to the member companies on Jan. 20.

Representatives of the American Association and also of the Accountants' Association have held several important conferences and committee meetings with representatives of the Interstate Commerce Commission relative to the classification of accounts which the commission will soon promulgate. The first meeting was held in Washington on Nov. 22, 1907, at which a tentative classification was discussed. This meeting was followed by several conferences and committee meetings, the most important of which occurred on Dec. 17 at Washington, D. C., another in Washington on May 10, and a third one in Atlantic City, N. J., on May 17 to 22. While the classification has not been issued by the commission in its printed form, the various conferences and meetings resulted in the drawing up of a classification which will meet the practical requirements of the electric railway companies.

At the meeting of the executive committee held immediately after the 1907 convention, it was decided that a new Association should be formed to take over the general work

*Abstract of report of Secretary Swenson, presented at meeting of American Association, October 13.

of the American Association relating to the operating end of the electric railway business. To this end a committee consisting of President Goodrich and W. Caryl Ely and James F. Shaw was appointed for the purpose of bringing about the organization of such an association. This committee called a meeting of the operating officials of member companies for the purpose of forming such an organization, and a meeting was held at the Association headquarters in New York City on Jan. 30, 1908. The American Street and Interurban Railway Transportation and Traffic Association was duly organized on that date, its constitution and by-laws were adopted, its various officers elected and its several committees appointed to carry on the work incident to the holding of the convention in October.

The organization of this new association was duly ratified by the executive committee of the American Association at its meeting held on Jan. 31, 1908. At this meeting of the executive committee of the American Association the question of the location of the 1908 convention was discussed. A Committee on Convention Location was appointed to fully investigate the matter and with power to act in the selection of a meeting place for the 1908 convention. While invitations were received from other cities, notably Chicago and Washington, the question as to the location of the 1908 convention soon narrowed down to Denver and Atlantic City. The Committee finally decided upon the last-named place, an important factor in the final decision being the question as to the probability of having a large and representative attendance of the Eastern companies (which constitute a majority of our members) at a convention held in a Western city in a year of financial depression and business inactivity.

Your President and Secretary were the representatives of the Convention Location Committee at a meeting held in Denver on May 3, 4 and 5 last. At the close of this meeting your Secretary, in accordance with the wishes of your President, made a somewhat extended trip throughout the West, with the object of visiting important electric railway properties in that section of the country, and becoming better acquainted with the officials of these roads, to the end that the Association and its work might become better known and of greater value to these companies. Both member and non-member companies and their officials were visited, and all showed your representative every courtesy and expressed interest in the Association. As a direct result of this trip, applications for membership have been received from the United Railroads of San Francisco, the Everett Railway, Light & Power Company, the Monterey County Gas & Electric Company, and the British Columbia Electric Railway Company. It is anticipated that companies at Los Angeles, Oakland and other places visited will join the Association soon.

The Accountants' Association at its 1907 convention decided to accept the recommendation of the American Association Executive Committee in discontinuing the services of a salaried secretary and in transferring the general routine work of that Association to the main office of the Association. Considerable work has been done in this connection, notably that in connection with the new collection of blanks and forms which forms an important feature of the Accountants' Association Convention this year.

The Membership Committee has carried on a most important campaign during the past year, the results of which are shown in more detail in the committee report and in the membership portion of the report of the Secretary-Treasurer. This campaign resulted in 64 companies becoming active members of the Association and 123 individuals becoming associate members.

In addition to the various important features of the Association work of the past year, as briefly described above, may be mentioned the many important committee meetings of the American Association and of its affiliated associations, which have been held at various times during the year. The results of the work of these committees are shown in the many valuable reports which have been presented at the different conventions this year.

The member companies have also made much freer use of the Information Bureau at the New York office of the Association this year than in either of the two preceding years since the reorganization. Valuable aid has been given to these companies in answer to requests for special and detailed information on many subjects. Among these special topics investigated and reported upon may be mentioned: Wages, Labor Disputes and Arbitration; Franchise Requirements as to Transfers and Taxation; Standardization of Height of Car Steps and Height of Trolley Wire Above Railroad Crossings; Hours of Service Enactment; Employers' Liability Law; Maryland Barratry Bill; and Rates of Fare.

The associate members who paid 1908 dues during the fiscal year ended September 30, 1908, numbered 249; delinquent 1906-07 members reinstated by payment of dues, 13; associate members with dues unpaid, 27; associate members resigned, 8; new associate members, 123; total associate members in good standing, 249.

Active members in good standing, 262; active members reinstated upon payment of dues, 4; lost by consolidation, 4; active members with dues unpaid, 13; active members resigned, 7; new active members, 52; total active members in good standing, 262.

REPORT OF TREASURER

The report of the treasurer for the year ended September 30, showed cash in bank, October 1, 1907, $6,137; receipts during year, $26,832; expenditures during year, $29,604; balance on hand October 1, 1908, $3,365.

AMATEUR VAUDEVILLE PERFORMANCE

The fourth annual manufacturers amateur vaudeville and theatrical performance will be given at the Savoy Theatre on Wednesday, at 8.30 P. M., admission being by official badge only. Boxes are reserved for the officers of the various associations. A wealth of talent has been enlisted for the occasion. There will be a strong orchestra, with opportunities for the audience to show that all the amateur talent is not on the stage. But the high note of excellence will of course be reached beyond the footlights. Saul Lavine will give a baritone solo; A. V. Thompson will drop naturally into a monologue, and a versatile musical trio will be found in Messrs. Murchison, Borden and Sanford. A clever little social comedy in one act will then be given by Jacob Wendell, Jr., John Conover and Mrs. Conover. To this will succeed the songs and dances of Reginald Campbell, and then Deems Taylor will vary the theme with "Stuff and Nonsense." Last of all—a mysterious glimpse of oriental witchery and winsomeness—with subtle serpentine movement, and the gliding flow of a languorous wave, Miss Gertrude Tankway will evoke a "Vision of Salome." This is the only real Salome now on the American boards. All the others are fake. In view of the attractiveness of the program the entertainment committee is somewhat afraid it may not have a full house!

The boardwalk, Atlantic City's highway, was opened in 1896. It is 5⅛ miles long, has an average width of 40 ft. and cost $300,000.

ENGINEERING ASSOCIATION—TUESDAY SESSION

President Fred G. Simmons called the convention to order in the Aquarium Court Hall, at 2:45 p.m.

The President: The custom of arranging for a number of preliminary addresses from gentlemen connected with other associations has been eliminated this year, in order to accelerate the work of the convention. To further the same end, the President has made his address brief.

President Simmon's address is printed in another column.

The Secretary presented the report of the Executive Committee. The minutes of the meetings of this committee, held in New York, Jan. 30 and Feb. 1, 1908, were abstracted in the issue of the Electric Railway Journal following the meeting. The committee held a second meeting in Atlantic City, Oct. 12, 1908.

There were present at this meeting the following gentlemen: F. G. Simmons, president; Paul Winsor, first vice-president; W. J. Harvie; E. O. Ackerman; William Roberts, and John W. Corning, secretary and treasurer.

The number of standing committees and their inter-relation was taken up and discussed at length, and it was finally decided to submit to the association for its consideration the following arrangement of committees: (1) Committee on Standards. (2) Committee on Way Matters. (3) Committee on Equipment. (4) Committee on Power Generation. (5) Committee on Power Distribution.

The Committee on Standards to consist of nine members, four of whom are to be chairmen of the other standing committees, and four of whom are to be appointed by the president from lines of work represented by the other committees, and a fifth member at large also appointed by the president.

Each of the other four standing committees to consist of six members, to be appointed by the president; this year two each for one, two and three years, and two each year thereafter for a term of service of three years. The chairman of each committee to be chosen by the president from among the committee members. All recommendations for adoption of proposed standards made by any of the four general committees shall be subject to the approval of the committee on Standards, and to be presented by them to the association. The president may, at his discretion, appoint such other committees from time to time as the best interests of the association may, in his opinion, demand.

It was the sense of the meeting that each committee should endeavor, as far as possible, to make definite recommendations as a result of its work.

A telegram was received from W. H. Evans, second vice-president, announcing the death of his father, and the secretary was instructed to telegraph the condolences of the Executive Committee, which was done.

With Mr. Winsor in the chair, a vote of thanks was extended to President Simmons for his efforts for the association's welfare during the year and a similar vote was tendered the secretary.

President Simmons appointed W. J. Harvie and E. O. Ackerman as an auditing committee to audit the account of the treasurer.

On motion the report of the Executive Committee was approved.

Secretary Corning presented his report of the money received and expended during the fiscal year ending Oct. 16, 1908. The association received from the American Street and Interurban Railway Association $1950.00, and from miscellaneous sources $38.23. The expenditures were $1983.86, leaving a balance on hand of $4.37.

The report of the committee on Maintenance and Inspection of Electrical Equipment was presented by title only by E. T. Munger, of the Metropolitan West Side Elevated of Chicago, in the absence of the chairman, L. L. Smith (Chicago & Milwaukee Electric).

Mr. Munger said that this committee in May submitted data sheets to the different member companies. In August the committee met in Cleveland, where it had a three days' session. Mr. Anderson of the General Electric Company and Mr. Davis of the Westinghouse Electric and Manufacturing Company attended the meeting and rendered valuable assistance. The committee took up all of the subjects which are presented in the report, and the data and conclusions were then turned over to the chairman who assembled it. There is one slight correction in the report as printed, relating to the dimensions of the vibrating test drum for carbon brushes.

(The correction has been made in the text of the report which is printed in another column.—Eds.)

The president called on E. W. Olds, of Milwaukee, to open the discussion.

Mr. Olds said that the members had a great deal to be indebted to this committee for, as it had certainly covered the work in fine shape. The matter of carbon brushes is one of great importance, and the tests suggested by the committee are good. Different types of motors require tests different from those mentioned. The vibrating test mentioned is well worth making. Insulating materials can hardly be touched upon. There are many good materials, and there has been great advancement in this feature during the past few years. It is gratifying to learn the number of companies which have put into practice the recommendations of last year's committee. It shows that they were in the main correct.

The gear and pinion specifications of the present report include tests as to correct thickness of teeth, as to proper meshing of teeth, tensile strength, elastic limit, elongation, reduction of area, etc. Pinions are a thorn in the flesh. What is wanted in a pinion is a life as long as the car. With the help of the manufacturers of gears and pinions he believed that point would be reached in the not far distant future. There may be some difference of opinion as to the required reduction of area of 20 per cent mentioned in the report. Some have thought that possibly 20 per cent was too small, while others want 40 or 50 per cent. If the steel in pinions is of the proper tensile strength and density much reduction of area cannot be expected.

Rapid strides have been made in the last few years in the matter of lubrication. Most of the members can remember when they were lubricating practically all axles and armatures with grease. To-day few are using grease but instead oil, even in some of the old motors. Progress has also been made in gear lubrication. Rules for lubrication for the government of car house employees is a matter in which no hard and fast rules for the guidance of employees can be laid down. There are different conditions to be met; for example, an elevated railroad does not have to meet the conditions of dusty and dirty streets found on the surface roads. In the matter of armature and axle liners, a few years ago babbit costing 15 cents a pound was used. To-day we do not ask the price of babbit, but will it stay in place and hold up the bearings for large mileage? The cheapest is dear at any price. Referring to trolley wheels, Mr. Olds thought that the recommendation was for too small a wheel and that a larger wheel is necessary. A large trolley wheel, however, means in-

creased tension on the trolley base and requires a stiffer and heavier pole, which, of course, is objectionable; but for high speed service a wheel must be used that will give good mileage and hold the lubrication.

Mr. Olds, referring to lightning arresters, said that it was a question he felt he could not answer. He did not know of any that were worth anything. But he put them on in the hope that some of them might work. The lightning arrester manufacturers claim that they have something that will arrest, but if they have, he knew all the members were anxious and ready to meet them half way.

To find a trolley pole that will work without bending the trolley base, that will be always in good operating condition, and a trolley wheel that will stay on the wire and not pull the overhead down, is one of the hardest problems of maintenance to solve. Another important point is to provide a connection between the trolley rope and the pole, which is a matter that has long been neglected. Most roads simply wrap a rope around the pole and make a knot in it. Something in the way of a metal connection that will stay in place and will not catch the wire when the wheel jumps off is needed.

Paul Winsor, chief engineer, motive power and rolling stock Boston Elevated, followed Mr. Olds and took up first the subject of impregnating coils. His company had no impregating apparatus but it has had impregnated outside about 500 old coils during the last eight or ten months. All of these old coils had thin cotten insulation which was charred sufficiently to condemn them, but none of them had been short circuited. After impregnation they were put into service with satisfactory results, none of them failing. He expected to put in an apparatus for impregnating very soon as a result of this experience.

He has always held out against trying any of the patented babbitt or other bearing metals, not, however, because he felt that there were not good babbitts to be bought. The babbitt used is made in company's own shops and is very expensive. It is high in tin which is what the committee recommends.

The Boston Elevated uses a small trolley wheel, as light as can be made. They are also made in the company's shops. Many manufacturers had asked him to try new poles and new harps, but when the actual cost for trolley bases, poles, trolley wheels, bushings, of only $2000 a year for all cars is shown them they have not much to say as to what they can save. This low cost is due largely to the fact that the company makes its own wheels, and gets all the scrap value from them. Two years ago the Boston Elevated began inspection on a mileage basis entirely. It seemed a very difficult matter with 1500 or 1600 operating cars to keep the daily mileage on each car, but a simple way of keeping records was found and all equipment is now being inspected on the mileage basis with most satisfactory results. One of the most important things that can be done in reducing cost of maintenance is to have foremen's meetings. His company has been doing this for three or four years. The meetings are devoted to a discussion of the troubles of the previous month. Troubles are tabulated on the basis of delays to service. Any car that has to be pulled in for trouble, counts as one failure. He thought favorably of the foremen's meetings because he believed they were largely responsible for reducing the delays in service more than one half. For the 12 months ending Sept. 1, this year, he had 992 cases of shell and spool trouble against 1272 last year. Motor flashes were reduced from 1714 to 810; grounded armatures from 3407 to 1495; bearings from 457 to 154,—with a total of 6750 cars pulled in for the year on something over 40 million car miles, as against 15,309 cases of trouble the year before. The figures are prepared each month and presented to the meeting, and a man is asked why he had so many armature troubles. The result has been that in the last few years there have been a good many changes of foremen.

H. H. Adams, superintendent of rolling stock and equipment, New York City Railway, said it had been his practice in the past not only to go farther than as outlined in the report, and try to present to the foremen interesting subjects. He had presented papers read before this association in endeavoring to create interest, and in addition had representatives of other companies attend and talk on various subjects. He found that by bringing into these meetings a small amount of routine work, that he created an interest among the foremen that he could not get in any other way. In regard to trolley wheels, when in Baltimore, he made some tests that were interesting in reference to the question of the diameter of the wheel. He took cars of the same size, on the same line, and used wheels 4 in. in diameter on some, and some were fitted with wheels 5 in. in diameter. The average life was about 7000 to 10,000 miles for the 4 in. wheels, while the 5 in. wheels ran from 20,000 to 25,000 miles.

J. S. Doyle: (Interborough Rapid Transit), said that during the last year his cars had run about three billion miles with carbon brushes costing about six times as much as the ordinary carbon. This type of carbon has reduced troubles on the Manhattan Elevated about 85 per cent, and about 96 per cent on the Subway. The cost of the carbon is about 17 3/10 cents per 1000 car miles, as compared with a former cost of 44 cents per 1000 car miles.

The mileage inspection practice has been used for three or four years, and is very profitable. In the design of gears and pinions he believed with Mr. Olds that the percentage of elongation, 20 per cent., is too low. It should be at least 35 per cent. The elastic limit of 70,000 lbs. is good for a standard pinion.

Mr. Gindre, of the Le Valley Carbon Company, said that in general the specification for carbon brushes coincided with his views. He considered that a good brush should show a fracture of uniform appearance both crosswise and lengthwise and must be free from certifications and shrinkage cracks. The general classification adopted by the committee divides all traction motor brushes into three classes. It is out of the question, the testing methods (electrical and mechanical) having been once adopted, to expect that the products of different makers belonging to the same class will show similar features throughout. There needs to be as many specifications for carbon brushes as there are different grades taken as standards. He did not think that the vibrator test corresponded closely enough with the conditions of practice. The shocks and vibrations to which traction motor brushes are normally subjected in actual service cannot be compared at all with the exaggerated conditions of this vibration test. He considered the slip ring test a valuable one and also found the resistance test of value, but he would suggest a still better one, the contact resistance test. This would consist in running two brushes of the same grade on a hard drawn copper ring, 10 in. in diameter, a given current entering through one brush and going out through the other and in measuring the total contact drop of the two brushes. An important feature of every carbon grade is its friction coefficient and the friction losses should be measured. The rational

abrasion test would consist in running different brushes on a soft material, the wear of which measured by the decrease in weight would be proportional to the abrasive coefficient. In regard to single and double width brushes the advantage of single width brushes is a better distribution of the current, as they fit on commutators better on account of their smaller sections.

J. S. Speer, of The Speer Carbon Company, said that he had been experimenting for the last 60 days with the vibratory, and glow tests, and had found that manufacturers could meet the specifications to the letter.

E. T. Munger, member of the committee, said there had been some objections made to the vibratory test, and the committee had agreed to make a change in the drop of ⅛ in. to 1-16 in. Also that the diameter of the wheel be increased to 9¼ in..

H. H. Adams, New York City Railway, thought the contact resistance test a difficult one to make, because the brush must fit properly. It is necessary that the brush fit properly also when testing for the current that will make the brush glow. In the specifications it was not indicated what glowing shall do to the brush. There are other refinements which could be brought in, such as a clause that glowing and sparking must not disintegrate the brush. Mr. Gendre proposed to take the slip ring, used for the glowing test, and with it measure the contact resistance. By mounting thereon a small motor for driving the wheel the coefficient of friction can be determined. The members should appreciate that while the tests proposed were purposely made severe, it was not expected that the brushes would stand up under them indefinitely. The tests indicate that a brush which will not be satisfactory in service will go to pieces in possibly five minutes on the vibrator wheel, whereas a brush which is excellent in service from the mechanical standpoint will run six hours without any serious effects. With the vibrator wheel if one brush is destroyed at 10,000 revolutions and another at 50,000 revolutions, the inference should not be drawn that one will last five times as long as the other. In service the one that lasts only 10,000 revolutions will break up very early and cause a great deal of trouble with the equipment while the one with a life of 50,000 revolutions on the vibrator wheel may continue until it is worn out without giving any trouble. The vibrator test as proposed, is not a correct measure of the service, but a specification for a carbon brush is needed, so the committee has endeavored to prepare such a specification. Time may change it very materially.

Mr. Brady (National Carbon Company) thought that most of the tests advocated will be found to be impossible for master mechanics and the men in the barns to make. They are laboratory tests which it is hard enough for the most experienced man to make accurately. Carbon, being of a cellular structure, has only a few points of contact, unless extreme care is taken in working the brush down to a true surface. This is one point which gives trouble, particularly on the slip ring test, which is more a matter of contact resistance than anything else. A brush with a high contact resistance will glow more quickly than a brush with a low contact resistance. A brush with a high contact resistance is a good brush to have in some cases, while one with a low contact resistance is good in other cases. The same criticism he applied to the abrasion test and the other tests. It is all a question of the fit of the brush. In his own laboratory slip ring test he found it necessary to run anywhere from 24 to 36 hours steadily on a smooth wheel to get the brush down to a true surface.

Mr. Doyle suggested it would be well to require in the specifications a performance of carbon brushes on a mileage basis. This might prove a more reasonable mark for the manufacturer to work to.

N. W. Storer, Westinghouse Electric & Manufacturing Company, congratulated the committee for getting down to work on the carbon brush question. It is one with which he had been struggling for the last 15 years at least. He has been greatly impressed with the difficulty of getting the manufacturers of carbon brushes to duplicate samples which they have submitted.

H. H. Adams, New York City Railway, referring to the recommendations of the committee on insulating varnishes, thought that their flash point should be considered from a fire insurance standpoint.

Mr. Roberts, going back to the carbon brush specifications, said that, while the amount of brush friction was largely determined by those who inspect and adjust the motors in the shops and car houses, the slip ring, vibrator and abrasive tests, which were the difficult ones to make, concerned the manufacturer chiefly and should properly be made in his laboratory.

Mr. Davis, Westinghouse Electric & Manufacturing Company, announced that his company intends to follow the brush specifications of the committee in detail.

J. F. Doyle, Interborough, said regarding the properties of steel used for gears and pinions that he had made tests of a special treatment for carbon steels which increases their strength 100 per cent. The Standardization Committee might at some future time be able to devise tests to develop the wearing qualities of different compositions and treatments of steel for this purpose. He had begun a preliminary study of carbon steel for axles intended to cover this point.

Mr. Winsor referred to the vibration tests offered by the committee, which he thought were a step in the right direction. The committee did not recommend a standard of how many vibrations a certain brush should make, but said that under certain conditions if it was found able to make 20,000 vibrations or revolutions it will stand up under certain conditions. It is the same way with steel and copper wire; if tested to the destruction point, certain information becomes available.

Mr. Anderson put in a plea for the value of the pinion specifications given by the Committee. The only absolutely perfect design is the epicycloidal type. In the forms on the market there is usually a slight deviation from constant angular motion. This would be evident if the effect could be magnified. In service the shocks which these pinions and gears receive would be greater if there was no spring motion, so it is not wise to run the tensile strength and the elastic limit too high because it makes the teeth too brittle.

E. E. H. Creighton then read a paper on lightning arresters which will be found on another page of this issue.

DISCUSSION ON LIGHTNING ARRESTERS

The secretary asked Mr. Creighton whether there is any well defined rule as to the proper number of lightning arresters to use per mile.

Mr. Creighton replied that the spacing depends a great deal upon the internal resistance of the lightning arresters. As a general rule the more arresters there are per mile the greater freedom there will from troubles with certain kinds of discharge. On the other hand it is very easy to produce, in the laboratory or on the line, a discharge along a wire 2 ft. or 3 ft. long which will puncture

the insulation of two double cotton covered wires placed together. A line arrester would have very little effect in taking care of a discharge which is near or just over a car. That has to be taken by the car arrester. The line arrester would help out in such a case only by reducing the quantity of electricity that the arrester on the car would have to take care of. As a rule two arresters per mile are sufficient to relieve the ordinary strain. On the other hand 40 arresters per mile along the line would not take care of some kinds of discharges. Direct strokes, however, happen very infrequently, even on long lines. Direct strokes will vary in intensity with the clouds. Some of the lightning arresters described would probably take care of light direct strokes, but that has not yet been tested. It is doubtful if there is any lightning arrester that will dicharge a direct stroke. One can only trust in Providence and hope for the best.

W. H. McAloney, Denver City Tramway Company, said that all his cars were equipped with three arresters, and a great many of them with four. Water boxes are used on the cars, and considerable trouble is had with them.

Mr. Roberts said that his power station had received a direct stroke, but that the arrester had taken care of it.

The report of the Committee on Maintenance was accepted with thanks, and was referred to the incoming committee. The meeting then adjourned until 9.30 o'clock Wednesday morning.

GERMAN TRACKLESS TROLLEYS

A report recently presented to the Manchester (Eng.) Corporation Tramways by a committee sent to investigate trackless trolley operation in Germany describes the conditions under which such lines are operated in the cities visited and gives the following summary of the recent improvements embodied: A lightly-constructed overhead equipment with bracket arms and four trolley lines fed by overhead wires. Specially designed overhead fittings for insuring the safe working of the positive and negative lines Small single-deck cars with single motors and front axle drive. Controllers of the cylindrical type with five power notches and four rheostatic brake notches. To minimize maintenance, rubber tires on the front wheels only. Single trolley poles with double shoe. Trailers used during busy hours. The report does not enter deeply into the finances of the problem, but states that the communities apparently are using the best available transportation means for thinly settled territory.

R. L. McDuffie has recently entered the sales department of the Lackawanna Steel Company, for the Metropolitan district of New York.

On Sunday W. S. McGowan took a select party of railroad men from New York to Atlantic City by automobile. In the party, besides Mr. McGowan and his chauffeur, were Nelson Grayburn, of Montreal, E. W. Chilson, of J. G. White & Company, Carl Sylvester, of Boston. There were incidents to the trip. John G. Buehler, of Brooklyn, had also started out by "bubble" but got stalled at South Amboy. The case seemed rather hopeless, when to the joy of the party, McGowan came along in his "fifty," and the rescue was effected very courageously and expeditiously. The spectators say that nothing was finer than McGowan's presence of mind except the presence of his auto. He had been training for the emergency for three years.

LIGHTNING PROTECTION FOR ELECTRIC RAILWAYS*

BY E. E. F. CREIGHTON

In railway work the usual conditions are: Transmission at about 13,000 volts, a. c., and utilization at about 600 volts, d. c. The problem of protection is not the same for both.

For the d. c. system, where motors are operated at any and every point along the line, arresters must be carried with the apparatus and placed in the line to give protection to the apparatus. The d. c. voltage being comparatively low, the amount of insulation required is correspondingly low, consequently greater care must be taken to make the arrester give a high rate of discharge without a dangerous increase in potential, and also to make the circuit through the lightning arrester to ground short compared with the connecting wires to the controllers and motors. The conditions of lightning protection are usually favorable on most d. c. roads because the wires are generally contiguous to houses and overhanging trees which take most of the induced electricity from the clouds.

In an a. c. transmission circuit, especially in transformers, the insulation is much higher than in d. c. circuits; hence it is easier to obtain a good factor of safety in the design of the arrester. Furthermore, the a. c. apparatus is concentrated in stations instead of being distributed along the line, and only a small percentage of the lightning storms occur immediately over the station. An induced lightning stroke loses much of its potential while traveling along the line.

The plan of placing lightning arresters on an a. c. transmission line to protect insulators only is uneconomical and inadvisable. Relief gaps have been used at the insulators, but so far this device has not been entirely a success.

The usual sources of abnormal potential on the system and the forms of protection recommended are as follows:

(1) Direct stroke from cloud to line. Trust in Providence and hope for the best. If the lightning cloud is not large or the discharge is a side stroke, a modern lightning arrester may take the discharge from the line without damage if it is situated at the point struck. Such a stroke does not run along the line, but jumps over the nearest insulators down to the earth. Such strokes are infrequent.

(2) Induced stroke on the line from a cloud which discharges in the neighborhood: On the line at a point nearest the cloud a peak of abnormal potential occurs, usually covering less than a thousand feet. This freed charge usually spreads out over the line and runs into the station where it meets a choke coil. If the lightning arrester has a reasonable spark potential and a sufficient discharge rate, the charge is carried harmlessly to the ground before it can get through the lightning choke coil to the apparatus. If after this the dynamic current from the generators follows the discharge path of the lightning over the arrester, the latter must be capable of extinguishing this energy current without damage to itself or disturbance to the normal potential of the system. The actual quantity of electricity in such an induced stroke could be furnished many times over by even a small pocket battery, but the rate of discharge is so great that the power may be comparable to that of the generating apparatus. The durations of many of these strokes have been measured and usually can be expressed as a few thousandths of a second. Some-

*Read before the American Street & Interurban Railway Engineering Association, Atlantic City, N. J., Oct. 12, 13, 14, 15 and 16, 1908.

times several of these short discharges will occur in quick succession—as many as seven within a second have been recorded. These successive strokes give the effect of longer duration.

The protection against these high frequency transitory discharges involves choke coils, multigap or aluminum arresters on a. c. and single gap or aluminum arresters on d. c., with a short length of wire or strip connecting to thoroughly made grounds.

Third. An abnormal potential disturbance occasionally occurs on an a. c. electrical system and is not due directly to cloud lightning, although it often happens as a sequence and is attributed to lightning. A small boy with a stone and an accurate aim, however, may accomplish the same result. These surges occur when an accidental arc plays from any phase to either the earth or an insulated conductor of any kind. The usual location is an arc over a line insulator or a transformer bushing. The accidental arc is extinguished at every alternation of the generator wave and is reestablished in the reversed direction, and each time a surge is set up on the system. If the conditions of capacity and inductance on the system are favorable, these surges may have more destructive effect on the apparatus than cloud lightning. Their source is internal and they reach the weaker internal windings of generators and transformers where the lightning cannot penetrate. The duration of these surges is the same as the time the arc is allowed to play and is often many minutes. The surges are manifested most strongly on the phases not arcing to ground.

As to the protection for this condition, the older types of multigap arresters are not suitable. The generator current is caused to discharge continually through the arrester until the resistance becomes overheated and the cylinders welded together by the arcs. If the surges have only sufficient potential to discharge down the gaps to the high resistance, the modern graded resistance multigap arrester will carry the discharge for a number of minutes without damage to itself. The gap aluminum arrester for a. c. is designed to carry a continual discharge for a half-hour without damage to itself and is, therefore, the only one adapted to take care of these discharges. It is estimated that, in general, relief can be given by switching or otherwise within a half-hour.

Fourth. The fourth form of potential disturbance results from a short circuit of one phase of a multiphase generator and occurs on the phases not shorted. The excessive current in one phase in the armature reacts on the fields of the generator for an instant, over-exciting them, and thus causing the generation of excessive potentials. The duration is brief but since the energy of the generator is back of it, the destructive effects on the lightning arrester, which is designed only for normal potential, are difficult to avoid. This condition requires an extra factor of safety in the lightning arresters.

The breaking of a short-circuit arc on either a. c. or d. c. frequently produces an electro-magnetic kick of potential.

CHARACTERISTICS OF LIGHTING ARRESTERS

The characteristics of the graded shunt multigap arrester for a. c. and the gap arrester for d. c. have been already described before the association. A few brief statements, only, will be given here regarding the two types of aluminum arresters at this time.

In all the types of arresters employing ohmic resistance to limit the current of the generator to a value that would not cause a disturbance on the system, the same resistance limits the discharge rate of lightning and therefore maintains the lightning potential on the apparatus. In the aluminum arrester the current of the generator is limited independently of the discharge rate of the lightning current. This is done by the film on the surface of the aluminum plates. This film gives a counter electromotive force equal to the impressed voltage up to a definite limit. The actual pressure used is 300 volts per cell.

The arrester used on 600 volts d. c. has two cells in quart jars. These cells are connected directly to the circuit without the use of a spark gap. Since it is impracticable to go below a certain sized gap, it will require from 2000 to 3000 volts to bridge this gap. Choke coils must be depended upon to hold the potential from the apparatus and pile it up at the lightning arrester. The aluminum arrester, having no series gap, begins to discharge as soon as the voltage rises above normal. This early discharge tends to relieve the strain as rapidly as it appears. At normal generator potential the d. c. aluminum arrester has a leakage current ranging from 0.001 to 0.005 amp., but since the internal resistance of the 1908 arresters is about one-half ohm, the discharge rate is about 2 amp. for every volt above normal. If the lightning were severe enough to produce a 1000 amp. discharge it would raise the voltage at the terminals of the arrester from 600 to about 1200 volts, which is still within the safe limits. It should be noted that this current is not drawn from the generator. Since the latter produces only 600 volts and the counter electromotive force of the two cells remains 600 volts, practically no current is taken from the generator. The action is somewhat analogous to the safety valve on a steam boiler; it discharges only at excess pressure.

These good characteristics of the aluminum arrester will be of little avail, however, if proper precautions are not taken to keep the connecting leads short and of low inductance. Furthermore, the good qualities have been obtained at some sacrifice. Since there is a constant leakage of current through the cells there is a gradual destruction of the positive plate. Cells have been operating over a year. Renewals are easily made, but more inspection must be given, for the present at least, as the price of greater protection. On every system these aluminum arresters are recommended for the protection of valuable apparatus like generators and converters, with also an arrester for each feeder at the point where it enters the station. Where the present gap type of arresters is giving satisfaction there is no reason for changing, but where the lightning troubles are severe the aluminum arresters are recomended for use on cars, as auxiliary assistance to the car arresters and along the trolley where they should be spaced two to the mile.

In the a. c. arrester the cells take a different form. There is a stack of inverted cones spaced about a ¼ of an inch apart. Each space is partially filled with electrolyte. The wearing action of the alternating current is so great that it is advisable to place the gap in series with the cells. This gap is set slightly above normal line voltage so that the arrester comes into action only when required. This a. c. arrester has been in service several years and now may be considered quite beyond the experimental stage.

The best form of station ground is made by driving eight or more vertical iron pipes equally spaced 5 ft. to 8 ft. and encircling the building. The pipes should be connected by a metallic conductor, preferably strip copper. Greater conductivity will be obtained at each pipe by scooping out the dirt around it at the surface and placing therein a few pounds of salt. Water should then be poured into this basin to carry the salt to the stratum of earth of

good conductivity. The basin may then be refilled with dirt.

This paper is intended to give only a brief review of the general conditions of lightning protection and does not take up special conditions and problems.

ASCERTAINING THE RELATIVE WEARING PROPERTIES OF RAIL STEEL

E. H. Saniter, in a paper read before the Iron & Steel Institute of Great Birtain, described a machine for ascertaining rail wear as it takes place in practice. The principle on which the test depends is that of a round test piece which revolves and rotates by friction the inner ring of a ball bearing loaded with a fixed weight, the action being very similar to the action of a wheel rolling on a rail. The test piece is made long enough to project well through the ball bearing and thus prevent any material side flow of the metal. The test piece at the part used is carefully measured with a micrometer gage, to the ten-thousandth part of an inch, before and after the test, and the wear test number as given in the table below is the number of 10,000 parts of an inch by which the diameter has been reduced.

The following table gives the comparative results obtained on steels of varying hardness:

	Carbon.	Silicon.	Sulphur.	Phosphorus.	Manganese.	Nickel.	Wear No.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	
Rail . . .	0·63	0 2·7	0·029	0·029	0·72	3 62	28
Rail . . .	0 77	0·064	0·022	0·012	0·78	Nil	45
Rail . . .	0·71	0 0.3	0 019	0·010	0·72	"	48
Tram Rail . .	0·59	0·278	0·026	0 031	0 82	"	48
Tram Rail . .	0·51	0·313	0·056	0·057	0 68	"	64
Rail . . .	0 43	0·215	0·059	0·055	1·04	"	65
Rail . . .	0·40	0·094	0·056	0·058	1·08	"	67
Axle . . .	0·30	0·114	0·028	0·027	0·69	"	75

The smallest wear number shows the least wear, and consequently represents the best wearing steel. The test pieces are taken from the top corner of the rail head, and in a longitudinal direction.

OLD AGE PENSIONS IN ENGLAND

At the seventh annual conference of the Municipal Tramways Association of Great Britain, held Sept. 23 to 25, Alderman H. Linsley, chairman of the Salford Corporation Tramways, presented some information on what British tramways are doing for superannuated employees.

In Glasgow the Corporation Tramways Friendly Society started a superannuation fund in 1899. The revenue of this fund consists of a penny per week per member of the society, and a like sum per member is contributed by the Tramways committee. The proceeds from the sale of all unclaimed property found in the cars, all money found in the cars, and the conductors' "overs" is also added to this fund; and nothing is to be drawn from the fund until 1911. No employee is eligible to draw from the fund until he has been in the service and a member of the society for 15 years, and in any case he has to be physically unfit for any kind of departmental work. At the end of 15 years' service an employee has a retiring allowance of 10s. per week, rising to 20s. per week after 25 years' service.

The Liverpool Corporation Tramways Department has also adopted a scheme for providing retiring allowances to its employees, based on somewhat similar lines to those in Glasgow. It has decided to make no payments out of the funds for ten years.

Belfast, however, has adopted a scheme which not only covers its tramway employees, but all city employees who are paid weekly. An employee unable to follow his employment through sickness or accident is allowed one-half of the average of the weekly wages he receives, but payment at this rate only goes on for a certain period, and then the amount is graduated. This means, therefore, that an employee rendered unfit for duty by an accident receives half wages under the Government Compensation act, and the other half from the Corporation Society. The scheme also provides for retiring allowances for members disabled by reason of sickness or injury, or as may retire or be discharged from employment because of age or infirmity. On a member attaining the age of 60 or 65 years, and having been a member of the society for 20 years, he is allowed a retiring allowance equal to one-half of the average of his weekly wage for ten years previous to his retirement. Payment on these lines did not operate immediately from the commencement of the society, but a graduated scale was adopted for the first five years. There are also payments on dismissal and death.

STORAGE BATTERY CARS ON PRUSSIAN STATE RAILWAY

According to London "Engineering" the Prussian Railway department has placed orders for a somewhat novel type of accumulator car with three firms, each of which will build 19 cars, according to the designs of Oberbaurat Wittfeld. The firms are the Allgemeine Elektricitats-Gesellschaft, the Siemens-Schuckert-Werke and the Felten & Guilleaume-Lahmeyer-Werke. The first-mentioned firm will also supply the electrical equipment; the carriages themselves are being built by the Breslauer Aktien-Gesellschaft fur Eisenbahn Wagenbau, and the batteries are being furnished by the Akkumulatoren Fabrik A.-G., of Berlin and Hagen. The cars are to serve as feeders to express trains and also care for the suburban traffic of the provincial towns. The first of these new accumulator trains has been tested on the Templehof-Zossen experimental line, which has so often been mentioned. Each carriage consists of a car body proper, of the ordinary height, and a lower portion containing the batteries, the whole running on two axles. The car body is subdivided into two compartments, corresponding to the third and fourth classes of Prussian railways. The battery space, which is in the front of the front car and in the rear of the rear car, is entirely separated from the compartments. The electrical equipment consists of two series motors with commutating poles, of 50 h.p. or 80 h.p. each. The battery comprises 168 cells, of 310 volts, and a capacity of 368 ampere-hours. The maximum speed is 50 km. (31 miles) per hour, and the train can run at least 100 km. (62 miles fully loaded. If one of the batteries should be damaged, the train will be able to continue with the other battery. Air brakes can be set either by the motorman or from any compartment. The brake operates in connection with a "deadman's" handle on the controller. Each train will accommodate 100 passengers. Among the lines on which the new cars are being put in service are the following: Gladbach-Julich-Duren, Osterfeld-Borbeck-Heissen and Heissen-Altendorf-Hattingen, Koln-Remagen, Koln-Aachen, and Koln-Niederlahnstein. These are all in the Rhenish districts, and the last-mentioned line is 80 km. long. Niederlahnstein is a little beyond Coblentz. On the line Konigsberg-Insterburg, in East Prussia kingdom, these cars are likewise being introduced. The experiment is therefore started on a fairly large scale.

ADDRESS OF PRESIDENT SIMMONS TO THE ENGINEERING ASSOCIATION

The annual address of the President of the Engineering Association, F. G. Simmons, was as follows:

This, the sixth annual convention of our association, is remarkable in view of the fact that we convene for the second successive time at one city. All who were here last year will agree that no better location could have been selected for the inauguration of this change in precedent. The example set by last year's convention gives us all a feeling of certainty that the present convention will be a bright and shining success. That some city located further to the west was not selected at this time is undoubtedly due to the fact that the business depression which is being generally felt throughout the country appeared in the eyes of those to whom were allotted the task of fixing the meeting place, good and sufficient reason for once more assembling on the Atlantic seaboard. Atlantic City last year proved her ability to take care of these conventions in a manner beyond criticism and we may rest assured that she will fully uphold her reputation.

It is with a great deal of pleasure indeed that I am able to call your attention to the fact that the reports of all the committees, and the Question Box also, have been published and distributed to the members for over two weeks past, in fact some of them have been out for nearly a month. This, gentlemen, is a state of affairs we have been endeavoring to bring about for years past and I believe you will appreciate its advantages.

Your Executive Committee have exerted themselves in every manner possible to this end, but nothing could have been accomplished without the enthusiastic co-operation of others, and the Association owes a debt of gratitude to the various committee chairmen and their co-workers on the committees, to your able, efficient and energetic secretary, who has labored unceasingly for this happy result, and to the enthusiastic help which has been rendered us by the secretary of the main association and his assistants.

The idea of carrying on the work of the association by means of Standing Committees, which was so ably put before you by our Past-President, Mr. Adams, in his addresses to the conventions at Columbus and here in Atlantic City last year, has been put into effect to such an extent that, as you have undoubtedly noted, all the work presented by the association this year, except only the Question Box, is presented through the medium of Standing Committees, and it might be said that for years past the secretary has been a Committee of One appointed to handle the Question Box.

We have at the present time nine standing committees covering practically the entire field, but it will undoubtedly be found desirable to add to, change and supplement these committees as we progress further and get more deeply into this important work.

The reports submitted this year cover a broad field and represent much effort and much sacrifice on the part of the gentlemen responsible for them. Their value is beyond dispute, and as the committees continue from year to year, methods of standard practice should be developed that, backed with the approval of our association and the main association, will eventually save to the street and interurban railway interests the gigantic sums now being expended in experimenting and through the lack of unification now existing in the business, in a manner and upon the same lines that great savings were and are being effected by the steam railway interests.

It is advisable in my opinion that our standing committees should endeavor to make definite recommendations as their work progresses in manner similar to the work already accomplished by our standardization committee, for all these committees should be in effect standardization committees.

These recommendations will of course require and entail much work in preparation and will and should be submitted to much discussion before the conventions in order that the very best possible conclusions may be arrived at, but it is strictly within the province of this association to arrive at these conclusions, and thereafter present the recommendations to the main association.

In connection with the work of our committees there is one vital point which I desire to bring to your attention at this time, and that is the difficulty so often encountered in securing answers to the data sheets sent out. It is certainly wrong that only thirty-two answers, and in many cases a less number, should be received to inquiries for data sent out to nearly two hundred member companies. Two excuses exist for this (there can scarcely be a reason): the first, apathy on the part of many of the companies; the second, a failure to account their operations so as to make the required data obtainable. To correct the apathy it should only be necessary to bring to the attention of the responsible head of the company the fact that his fees paid for membership are being thrown away unless he is willing to participate in the work being accomplished to the extent of seeing that these question and data sheets receive careful consideration and are given as full an answer as possible. The results to be finally obtained therefrom are the reasons for our existence and the object of his expense. In some cases certain data required by the committees is not obtainable on account of the methods of accounting employed, and it would appear that a Joint Committee of the Accountants and Engineers might at this time devise ways and means to at least partially overcome this difficulty. It is undoubtedly essential that all the member companies see to it that some qualified officer give proper consideration and a formal answer to all inquiries along the lines suggested above, which they may receive.

You will have observed that notice has been sent out upon order of the Executive Committee thirty days in advance of the convention calling for a vote of the association upon three proposed changes in the Constitution and By-Laws; these are all important and deserve your careful consideration. If you are not informed as to the reasons leading up to their introduction I am sure that any member of the Executive Committee will be glad to explain matters in order that you may later be enabled to discuss them and vote on them intelligently.

The Executive Committee, as you have seen by the program and as you will be advised by their report, has set aside one entire day to be devoted to the inspection of exhibits. This was intended in no sense as an intermission in the work. The committee had brought before it much complaint to the effect that our sessions were so long and strenuous that little opportunity was had to inspect the comprehensive and instructive display of the manufacturers, and it was thought advisable to set apart a day for this purpose. In both your own interest and in the interest of the Manufacturers' Association I ask that everyone do actually devote this day to the purpose for which it was intended.

The American Street and Interurban Railway Association and its affiliated Associations, the Accountants', Engineers' and Claim Agents', have been much strengthened during the year since the last convention by the organization of the Transportation & Traffic Association. This completes our circle, or to be more exact our square, there now being four subsidiary associations covering the full field of street railway work.

In conclusion, I desire to beg your indulgence and solicit your assistance in carrying on the impending sessions of this association. There is much work to do in the time alloted. It is advisable that a full and free discussion of every report be had, and as these reports have been in your hands for some time and have undoubtedly been carefully studied by you, we can rightfully expect an unusually free and intelligent discussion of them. For this very reason, however, you will have had an opportunity so to digest the report and understand its purpose that you will be in a position greatly to assist the chair by bringing into our sessions only that which is material and pertinent.

It is also of extreme importance that you report promptly at the time set for the various sessions, and I wish to impress on everyone the necessity for their particular presence. The committeemen are sufficiently interested that they will of course be present, but it is fully as or more important that lay members attend and participate in the discussions for only in this manner can the best results be obtained.

Let us treat this, gentlemen, as we treat our daily sessions at our office desk. Let the time set appeal to us as would an appointment on our daily work and there will then be no difficulty in carrying on this convention in an orderly, satisfactory and business-like manner.

CONVENTION PROGRAM FOR TO-DAY

Claim Agents' Association

(TRAYMORE HOTEL)

9:30 A. M. to 12:30 P. M.

Question Box.
Discussion—"The Medical Side of the Prevention of Accidents."
General Business.
Reports of Convention Committees.
General Business.
Report of Nominating Committee.
Election of Officers.
Installation of Officers.
Adjournment.

Transportation and Traffic Association

(GREEK TEMPLE)

9:30 A. M. to 12:30 P. M.

Appointment of Committee on Nominations.
Symposium—"The Possibilities of a Well Conducted Publicity Department" (led by A. W. Warnock, 3d Vice-President).
Papers by:
- George Sabin Brush, Clerk, Transportation Department, Boston Elevated Railway Co., Boston, Mass.
- B. R. Stephens, General Traffic Manager, Illinois Traction System, Springfield, Ill.
- Charles E. Flagg, Department of Publicity, Inland Empire System, Spokane, Wash.
- George H. Gall, Publicity Manager, Washington, Baltimore & Annapolis Electric Railway Co., Baltimore, Md.
- Charles W. Lamb, Advertising Expert, Milwaukee, Wis.

Report of Committee on Interurban Rules.

Accountants' Association

(CHALFONTE HOTEL)

9:30 A. M. to 12:30 P. M.

Convention Called to Order.
Annual Address of President.
Annual Report of Executive Committee.
Annual Report of Secretary-Treasurer.
Paper—"Organization of the Accounting Department of an Electric Railway and Light Company," by A. R. Patterson, General Auditor, Savannah Electric Railway Company, Savannah, Ga.
Report of Committee on "Collection of Blanks and Forms," by Elmer M. White, Secretary, Accountants' Association, Brooklyn, N. Y.
Appointment of Convention Committees.
New Business.

1:00 P. M.

"Get-together Luncheon." (Place to be announced at morning session.)

Engineering Association

(AQUARIUM COURT HALL)

9:30 A. M. to 12:30 P. M.

Report of Committee on Standardization.
Report of Committee on Power Generation.

2:00 P. M. to 5:00 P. M.

Report of Committee on Control.
Appointment of Nominating Committee.
Report of Committee on Power Distribution.

American Association

(GREEK TEMPLE)

2:00 P. M. to 5:00 P. M. (Executive Session.)

Appointment of Nominating Committee.
Reports of Committees.
- (a) Education.
- (b) Compensation for Carrying Mail.
- (c) Interstate Commerce Commission Classification.
- (d) Committee to Confer with Interstate Commerce Commission on Depreciation.

An enthusiastic astronomer who had often recommended to his wife the study of the stars was surprised one day when she told him that never until then had she appreciated the use of the telescope. She had often wondered what the Browns were doing at night and now knew that they sat up making their own pickles. Rich folks, but Lord, how stingy! The fishermen from the convention bobbing around the horizon six or seven miles out in the long, lazy swells, and concocting fish stories in the intervals of otherwise relieving their minds, may be astonished to learn that they are being watched by a whole city full through the Brill telescope mounted at the end of the car trestle. This exhibit shows also how a Brill car can be telescoped without the slightest damage or change in its interior anatomy. By day the telescope is trained on the ocean's surface, and picks up remote steamers with the ease of a derrick. At night it is fitted with a powerful celestial lens, and then you can tell at once the difference between the milky way and the whiskey way. The moon has been brought at once within the range of convention politics and its distance from Atlantic City accounts for the fact that on Sunday night it was seen to be full. The J. G. Brill Company have added to the entertainment of a great many people by this optical addition to the resources of the week. Even the older people now stay out in the sentimental moonlight.

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It costs $12,000 a year to illuminate Atlantic City's boardwalk.

CARRYING UNITED STATES MAIL ON STREET RAILWAYS—ITS ADVANTAGES AND DISADVANTAGES AND THE COMPENSATION THEREFOR*

BY C. H. HILE, ASSISTANT TO VICE-PRESIDENT, BOSTON ELEVATED RAILWAY COMPANY, BOSTON, MASS.

The use of street railways for the carrying of United States mail began early in the days of electric street railroading, the first attempt being made in St. Louis in 1892.

The first line was a railway postoffice car running from Sixth and Locust Streets westward to the city's limits, a distance of about 6 miles, the schedule time being 40 minutes.

In Boston, where the railway postoffice car service was established in 1895, it is believed that the possibilities foreseen by Postmaster-General Wanamaker have been most nearly attained. Besides Boston, six cities and towns lying in the metropolitan district are served by the railway postoffice car service furnished by the Boston Elevated Railway Company. Within the limits of Boston and the six cities and towns 25 sub-stations are served. The number of deliveries and dispatches of mail varies from one to 40 per day, depending upon the importance of the station and its location with respect to the routes laid out.

The railway company maintains 12 railway postoffice cars for this service, all fully equipped for the "working" of mail en route. The work is laid out in 22 routes varying in distance from three to 24 miles per round trip. Sixteen mail clerks are assigned to this service by the Boston postoffice authorities, and their work is performed on the cars to the great saving of time in the dispatch of mail matter and the advantage of saving much needed room in the main office for the number of men and mail they handle en route.

In addition to the mail-car service about a dozen routes are in operation for the dispatch of closed pouch mail on the regular passenger cars. The railway postoffice car mileage for the Boston service amounted to 231,381 miles in 1897, with about 16,000 miles of closed-pouch service.

By the system of mail dispatch and delivery thus worked out by the Boston postoffice officials incalculable advantages in the matter of prompt delivery of all mail matter in transit are gained. Letters from the surrounding towns and the various substations destined for New York and out-of-town business centers are collected, "worked" en route and delivered directly to the steam-railroad stations, instead of being carried to the main office as formerly and there "worked" and sent to the steam-railroad stations by wagons.

The system of service here instituted particularly lends itself to the quick dispatch and delivery of mail matter between the towns covered and the local business centers where substations are established. The Boston postoffice officials have especially perfected the service to this end. Where it used to take hours and even more than a day for a letter to go from one town or community to another, it is now a matter of minutes or a few hours at most. Early in the service the advantage of a night route was appreciated by the Boston officials. The railway company provided a 25-ft. car fully equipped for the handling and "working" of the mail. The car starts after midnight with two clerks, taking in seven cities and towns, calling at 20 postoffices, and by the time it reaches the main office it has covered about 70 miles. All the mail matter which has been collected from the street boxes and brought to the local substations or postoffices is taken on the car and "worked" in transit and delivered at a point where it is ready for the hands of the letter carriers for the first delivery, or at the steam-road station if destined for out of town. Previously the letters of the late evening mailing would be collected and left at the local postoffice or substation, where it would lie until next morning, then have to be "worked," sent into the main office in Boston and there "worked" and sent out by wagon, car or steam train to its destination.

The highest attainment of the Postoffice Department should be to carry first-class mail matter in the very shortest possible time from the point of dispatch to the point of delivery. That the postoffice officials appreciate the desirability of giving the people the best service is fully shown in their annual reports and recommendations, as well as in their endeavors to secure from the railroads and steamship companies fast train and boat service, and also as shown in their adoption of, and experimentation with, the pneumatic-tube service in the larger cities. However, the one means which prevented the widest possibilities for saving time and labor and giving expedition to the service has not been availed of to nearly the extent that it could and should be. The street railways, with their lines running to the homes and business places of the people, touching the business centers and connecting suburban cities and towns, offer quick and reliable facilities for the realization of all the advantages postoffice officials have so fully outlined in their annual reports.

They can supplant and improve immensely the wagon service still in use, supplement and expedite the carrier and messenger service and simplify and cheapen rural free delivery, and, at the same time, afford the advantages of the railway postoffice steam-road service, which enables railway clerks to "work" mail en route.

While the first attempt to utilize the street railways for carrying mail began in 1892, the extension and development was slow, and not until 1895 did there appear to be much evidence of growth or an active appreciation of the possibilities of the service. In this year the service was instituted in Boston by an agreement with the West End Street Railway Company. The railway postoffice service began with eleven 16-ft. cars, with a compensation of 11.68 cents per car mile. To-day there are 12 cars maintained by the railway company, and for the 16-ft. cars the compensation now amounts to 15.9 cents per car mile. In a period of 11 years the car mileage on the Boston system has increased from 166,655 in 1897 to 231,381 in 1907, or at an average rate of increase of about 3.88 per cent.

The total number of street-railway mail routes reported in 1906 was 487 (including railway postoffice car and closed-pouch service). In the same period covered from the beginning of the use of street railways for the carrying of mail, i. e., from 1892 to 1896, the postoffice report shows that on the steam roads the number of mail routes have increased from 2261 to 3168, or 907 new routes established. In 1897 there were 65 railway postoffice cars reported in service throughout the United States on street and cable roads, and in 1907 the postoffice reports showed 28 cars. The car mileage dropped from 1,612,829 in 1897 to 795,252 in 1905.

During this period of development of the street-railway mail-carrying service the growth in the upbuilding and ex-

*Read before the American Street and Interurban Railway Transportation and Traffic Association, Atlantic City, N. J., October 12, 13, 14, 15 and 16, 1908.

tension of electric street and interurban railways has been phenomenal.

When you take into consideration all these facts and read the fine endorsements of the street-railway mail service and its possibilities by the postmasters-general and the officials having direct charge of such service, the conclusion is inevitable that there is something wrong somewhere, and that for some reason the public fails to get what it is entitled to from the Postoffice Department.

Looking into the history of the service from the beginning it would appear that a misconception of the value of the street-railway mail facilities existed in the minds of the postal authorities and to some extent, it might be said that the railway managements misconceived the advantages and value of the United States mail service as developed by the Postoffice Department.

Postmaster-General Bissell in his report for the year of 1893, in referring to the street-railway mail service, says:

"These companies can perform much service that otherwise would depend on star carriers; and as the visible outlay incurred by the roads is small, they are disposed to accept ordinary railroad rates for same."

Without any investigation as to the cost or value of this class of service, from the beginning it would appear that steam-railroad mail service and the compensation allowed therefor formed the basis for determining what remuneration the Government would allow the street-railway companies for the carrying of mail.

In the report of Second Assistant Postmaster J. Lowrie Bell, 1893, he says:

"The department has maintained the position that the maximum cost of electric service must not be in excess of the maximum pay for corresponding weights on steam roads; and the disposition of the managers is to accept of the application of the statutes and regulations governing steam carriage."

In the report of Postmaster-General William L. Wilson, 1895, he says:

"The system in operation on the steam roads has been adjusted to the electric and cable lines in such a manner as to render excellent service already and to promise further development."

It was upon such mistaken premises that the bill regulating street-railway mail service was formulated and presented in 1895 and later became a law.

In the same report in which the new regulations governing the compensation for the service rendered by the street railways (see report of Second Assistant Postmaster Neilson in Postoffice Department report in 1895), Second Assistant Postmaster Neilson says, referring to street-car mail service:

"The total expense, as near as it can be estimated, will be very much less than the present estimate for wagon service for the same amount of service rendered; that is, the same number of deliveries. However, by the electric lines the service will be more than doubled as compared with that rendered by the wagons, with a very slight increase over the present cost of the wagon service, if any. The impression is that the entire improvement will be gained for practically the same amount of expense to the government, which will undoubtedly be a most satisfactory result."

Regulation wagon service at this time was costing from 16 to 22 cents per wagon mile, while the bill recommended, allowed for a full railway postal car 16 ft. long and to be used for postal purposes only, a rate not to exceed 12 cents per car mile.

As shown in the foregoing quotation just what kind of service the street-railway service would replace, and in defining the operations and equipment of the postal cars, it is clearly indicated that the conditions under which steam road systems furnished mail service were radically different from those under which the street railways would be enabled to operate.

Take the railway postoffice car for example: With the steam road a car is added to a train, without an additional employee being added to the train crew; it in no way interferes with the running time of other service in the matter of right of way or incidental delays in mail collections. In the case of a street railway for every car that is operated two men must be employed, and with the frequency of service which is maintained by the railways interference with the regular passenger service is inevitable on account of the collection and delivery of mails and the giving of the right of way to mail cars. Also with the street railway postoffice car service, cost of maintenance is necessarily higher since each car must carry elaborate and complicated electric equipment, motors, etc., subject to the hard usage of city car service, while the steam railroad car is equipped with comparatively simple and standard apparatus used in ordinary steam road practice.

In the matter of carrying closed pouch mail, again the conditions are radically different. The trains on steam roads always have baggage cars or compartments for express and baggage giving ample spare space for mail pouches, under the care of a person whose only business it is to look after the contents of the baggage car or compartment, and little or no risk of such matter coming in contact with the traveling public.

In the case of the street railway, closed pouch mail is carried on the regular passenger car under the supervision of men whose duty is primarily looking after the safety and welfare of passengers and the revenue of the company.

Street railway cars are designed to give the greatest possible carrying capacity with the least weight and useless space, and as is well known in every city and town in which street railways are operated there are two periods occurring each day when every available foot of carrying space is needed for the accommodation of passenger traffic. It would, therefore, seem entirely reasonable to contend that, for the purposes of the postoffice authorities the use of street railways for carrying mail presents an entirely different proposition in their application, and in the consideration of compensation.

The postoffice officials seem to have approached the question of utilizing street railways, so far as their utility it concerned, with an appreciation of their capacity to perform, in a better and more expeditious manner, the work then being performed by wagon and carrier service, but in the matter of compensation, the steam road service furnished the more favorable basis for arranging rates of pay allowed rather than the service supplanted.

In the report of Postmaster-General Bissell, for 1893, he says:

"These companies (street railways) can perform much service that otherwise would depend on star carriers."

Second Assistant Postmaster J. Lowrie Bell in his report for 1893, says:

"In the aggregate it is believed that this class of service (street railway service) will be a saving in cost over star and mail messenger routes."

Yet the service under consideration was making it possible to make quicker and more frequent deliveries and dispatches of first-class mail. It was also making the sub-

station in postoffice administration a practical fact, bringing all the facilities of the main office almost to the doors of the people.

Besides the local benefits in supplanting wagon and messenger routes service, there has been, as, for instance, in Boston, an adaptation of the function of the steam railroad railway postoffice car whereby clerks are employed on the cars who "work" the mail en route, thus saving the post-office space, extra work in the main office and at the same time gaining hours for the delivery and dispatch of mail.

The street railway companies are legitimate business corporations, endeavoring, as do all honest business concerns, to fulfill their obligations to the public and at the same time earn fair returns upon the money invested by their stockholders.

While they are from the nature of their business semi-public institutions, there exists no reason or obligation, either moral or in law, why they should perform a service which continually entails a loss. It is a fact that the compensation allowed the street railways for the railway post-office service rendered is below cost. It is also a fact that at no time in the history of the development of the street railway mail service has the question of compensation been approached by the Government with the view of arriving at the actual value and cost of such service, or with any recognition of the right of the companies performing the service to fair returns upon their investment and costs.

The representative of the Postoffice Department of the United States who was making an investigation into the railway mail service of Great Britain and other European countries, in reporting to the postal authorities (see Second Assistant Postmaster's report, in report of Postoffice Department for year ending June 30, 1898, pages 318 and 320) states:

"In reply to a question as to what was regarded a reasonable compensation for a mail train, I was told that it must not in any event exceed the revenue derived by the railway company from an average passenger train of like size."

It is along some such lines that the question of reasonable remuneration should be taken up by the United States Government, and the prices for the service rendered be fixed upon a reasonable business basis. Since wages, fuel and material vary greatly between different localities, the cost for a given class of service should take such facts into consideration, and for this reason attempt should not be made to set a flat rate for the same service throughout the country.

The car mile has by custom become the chief unit in comparing street railway operations and in the case of a railway postoffice car there is absolutely no reason why it should not bear its proportion of expense per car mile, taking into consideration its size and weight. Since the single car is the unit in transportation, in city and town street railway service, whether the car be used for mail, freight, express or passenger service, no legitimate reason can be advanced why each car in proportion to its size and weight should not contribute its share toward the revenue of the company.

In these days of publicity in all that relates to public service corporations, with the facilities which the Interstate Commerce and State Railroad Commissions, and the Bureau of Commerce and Labor, have for securing correct information concerning costs of operation, earnings and capital accounts of railway companies, it would not seem a difficult task for the postoffice authorities, or a congressional committee, and the railway companies, to arrive at basic figures for determining what would be reasonable remuneration for the several classes of mail service now furnished by street railway companies.

Since costs entering into the furnishing of this service

Table I

SHOWING THE NUMBER OF MAIL ROUTES, MILES OF ROUTES, MILEAGE, EXPENDITURES, ETC., ENTERING INTO THE DEVELOPMENT OF THE USE OF STREET RAILWAYS FOR CARRYING U. S. MAIL FROM 1895 TO 1907 INCLUSIVE

Fiscal Year Ending June 30	Total No. of Mail Routes	Total Miles of Route	Total Mileage Operated	No. of R. P. O. Cars In Service	Miles of Road Oper. Upon by R. P. O. Cars	R. P. O. Car Mileage	Miles of Road Operated Upon as Pouch Service	Closed Pouch Mileage	Amount Recommended for the St. Ry. Service	Amount Appropriated for the St. Ry. Service	Amount Actually Expended for the St. Ry. Service
1895	19	†	.....	12	126.44	Oct. 26 serv. at rate of 73,356 Mi.	.....	.....	.....	.....	.....
1896	25	.....	.....	47	181.16	907,863	.....	.....	.....	.....	.....
1897	177	*1,102.0	3,452,173.5	65	303.68	1,612,829	798.24	2,368,786	$200,000.00	$150,000.00	$139,734.81
1898	229	1,550.2	4,501,801.7	71	379.47	1,744,694	1,304.43	2,296,703	325,000.00	250,000.00	204,936.06
1899	267	1,926.8	4,978,130.1	63	385.36	1,829,160	1,569.71	2,974,813	375,000.00	300,000.00	255,684.19
1900	287	2,346.9	5,700,303.4	25	202.86	566,858	1,905.84	3,307,991	350,000.00	350,000.00	288,358.40
1901	326	2,956.9	6,589,408.6	20	283.50	499,020	2,452.79	3,992,240	350,000.00	350,000.00	330,894.61
1902	327	3,503.1	7,534,757.1	24	330.50	608,805	2,899.32	4,6-0,086	500,000.00	400,000.00	389,987.61
1903	379	4,283.3	8,585,950.9	20	355.17	523,253	3,515.33	5,344,711	450,000.00	450,000.00	440,420.41
1904	421	4,915.8	9,515,920.3	24	399.07	596,855	4,119.63	6,398,556	510,000.00	510,000.00	484,346.24
1905	449	5,645.7	10,541,687.4	25	520.14	795 252	4,721.09	7,307,401	606,000.00	550,000.00	521,825.79
1906	460	6,014.7	11,114,183.9	27	....	....	....	....	615,000.00	600,000.00	556,219.05
1907	487	6,343.8	11,302,554.9	28	.....	.....	.....	.....	793,600.00	698,000.00	‡614,007.39
1908	.....	.....	.....	.....	.....	.....	.....	.....	920,000.00	.....	.....

†These amounts not reported upon in separate statement by the Post Office Department.
*Estimated. Records not completed on this item.
‡Annual rate of expenditur

The total number of mail routes, miles of routes and mileage in second, third and fourth columns include all Railway Post Office car, trailer, apartment and closed pouch routes.

While the postal laws of Great Britain are more peremptory in their application to railroads than in the United States, they at least recognize the principle of reasonable remuneration.

Section 19 of the postal laws of Great Britain reads:

"Every railway company shall be entitled to reasonable remuneration for any services performed by them in pursuance of this act with respect to the conveyance of mails, and such remuneration shall be paid by the Postmaster-General.

"Any differences between the Postmaster-General and any railway company as to the amount of such remuneration, or as to any other question arising under this act, shall be decided by arbitration in manner provided by the act of the session of the first and second years of the reign of her present majesty, chapter ninety-eight, or at the option of such railway company, by the Commissioners."

vary anywhere from 20 to 50 per cent, or even more, depending upon locality, it seems a fair and logical proposition that these facts should be taken into consideration in determining the rate of pay for mail service.

Table II, made up from the annual reports of the companies considered, illustrates the difference in costs, expenditures, etc., due to locality and operating conditions.

In any investigation which may be made, with the view of determining costs and fair compensation for street railway mail service, the importance of the recommendation made in the last annual report of the Postmaster-General, for the extension of the parcel post to the rural free delivery service and a reduction in the cost per pound for the present parcel post service should not be lost sight of. In the development of the street railway mail service, its use for the purposes of the Postoffice Department should expand and become more diversified than at present, but, upon the basis of present compensation allowed, such service must either be refused by the street railway companies, or the further burden of increased loss be borne.

Much as may be said upon the subject of street railway mail service, and however enthusiastically the postoffice officials may describe the great advantages of the service to the communities served, there is, probably, no influence so potent against a fair and unprejudiced consideration of the question of railway mail compensation, or for that matter, the consideration of any scheme looking to the fullest development of the postal facilities, by the Postoffice Department, than the condition foisted upon the people by the abuse of the law governing the carriage of second-class mail matter. In this connection it is interesting to read the following extracts from the reports of the Postoffice Department:

Table II

	Earnings From Operation per Car Mile	Operating Expenses per Car Mile	Charges Against Income per Car Mile
Average of all railways in Massachusetts, 1907	25.96c.	17.58c.	6.27c.
Boston Elevated Railway Co., 1907	26.9c.	18.6c.	6.8c.
Detroit United Railway, 1906	23.3c.	14.3c.	4.7c.
New Orleans Railway & Light Co., 1906	21.0c	12.5c.	.....

Postmaster-General James A. Gray, in his report for 1897, says:

"By the Acts of Congress passed in 1874, 1879, 1885 and 1894 a privileged class has been created, entitled to the use of the United States mail service either free of charge or at a cost far below the price the Government is compelled to pay the railroad companies for the transportation of the mails thus carried. The right thus conferred is entirely abstract from the right to frank official documents, which is given to members of Congress and the officials of the executive departments and other public servants. It is bestowed upon persons engaged in private enterprises, and inures simply to their emolument, without any appreciable benefit to the public at large, while the loss on this service, now amounting to more than $26,000,000 a year, is defrayed out of proceeds of taxation drawn from all classes of the people."

Postmaster-General Charles Emery Smith, in his report for 1899, refers to the abuses in second-class matter as follows:

"For this costly abuse, which drags on the department and weighs down the service, trammels its power and means of effective advancement in every direction, it involves a sheer wanton waste of $20,000,000 or upward a year. The postal deficit for the current year is $6,610,776. But for this wrongful application of the second-class rate, instead of a deficit, there would be a clear surplus of many millions. If this deadly burden upon the mails were removed the Department could hopefully enter upon a systematic policy of enlarged and progressive service with the assurance that sound business management and increasing facilities would bring commensurate returns which would not be swallowed up in the maw of private interests without any public advantage. This misapplication of a legitimate public object to strictly personal ends not only entails a large loss and taxes all the people for the benefit of a few, but it cripples the Department and obstructs needed improvements."

EMERGENCY STRAIGHT AIR-BRAKE EQUIPMENT

The General Electric Company is exhibiting this year an emergency straight airbrake equipment, developed for cars operating singly or in short trains of two to three motorcars, or a motorcar and one or two trailers. It is essentially a straight airbrake with the addition of an emergency valve and an auxiliary reservoir whose function is to cause the brakes to be automatically applied on all cars in the train in case of a break-in-two. The emergency valve consists of a piston, which operates a slide valve and which is normally held by a spring in such a position that the slide valve establishes connection between the brake cylinder and the service train line from the motorman's valves. One side of the piston is acted upon by the pressure of the air in the auxiliary reservoir, the other side of the piston being normally subjected to an equal pressure from the emergency train line. The auxiliary resorvoir is kept fully charged by a small port in the valve seat. The emergency train line is charged by leak grooves around the piston.

In case the emergency train line is opened to the atmosphere by the cars pulling apart, the pressure on the under side of the emergency valve piston is reduced, and the pressure of the auxiliary reservoir forces the piston down, moving the slide valve with it and connecting the brake cylinder direct to the auxiliary reservoir. The connection between the brake cylinder and service train line is cut off at the same time.

The motorman's valve is similar to the G. E. straight airbrake valve, except that it has an emergency position in which the emergency train line is connected to the atmosphere. In this position the emergency valves operate exactly as if the train had pulled apart. With this system an emergency application of the brakes can always be made, even if the main reservoir pressure has been lost, due to a leak in the reservoir or in the connections between it and the motorman's valves.

These equipments are being extensively used by a number of large city railway systems which operate two or more cars in trains during rush hours.

F. I. Fuller, general manager of the railway department of the Portland Railway, Light & Power Company, Portland, Ore., has returned to that city after a short stay in the East in the interest of the company. Mr. Fuller attended the fender tests at Schenectady, and is quoted by the Portland "Oregonian" as being favorably impressed with the methods adopted by the Public Service Commission of New York to determine the efficiency of the devices offered for trial by the various manufacturers. On his way West Mr. Fuller inspected a number of pay-as-you-enter cars which are being built for the Portland Railway, Light & Power Company in St. Louis. Mr. Fuller says that these new cars will be ready for delivery soon, and that they will all be placed in service for operation during the winter.

LUMINOUS ARC HEADLIGHTS

The adoption of the luminous arc lamp for street lighting has met with such success that it is now being used for headlights on city street and interurban cars. In this capacity it has been found to be in many respects a more efficient and reliable headlight than the enclosed carbon arc.

The accompanying illustration shows a headlight of this type made by the General Electric Company, which is similar in external appearance to the carbon headlight. It consists of a galvanized sheet steel casing reinforced by iron door castings, making a rigid structure.

The track illumination at night is excellent. The headlight not only illuminates the track for a distance of 1200 to 1800 ft. ahead of the car, but gives a broad beam. The lighting of a considerable area each side of the track is of assistance to a motorman in approaching curves and is an additional insurance against collision with vehicles, animals or persons approaching the track at road crossings.

The peculiar characteristics of the luminous arc are such that by reversing the current, thereby making the copper electrode negative, the light is reduced to such an extent as to make such a headlight suitable for city service. This is readily accomplished by a reversing switch installed in the car vestibule near the motorman.

The maintenance of the enclosed arc headlight for cars has been comparatively high on account of excessive globe breakage and resulting rapid consumption of carbons. A life of 2000 to 3000 hours for the positive electrode, 50 to 75 hours for the negative electrode, together with the absence of all enclosing globes, are strong arguments in favor of the luminous arc headlight.

In accordance with an agreement reached between the State Railroad Commission on Pennsylvania and the officials of the electric railways in that state at the recent conference in Harrisburg, relative to regulations designed further to minimize accidents, a committee has been appointed by Frank B. Musser, president of the Pennsylvania Street Railway Association, to confer with the Commission on these matters at a date to be announced by the State Railroad Commission in the near future. This committee consists of the following: Frank B. Musser, president, Central Pennsylvania Traction Company, Harrisburg; Charles O. Kruger, vice-president and general manager, Philadelphia Rapid Transit Company; Ernest H. Davis, secretary and general manager, Williamsport Passenger Railway; Hon. R. H. Koch, Pottsville, president, Danville & Bloomsburg Street Railway; J. W. Brown, Connellsville, superintendent of transportation, West Penn Railways; E. M. DuPont, superintendent and general manager, Johnstown Passenger Railway; E. R. Sponsler, Harrisburg, director, Lewistown & Reedsville Street Railway. Of this committee, Messrs. Musser, Kruger and Davis are officials of member-companies of the Pennsylvania Street Railway Association, while others will represent the electric railways of the State not affiliated with that organization. It is expected that a conference between this committee and the State Railroad Commission will be held within the next two weeks.

The introduction of petrol-electric motor coaches on the Arad-Csarras Railways in Hungary for the light traffic has resulted in a great financial improvement. Two sizes of car with 40 h.p. and 80 h.p. equipments are used, either alone or in combination with one or two trailers.

WESTINGHOUSE AMM TRACTION BRAKE EQUIPMENT

The Westinghouse Traction Brake Company is showing its types AMM and SME air brake equipments at the exhibit of the Westinghouse Companies. These brakes are designed for interurban and city service, respectively. The type AMM brake equipment is for use in interurban service where trains of from one to five cars must be operated at slow speed with frequent stops inside the city limits, but must also run at high speed for comparatively long distances between towns. This service covers a wide range of operating conditions which can be met only by an automatic air brake system. Straight-air brakes could not meet the emergencies that may arise, such as damage to the piping system or a break-in-two of the train, nor could the proper operation of the brakes in ordinary service be depended upon.

The equipment is so constructed that the auxiliary reservoirs are quickly recharged when a release is made, thus insuring positive response of the brakes even when rapid successive brake applications are required. In addition, the brakes are quickly applied successively from car to car so that the motorman has normal control over his train for a smooth and efficient stop and also can apply the highest emergency brake pressure when a quick stop is necessary. Two pipe lines are used throughout the train, known as the brake and control pipes. The first corresponds to the single pipe of the old standard automatic brake system used on steam roads. It is used by the motorman for applying and releasing the brakes and also for recharging the auxiliary reservoirs. The control pipe connects together the reservoirs on each car and also supplies air to the brake triple valves on each car to assist in obtaining a graduated release of the brakes, as well as a quick recharging of the reservoirs and supplying the high pressure required for emergency applications. Any desired braking pressure may be carried, and the change from high to low pressure requires no additional apparatus of any sort. The AMM brake equipment is designed especially to operate successfully under all the conditions to be met with short trains in modern electric traction.

At the September meeting of the Iron & Steel Institute of Great Britain, Charles H. Merz described the Carville station which supplies power to numerous industries and railways on the northeast coast of England about New Castle. This plant has an aggregate capacity of 56,000 e. hp, and is the largest public supply plant in Europe; in fact it represents one-ninth of the total output of all public supply stations in the United Kingdom. The cost per kw-hour is said to be extremely low because of the utilization of heat from coke ovens and blast furnaces for the water-tube boilers and of the exhaust heat from rolling mills for low-pressure turbines. The generating potentials are 3000 and 6000 volts, 3-phase at 40 cycles. Power is distributed at various voltages ranging from 20,000 to 250 volts a.c. and from 600 to 240 volts d.c.

Delegates should call at the exhibit of the American Brake Shoe & Foundry Company, Marine Hall, spaces 763-67, and have explained to them the difference between old and standard practice as regards brake heads and shoes. The company's representatives are present to explain the value of standardization in reducing the cost of brake shoe maintenance.

REPORT OF THE COMMITTEE ON TRAINING OF TRANSPORTATION EMPLOYEES*

BY J. W. BROWN, CHAIRMAN, E. P. SHAW, JR., W. R. W. GRIFFIN, L. K. BURGE, C. D. EMMONS, H. W. FULLER.

Rapid developments in the traction field during the past few years have greatly changed the surroundings of the transportation employee. A comparison of conditions existing in the early days with present-day conditions emphasizes the radical changes that have taken place. Back in the horse-car days the principal qualifications of the front platform man were an ability to wield the gad and to endure from fifteen to eighteen hours' exposure a day. A stiff hand brake, a whip and the lines constituted the paraphernalia. An approximate adherence to a schedule of from 5 to 7 miles per hour was also considered sufficient. To-day the situation is different. Congested city streets, close headway of cars, heavier equipment and more frequent stops all tend to make requirements severe on city service, as compared with those of early days. The modern interurban car presents a still more complicated situation, with its multiple-unit control and automatic air brakes, with the attendant contactors, reversers, governors, pumps and various other devices. In addition to possessing a clear and comprehensive knowledge of this equipment and its operation, the present-day motorman must adhere to a schedule which splits minutes and calls at times for a speed of 50 to 65 miles per hour, while "19" and "31" orders, block signals, semaphores and interlocking switches demand quick and accurate interpretation.

The responsibilities of the present-day conductor have also increased greatly during the evolution which has been taking place, and to-day the electric railway service calls for men of intelligence, keen perception, acute senses and thorough training to their work.

While the last few years have shown a rapid advancement in the mechanical and electrical development of traction properties, we feel that the education of the employees, to whom is charged the care and operation of these advanced mechanical and electrical features, has not kept pace with the necessities of the case. We find that on a number of roads little care is taken in the selection of employees, and their subsequent training.

With a desire to obtain the views of operating officials on the selection and training of transportation employees, your committee mailed inquiry sheets, through the office of the Secretary, to the member companies, requesting replies to a number of questions bearing on the subject. One hundred and eighty-seven companies have replied to this request, showing considerable interest on the part of operating officials in the work.

CLASSIFICATION OF COMPANIES BY KIND OF LINE OPERATED

The companies replying have been classified as to kind of lines operated, as follows:

City only	44
City and interurban	53
City and suburban	49
City, interurban and suburban	21
Interurban only	19
Suburban only	1
Total companies replying	187

*Read before the American Street and Interurban Railway Transportation and Traffic Association, Atlantic City, N. J., October 12, 13, 14, 15 and 16, 1908.

INTERURBAN LINES ONLY, SINGLE OR DOUBLE TRACK

In answer to the question, "If Interurban, Single or Double Track?" 102 companies have replied, as follows:

Single track	70
Double track	10
Both single and double track	22
Total companies replying	102

COMPANIES OPERATING UNDER STANDARD CODE OF RULES

In reply to the question, "Do you operate under the Standard Code of Rules of the American Street and Interurban Railway Association?" 182 companies answered, as follows:

42 companies reply in the affirmative.
47 companies use them in part.
93 companies reply in the negative.

Noting the wide variation in the matter of the standard code of rules, this committee feels that the report of the Committee on Rules should receive earnest attention, to the end that uniform rules may become effective as far as possible on the lines of the member companies.

The Selection of Employees

AGE LIMIT FOR TRAINMEN

The following replies to the question, "Between what ages do you employ conductors and motormen?" have been received:

2 companies, over 17 years of age.
11 companies, between 18 and 45 years of age.
76 companies, between 21 and 40 years of age.
59 companies, between 21 and 45 years of age.
9 companies, between 21 and 50 years of age.
6 companies, between 23 and 45 years of age.
9 companies, between 25 and 35 years of age.
13 companies, between 25 and 45 years of age.

A few companies report that they have no set rule on this point.

1 road employs conductors only at the age of 16 years.
2 roads employ conductors only at the age of 17 years.
6 roads employ conductors only at the age of 18 years.
8 roads employ conductors only at the age of 20 years.

The remaining companies which have replied, employ conductors 21 years of age or over, the limit being 50 years, with the exception of one company, the limit of which is 60 years.

With the exception of six companies, all those reporting do not employ motormen under 21 years of age. The maximum age limit for motormen on these roads is placed at 50 years in all instances, excepting two, where the limit is put at 60 years.

The recommendation of your committee is that the age limits for both conductors and motormen be between 21 and 40 years.

WEIGHT AND HEIGHT REQUIREMENTS

Below is given a summary of the answers received to the question, "Do you have a weight and height limit? If so, what are they?"

MINIMUM WEIGHT

Motormen and Conductors.
1 company, 120 lb.
1 company, 125 lb.
1 company, 130 lb.
1 company, 135 lb.
3 companies, 140 lb.
5 companies, 145 lb.
6 companies, 150 lb.
2 companies, 160 lb.
1 company, 170 lb.
1 company, 175 lb.
2 companies, 200 lb.

Motormen Only.
2 companies, 135 lb.
3 companies, 140 lb.
4 companies, 145 lb.
14 companies, 150 lb.
8 companies, 160 lb.
2 companies, 165 lb.
2 companies, 175 lb.

Conductors Only.
2 companies, 120 lb.
2 companies, 125 lb.
5 companies, 130 lb.
2 companies, 135 lb.
2 companies, 140 lb.
1 company, 145 lb.
1 company, 150 lb.
1 company, 165 lb.

MAXIMUM WEIGHT

Motormen and Conductors.

1 company, 150 lb.
1 company, 185 lb.
1 company, 200 lb.
1 company, 225 lb.
1 company, 250 lb.

Motormen Only.

3 companies, 200 lb.
1 company, 210 lb.
1 company, 220 lb.

Conductors Only.

1 company, 175 lb.

MINIMUM HEIGHT

Motormen and Conductors.

1 company, 5 ft.
1 company, 5 ft. 2 in.
1 company, 5 ft. 3 in.
2 companies, 5 ft. 4 in.
2 companies, 5 ft. 5 in.
17 companies, 5 ft. 6 in.
10 companies, 5 ft. 7 in.
2 companies, 5 ft. 7½ in.
7 companies, 5 ft. 8 in.
1 company, 5 ft. 9 in.
1 company, 5 ft. 10 in.

MAXIMUM HEIGHT

Motormen and Conductors.

2 companies, 6 ft.
1 company, 6 ft. 2 in.
1 company, 6 ft. 6 in.
1 company, 6 ft. 11 in.

MINIMUM HEIGHT

Motormen Only.

9 companies, 5 ft. 6 in.
6 companies, 5 ft. 7 in.
5 companies, 5 ft. 8 in.
1 company, 5 ft. 10 in.
1 company, 6 ft. 1 in.

Conductors Only.

2 companies. 5 ft. 4 in.
1 company, 5 ft. 5 in.
6 companies, 5 ft. 6 in.
10 companies, 5 ft. 9 in.

One hundred and two companies report that they have no weight or height limit.

From this it appears that most of the roads reporting do not attach a great deal of importance to this requirement.

This committee recommends as follows:

Weight.—Conductors: Minimum, 130 lb.; maximum, 200 lb. Motormen: Minimum, 150 lb.

Height.—Conductors and motormen: Minimum, 5 ft. 6 in.

Note.—In interurban service, using airbrakes, and remote control, the necessity of having motormen weighing 150 lb. is not so great as in city service, where hand brakes are used.

PREFERENCE FOR EXPERIENCED OR INEXPERIENCED TRAINMEN

In answer to the question, "Do you prefer men having previous electric railway experience or men without experience?" the following replies have been received:

104 companies report that they prefer men without previous electric railway experience.
55 companies prefer men with previous experience, if records are good.
12 companies report that they have no preference.
15 companies prefer experienced motormen.

It is the recommendation of the committee that men with previous experience be employed, provided that such experience was in the same class of service as that applied for and that previous record is entirely satisfactory, especially after a uniform set of rules has been adopted.

To the question "If the latter, do you prefer country or city-bred men?" the following replies have been received:

118 companies report that they prefer country-bred men.
34 companies report no preference.
8 prefer city men.
1 prefers country-bred men for motormen.
1 prefers country-bred men, without trade, for city and suburban service; country-bred, with trade, for interurban service.

It appears that the preponderance is in favor of the country-bred man, and in this the committee concurs, especially for interurban service, as observation has shown that in city service the country-bred employee is more susceptible to the allurements of the city than one who has grown up in the midst of them.

PREFERENCE FOR MEN HAVING STEAM RAILROAD EXPERIENCE FOR INTERURBAN WORK

To the question "On interurban divisions, do you favor employing men of steam railroad experience?" replies as follows have been received:

91 companies make no reply.
60 companies report that they do not favor it.
22 companies report favorably.
7 companies report that they have no choice.
2 companies report that they have no interurban division.
3 companies report favorably as to motormen only.

It appears that of those companies reporting, the preference is for men without steam railroad experience, in which view the committee concurs.

NATIONALITY OF EMPLOYEES

The questions, "Do you employ others than Americans? If so, what nationalities?" brought forth replies as follows:

107 companies report that they do hire other than Americans.
77 companies report that they do not hire other than Americans.

In nearly every instance where other than Americans are employed it is required that applicant must speak English well and be possessed of the required intelligence.

Your committee would not recommend a distinction other than that all employees be American citizens, excepting only negroes, Chinese and Japanese, the employment of whom in train srvice is not recommended.

INFORMATION REQUIRED OF APPLICANTS

The question "What information do you require from the applicant? (Please answer this question by attaching one of your application blanks, if you use such forms), has received the following answers:

97 companies answer by attaching the application blank in use.
47 companies do not answer.
28 companies report that they require full information as to character, habits and previous employment. Some require letters of recommendation. (Of these 28 roads, some report that they do not use any form, while others fail to state whether they do or not.)
7 companies report that they use no form.
3 companies report that men are hired through personal examination by the general manager, superintendent or employment agent.
2 companies report that they are preparing new forms.
1 company requires references from six business men.
1 company requires reference from three business men.
1 company requires references, and that applicants be able to read, write and talk plain English.
1 company requires full face and profile photographs.

Answering the question "How do you verify his statements? (If you use inquiry form, kindly attach one"), the following replies have been received:

67 companies reply by attaching inquiry form used.
14 companies report that they use no form.
41 companies make no reply.
38 companies report that they make inquiry by letter to individuals named as references.
5 companies report that they inquire personally and by letter.
12 companies report that they make personal inquiry.
6 companies report that they make inquiry of former employers.
2 companies require references from responsible business men.
2 companies report that they have advance information (waiting list).

The committee recommends the use of forms as submitted, special attention being called to the form of release, also to the furnishing of photographs.

The size of forms recommended are 8 in. by 26 in. for Form "A," and 8 in. by 13 in. for Forms "B" and "C." These three forms are reproduced herewith.

The committee also recommends that in such States as have a statute making it a misdemeanor to make false statements, that this statute be made part of the application.

PHYSICAL AND OTHER EXAMINATIONS

Answering the question, "Do you have vision test?" the following replies have been received:

PHYSICAL AND OTHER EXAMINATIONS

94 companies report that they have a vision test.
74 companies report that they have no vision test.
6 companies report with blank attached.
3 companies expect to adopt a vision test.
3 companies have a vision test in doubtful cases only.
2 companies have a vision test for motormen only.
1 company has a vision test for interurban men only.

To the question, "Of what does it consist?" the following replies have been received:

16 companies report that they use Snellen's test.
6 companies use watch and voice test.
7 companies use standard steam railroad test.
1 company uses Dr. Thompson's test, and the remaining companies use tests of various kinds.

The question, "Do you have a color test?" has been answered as follows:

88 companies report that they do not employ a color test.
75 companies report that they do employ a color test.
4 companies attach blank.
3 companies report that a color test will be put into effect soon.
1 company reports that color tests are given only to motormen.
1 company reports that color tests are given to interurban men.
1 company requires a doctor's certificate.

In most cases the above test is conducted by the company physician and consists of various colored yarns. (Holmgren's test 4, Snellen's 2, Thompson's 2.)

To the question, "Have you a hearing test?" replies have been received as follows:

88 companies report that no hearing test is conducted.
78 companies report that they do conduct a hearing test.
6 companies reply by attaching blank.
1 company replies that a hearing test is given to interurban men only.
3 companies report that they will have hearing tests in effect shortly.

The above companies have reported that hearing tests are conducted as follows:

16 companies use a watch tick test.
15 companies report it done by a physician.
6 companies use a voice test.
6 companies use watch and voice test.
1 company uses Snellen's test.
2 companies use a tuning fork and watch test.
1 company reports this test given interurban men only.

To the question, "Have you a physical examination?" replies have been received as follows:

97 companies report that no physical examination is made.
62 companies report that they require a physical examination.
8 companies report by attaching blank.
3 companies report that a physical examination report will be put into effect soon.
2 companies report that a physical examination is required of interurban men only.
1 company reports that a physical examination is required of motormen only.
1 company reports that a physical examination is required in special cases only.

The committee recommends that the forms "Record of Examination of Sight, Color, Sense and Hearing," "Surgeon's Certificate of Examination," and "Instructions to Surgeon," as herewith submitted, be used in examinations and that these forms be made standard in size with Form "B." These are designated as Forms "D," "E" and "F" and are reproduced herewith.

THE TRAINING OF EMPLOYEES

FIRST STEPS

To the question, "After applicant has been accepted, what is the next step if he is to be a motorman? If he is to be a conductor?" the following replies have been received:

148 companies place the applicant on a car with a competent motorman or conductor as a student, to "break in."
20 companies give applicants for motormen shop experience first and place conductors on the road with instructing conductor.
5 companies place applicants in a school of instruction.
5 companies report that they give an oral examination.
3 companies attach blanks.
2 companies report that applicants have a talk with the superintendent of transportation on the work to be taken up.
1 company reports "See Electric Traction Weekly under date of February 20 and 27, 1908."
1 company reports that men are turned over to the chief trainman.
1 company reports that the superintendent gives a lecture.
1 company reports men are turned over to the claim agent for instruction, then to the division superintendent, then to barn foreman, and then are placed on cars.
1 company reports that men are assigned to the extra list and the despatcher is instructed to place them in service on outside lines for first experience.
1 company reports that conductor is instructed in the making out of trip sheets, and is then given two days on instruction car before being turned over to regular conductor. Motormen are taught on instruction car and are then turned over to a competent motorman for final instruction.
1 company reports that applicant is put in the charge of the despatcher and then goes to instructing motorman or conductor.
1 company reports that applicants are placed on extra list until a vacancy occurs.

SHOP EXPERIENCE GIVEN

To the question, "Do you give motormen shop experience?" the following replies have been received:

100 companies report that they do not give shop experience.
73 companies report that they do give shop experience.
10 companies report that they do in some cases.

Answering the question, "If so, how much?" various amounts are given.

To the question, "Do you allow compensation while in shop?" 31 companies reply that they do allow compensation, the amounts reported paid being varied.

TRAINING SCHOOLS

To the question, "Do you have a training school with dummy car?" the following replies have been received:

150 companies reply in the negative.
21 companies reply in the affirmative.
3 companies use a regular car in shop.
3 companies expect to adopt the above named plan.
1 company has practical demonstrations, with apparatus in shops and resistance.
20 companies report that they have found the above plan profitable, one company reporting, "Practically indispensable."

DUTIES OF BOTH CONDUCTORS AND MOTORMEN REQUIRED TO BE LEARNED

To the question, "Do you require men to learn the duties of both motorman and conductor?" the following replies have been received:

102 companies reply that they do not require the above.
55 companies reply that they do require it.

22 companies reply that they do in some cases.
4 companies require conductors to be able to operate car, but do not require motormen to learn the duties of conductors.
3 companies do not answer.
1 company says, "All regular men."

PROMOTION—CONDUCTORS TO MOTORMEN

To the question, "Do you promote conductors to motormen?" replies have been received as follows:

87 Companies reply that they do not promote conductors to motormen.
43 companies do promote conductors to motormen.
38 companies in some cases make such promotion.
6 companies do not answer.
4 companies do not consider this transfer a promotion.
2 companies promote motormen to conductors.
3 companies interchange.

LENGTH OF TIME REQUIRED IN INSTRUCTION

To the question, "Do you require a certain length of time to be spent by the student on the car, or is it left to the discretion of the instructor?" the following replies have been received:

114 companies leave this to the discretion of the instructor or inspector.
45 companies require a given length of time, as follows:
2 companies require 21 days.
1 company requires not less than 20 days.
1 company requires 15 days.
6 companies require 2 weeks.
1 company requires not less than 13 days.
1 company requires not less than 12 days.
13 companies require 10 days.
8 companies require 1 week.
2 companies require 6 days.
1 company requires 140 hours minimum.
3 companies require 5 days.
1 company requires 100 hours.
5 companies require a minimum time, but do not state period.
1 company reports: Motormen, 20 days; conductors left to the discretion of the instructor.
1 company reports for city and suburban, 1 week; interurban left to the discretion of the instructor.
2 companies report that they must pass oral examinations.
2 companies have no fixed rule.
7 companies leave it to the discretion of the superintendent.
1 company reports to trainmaster.
1 company reports that it is left to the discretion of barn foreman.
2 companies use both methods.
10 companies do not answer.

USE OF TRAINMEN AS INSTRUCTORS

To the question, "Do you use old motormen and conductors as instructors?" the following replies have been received:

173 companies report that they do use old conductors and motormen as instructors.
3 companies report that they do not use old conductors and motormen as instructors.
3 companies report that they do for a portion of this work.
2 companies report that they use any competent men.

Answering the question, "If so, do you allow them any extra compensation?" are the following replies:

145 companies report that they do not allow extra compensation for the work.
29 companies do allow such compensation.
1 company reports that this compensation is allowed motormen only.
1 company reports that they do not believe such allowance advisable.

The rate of this compensation has been given as follows:

1 company pays 1 hour extra.
1 company pays 1 cent per hour.
3 companies pay 2 cents per hour.
2 companies pay 2½ cents per hour.
2 companies pay 10 cents per day additional
1 company pays 10 cents per day the year round.
1 company pays 24 cents per day.
1 company pays 25 cents per day.
8 companies pay 25 cents per day.
1 company pays 25 cents per day for motormen.
1 company pays 50 cents per day.
1 company pays 2 days' pay.
1 company pays for time off with full pay.
1 company pays $5 per month over the amount regular run pays.
1 company pays 35 cents.
1 company pays $2 for each student instructed.

EXAMINATION AFTER INSTRUCTION

To the question, "After being 'turned in,' do you give the new employee an examination?" replies have been received as follows:

156 companies report that they do give such an examination.
24 companies report that they do not.
2 companies report that they do in some cases.
1 company attaches blank.

To the question, "Is it oral or written?" the following replies have been received:

128 companies report that the examination is oral.
11 companies report that it is written.
12 companies report both oral and written.
1 company reports that the examination has been oral, but that they are now working on a written examination plan.
1 company attaches blank.
1 company requires the men to sign the rule book.
1 company reports that men are taken over the road on a car by the superintendent.

The examinations consist mainly of questions on general rules of operation, care of equipment, accidents, time points, etc.

The committee recommends that after acceptance the applicant be given a talk by the head of the transportation department or a delegated official, on the duties of the position which he is about to assume.

The committee recommends that before permitting the applicant to go out on the road, it is advisable to give him a certain knowledge of the handling of control and other apparatus, either by means of a service car in the barn or shop, or on an instruction car fitted up for that use.

The committee recommends that the applicant then be given an order to the instructing motorman or conductor, who should be specially selected as to his fitness to act as an instructor.

It is recommended that the length of time with the instructor should be left to the discretion of the inspector and the applicant's ability to pass subsequent examination.

Your committee suggests that these examinations be both written and oral, the written examination to cover all essential points on rules of operation, and that this be retained as a part of employee's record.

PROMOTION FROM CITY TO INTERURBAN SERVICE

To the question, "Where city and interurban service is operated jointly, do you promote city service men to interurban service?" the following replies have been received:

103 companies do not reply to this question.
40 companies do make such promotion.
18 companies do not make such promotion.
2 companies use men either way.
1 company does in some cases.
15 companies report that they do not have such a condition.

The opinion of the committee is that it is inadvisable to promote city service men to interurban service.

EXTRA TRAINMEN USED ON BOTH CITY AND INTERURBAN SERVICE

To the question, "Where joint city and interurban service is operated, do you work extra men on both city and interurban lines? the following replies have been received:

47 companies report that they do follow this plan.
20 companies report that they do not.
103 companies do not answer this question.
7 companies report that they do not have such a condition.
6 companies prefer older city men for extra runs on interurban.
3 companies do for city lines only.
1 company prefers to use regular men for local lines.

It is the recommendation of the committee that the service should be separately operated. With the high efficiency necessary on interurban work, it is inadvisable to take extra men from city work and place them in interurban work.

TRAVELING INSTRUCTORS FOR NEW TRAINMEN

To the question, "On city service, after trainmen have been taught their duties and turned in, do you employ traveling instructors to follow up new men?" the following replies have been received:

70 companies report that they do not employ such instructors.
29 companies report they do employ such instructors.
23 companies have this work done by inspectors.
12 companies have this work done by superintendents.
3 companies have this work done by road officers.
3 companies have this work done by dispatchers.
2 companies have this work done by instructors.
2 companies have this work done by supervisiors.
2 companies do employ this method in some cases.

It is the recommendation of the committee that traveling instructors be employed to follow up new men.

EDUCATIONAL WORK MAINTAINED

Answers to the question, "What educational work are you carrying on among men already in the service?" follow:

81 companies report that they carry on educational work.
51 companies report that they do not.
54 companies do not reply to question.
1 company reports "not much."

The committee deems it advisable and to the interest of the companies' service to take up educational work for the men, through meetings with the men, conducted by the transportation department, at which talks should be given by the master mechanic, claim agent, auditor and others, on the different subjects pertaining to their respective departments, in which the transportation department has to co-operate or execute.

The committee feels that one of the greatest means of reaching and maintaining high efficiency among employees is through "follow-up" work along educational lines, and that the mental and moral development of the man should go hand in hand with his training as a transportation employee.

METHODS OF DISCIPLINE

To the question, "What methods of discipline do you recommend?" note the following replies:

43 companies report reprimand, suspension and dismissal.
3 companies report moral suasion and suspensions.
2 companies report lower rating and suspension.
1 company reports for serious offences discharge; minor offences placed, at his own expense, under instructor, to do the same class of work until he understands the rule he has broken.
1 company reports suspension and payment for damage if liable.
10 companies report suspension system.
1 company reports rigid discipline.
12 companies report reprimand and discharge; no suspensions.
8 companies report records kept of each man; reprimand or discharge; no suspensions.
2 companies report good men put on extra list; get rid of men who are of no account.
3 companies report placed on extra list.
13 companies report "heart to heart" talks and discharge.
1 company reports left to discretion of superintendent.
1 company reports no standard method; left in hands of division superintendents, which is very satisfactory.
6 companies report the use of Brown's merit system.
6 companies report merit system.
8 companies report merit and demerit system.
6 companies report demerit system.
8 companies report, "It depends upon the man."
3 companies report, "Unsolved as yet."
2 companies report none to recommend; would be glad to hear from some one using merit system.
1 company reports no discipline.
46 companies do not reply to this question.

Discipline is the fundamental element of all successful operation and is direct in its bearing upon moral conditions. The most essential requisite of discipline is a set of rules suited to local conditions. The next is proper enforcement, for no matter how perfect the rules, unless they are properly enforced, discipline is lacking. While minor violations may not seem to have any great tendency to create harm, as far as the object of certain rules is concerned, at the same time if allowed to go unnoticed, other and greater violations are sure to follow.

The committee, after careful consideration of the various methods of discipline and with knowledge gained through actual operation of the merit and demerit system, recommends it as being the best form of administering discipline, on account of its taking notice of minor infractions of rules which otherwise would not be made subjects of discipline, and also because of the fact that it makes possible commendation of good work on the part of the employees; it affords as well a complete and accurate record of the employee's work in every particular and is of great value in determining standards of efficiency.

Your committee recommends very strongly that the subject of "Selection and Training of Transportation Employees" be given earnest consideration by the members of this Association, to the end that the men operating the cars and trains be selected with a proper view of their fitness as to intelligence, acuteness of senses, physical condition and proper aptness for the work in which they are about to engage, and that the preliminary and subsequent training be systematic and thorough.

FORM A

APPLICATION FOR EMPLOYMENT

..... Company

I hereby make application for a position with the .... Company as ....., pledging myself if employed to faithfully and honestly discharge the duties of the position to the best of my ability, and to strictly comply with the Company's Rules and Regulations. I further promise to keep sober and temperate and abstain from the use, while on duty, of intoxicating liquors; to conduct myself honestly and with proper obedience and respect to the officials of the company and with courtesy to passengers and public.

And I agree to have ..... photographs taken, of such size as may be required, and deposit the same with the Company, and they shall then become the property of the Company and a part of this application.

Applicant must answer the following questions and sign this application in ink in his own handwriting:

Name in full?.....
(No initials)
Address in full?.....
Name and address of parents or nearest relative?.....
.....
Age?..... Height?..... Weight?.....

Single or married? If the latter, give extent of family and their residence .....
How long have you lived at present location?.....
Where were you born?.....
If out of the United States, how long have you lived in this country? .....
Are you, or have you declared your intention to become, a citizen of the United States?.....
Have you ever been in the employ of this or any affiliated company? .....
If so, in what capacity, on what division, and why did you leave the service? .....
Were you ever employed by a street, interurban or steam railway? ..... If so, when, where and in what capacity? .....
Why did you leave the service?.....
Have you ever been discharged or suspended from any situation? If so, state when, where and for what reason.....
Have you ever been convicted of any crime or misdemeanor?.....
Do you drink intoxicating liquors?.....
Do you smoke cigarettes?.....
Are you in debt? If so, how much?.....
What is your trade or occupation?.....
Where were you last employed and in what capacity?.....
When and why did you leave?.....

State on the following blank your employment and employers during the last five years:

From what date.	To what date.	Employed as.	Name and address of employers
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

We, the undersigned, request the ..... Company to employ ..... as ..... and do state that we have known him intimately for the past ..... years, and that he is a man of good moral character, of sober, temperate, industrious habits, not addicted to the use of intoxicating liquors and no violator of the law and good order. We further represent that he is a man of truth and integrity, good understanding and of temper and manner fit to be employed by your system.

...?..... Address .....
..... Address .....
..... Address .....

Applicant Signature at Superintendent's Office.....

I agree to submit to a medical examination by the Company's Doctor and pay $..... for the same.

In part consideration for my employment, I agree to return upon demand, or on severing my connection with the Company, all the Company's property then in my possession, and whenever requested, to make and verify an affidavit containing a full and truthful statement of any and all accidents, ejections, refusals of transfers and assaults of which I may have knowledge.

I agree to make application for a bond whenever and with whatever surety company the Company may designate, and in the event of their refusing to become my bondsmen, that I will, upon notification to that effect, resign from the service and hereby agree to waive all claim for any damages resultant therefrom.

I agree to work under instructions on trial, without pay, until such times as I am accepted by the Company.

I understand that no compensation is paid to trainmen for the time spent while engaged "on watch" (meaning waiting at any designated point for opportunity to work), but that Company's standard wages are allowed only for services rendered while actually employed on its trains.

I further agree that if I am discharged, or leave the Company's service voluntarily at any time during or after the trial period above referred to, I shall have no claim against the Company for services rendered or expenses incurred by me during said trial period or while performing duty on watch as above explained, and any wages earned by me shall not be due and payable until the next regular payday of the Company.

I agree to at once provide myself with a standard uniform, in accordance with the rules and regulations of the Company.

While in the Company's service I agree to study carefully and comply faithfully with all its rules, regulations and orders.

I, ..., have read the foregoing and clearly understand all conditions specified therein, and to the truth of all statements made and my willingness to abide by the conditions of this contract, I hereby make affidavit.

State of.....
County of..... } ss.:
City of.....

....., being duly sworn, deposes and says that the above statement is true to the best of his knowledge and belief.

Sworn to before me this ..... day of ....., 190...

Application No..... Bond No..... Employee No.....
....., Employed as.....
Nationality..... Age..... Height..... Weight.....
Married, Single, Widower, General Appearance.....
.....
Introduced by..... Approved by..... Surgeon, 190...
To.....for instruction....., 190...
To.....for instruction....., 190...
Time with..... .....hours
Time with..... .....hours
Total time worked under instruction on trial.....hours
Approved.....190... ....
Approved.....190... ....
Approved.....190... ....

FORM B

Photograph attached

REFERENCE INQUIRY
(Sent to Previous Employer)

..... Company
.....190....

Mr.....

DEAR SIR:—

Mr. ..... is an applicant for employment in the service of this Company as.....
He states he was employed by you as..... from ..... to.....

Will you kindly answer the following questions, which will be treated as strictly confidential.

1. Is the applicant in any way related to you?.....
2. Is the above a correct statement as to occupation and time employed by you?.....
3. Did he resign or was he discharged?.....
4. Do you consider him honest, sober and industrious, and are his general habits good?.....
5. Has he, to your knowledge, ever been employed on any steam, elevated or surface railway?.....
6. Would you recommend him for the position applied for?.....
7. Is the attached photograph a good likeness of the applicant?.....

A reply by return mail in enclosed stamped envelope will be appreciated, and we shall be glad to reciprocate should opportunity offer

Yours truly,

.....
.....

General Remarks:

.....
.....
.....
.....

Signature.....

Date....., 190... Address.....
....., 190...
.....
.....

I refer you to.....
Title .....
Place ..... for my previous record, and I hereby authorize him to furnish the same, together with my reason for leaving the service, if known, and all information which he may have concerning me, whether the same be of record or not; and I hereby release the Company which he represents from all liability from any damage whatsoever on account of furnishing the above named road with such a record.

I was employed by.....
as ..... from .....
19 ..... to ..... 19.....
Signed .....

FORM C

REFERENCE INQUIRY
(Sent to Individual Named as Reference)

Application No.....
....Company.
....., 190...

Mr. .....
.....

Dear Sir:—

Mr. ..... is an applicant for employment in the service of this Company as..... He names you, among other persons, as knowing him well. It being the desire of this Company to employ good and worthy men, we kindly ask you to state (under general remarks on this sheet) your knowledge of this man's integrity, sobriety and general habits. Has he, to your knowledge, ever been employed on any steam, elevated or surface railway?

Is he in any way related to you?

A reply by return mail in enclosed stamped envelope will be appreciated and treated as strictly confidential.

Yours truly,

.....
.....

General Remarks:

.....
.....
.....
.....
.....
.....
.....

Signature.....

Date..... 190... Address.....

FORM D

RECORD OF EXAMINATION OF SIGHT, COLOR, SENSE AND HEARING

.....
.....Division

Name	Age	Occupation	Date

Sight

	Right Eye	Left Eye	Both Eyes Open
Acuteness of Vision, without Glasses			
Distance in feet, at which standard test-type are read.....	20/	20/	20/
Smallest line of standard test-type read correctly			

	Without Glasses	With Glasses
Reading Test, both Eyes Open.....		
Size of reading test-type read correctly		

Color Sense

Test-Skein Submitted	Standard Holmgren Color Set									
B—Rose.....										
A—Green.....										

Hearing

Number of feet at which numbers of words can be repeated correctly when spoken in a conversational tone..... Right Ear Left Ear

Number of feet at which ratchet acoumeter can be heard.....	Right Ear	Left Ear

Remarks:

I hereby certify that I have personally examined.....
.....age.....years last birthday, and find that his acuteness of vision, color perception and hearing, conform to the standard required for position of.....
(Signed).....
Examiner

Date.....
.....
Signature of party examined

This blank must be filled out and signed with pen and ink in all cases.

FORM E

SURGEON'S CERTIFICATE OF EXAMINATION

.....Division
.....
(Date)

Name .....
Age ..... Occupation .....
What is rate of pulse?..... Respiration?.....
What disease has he suffered from?.....
Date?..... Result.....
Has he hernia?..... What form?.....
In present condition?.....
Has he ever been injured?.....If so, what and when?.....
.....
Is he subject to any deformity from injury or otherwise?.....
If so, note here.....
Has he any present source of disability in heart?.....Lungs.....
Kidneys.....Joints.....Veins.....Feet and Legs.....
Hands and Arms.....Spine.....Urinary Organs.....
Nervous System.....

Applicant must be stripped for this examination. Note with care varicose veins, enlarged joints and anything tending to produce prolonged disability.

Does he use intoxicating liquors?..... Is his appearance that of a temperate man?.....
Has he had smallpox?..... Has he been recently vaccinated?
.....
His height is.....feet.....inches. Weight.....pounds
Color of eyes.....Hair.....
Chest Expansion { Forced Expiration..... / Forced Inspiration.....
He is physically a { First-class / Average subject for position as..... / Defective
Mental Characteristics { Alert / Average / Dull
Signature.....
(Surgeon)
Signature.....
(Applicant)
Examined....., 190...

Remarks:
.....

FORM F

INSTRUCTIONS TO SURGEON

Applicant must be stripped for examination
Note with care varicose veins, enlarged joints and anything tending to produce prolonged disability.

.....

Requirements for Applicants

Age.....
Min. height.....
Min. weight.....
Must read.....full-face type at distance of 20 ft. with either eye or with both eyes, without glasses.
Must read nonpareil type at distance of 14 in. with either eye or with both eyes, without glasses.
Selection of green, red and purple color from 40 test skens; must be both prompt and correct.
Must hear watch tick at 3 ft. distance, with either ear, and must be able to repeat correctly 12 out of 15 letters or numbers given over telephone, testing each ear.
Must be able to converse in low tone at 20 ft.
Chest mobility must not be less than 2 in. in man of 5 ft. 6 in., and not less than 3 in. man of 6 ft. or over.

Physical Deformities which Bar Applicant from Employment

Loss of eye, arm, leg, more than two fingers, one thumb, great toe, rupture, fits or fainting spells of any character, syphilis, running sores, severe varicose veins, heart disease, tuberculosis in any form and alcoholism.

.....

Note: Medical examiners are referred to Tripler's Manual for examination for recruits in United States Army as a general guide.

The Globe Ticket Company of Philadelphia is making a special exhibit of the Pope patent P. M. Coupon transfers at its booth, spaces 718-22, in Marine Hall. It is used by some of the largest city companies in the country, and it is said with satisfactory results. Round-trip rides stop immediately with its adoption, and other abuses prevalent with the older styles of transfers are corrected. The Globe Ticket Company is showing all the different arrangements of the Pope patent P. M. Coupon transfers which are being used by more than 100 street railway companies, in amounts totalling over 800 million a year.

***

The Lord Electric Company reports having recently received some large orders for the Earll trolley retriever. Some of the orders received have been from former users showing that the devices already in service are proving satisfactory. The company claims that by the use of the Earll retriever its cost can be covered by the saving which it effects in maintenance of trolley poles and overhead line in a few months. Some roads state that this retriever pays for itself several times in a year.

***

The Niles Car & Manufacturing Company is now shipping on their own wheels from Niles, Ohio, to Portland, Ore., eight 58-ft. trailer cars for the Oregon Electric Railway. Six of these cars have a single passenger compartment with toilet room. They are handsomely finished in mahogany with full empire ceiling and furnished with Heywood Bros. & Wakefield Company's reversible seats in green plush. They are lighted with 35 lamps in holophane hemispheres and are fitted with 12 Consolidated truss plank type electric heaters. Westinghouse automatic air brakes and air signals and Peacock type C drum hand brakes are used. The seating capacity is 62 persons. The bottom frames are semi-steel with double floors having 1 in. of mineral wool between. Two of the eight cars are to be used for carrying express and baggage. They have the same outside dimensions as the passenger cars and are intended to be run as trailers in same trains. They are mounted on Baldwin Class 78-30 trucks which have Standard forged-rolled steel wheels.

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The T. H. Symington Company is exhibiting a dust guard which is believed to embody the three points essential in a device of this kind to meet the general favor of the mechanical and purchasing departments, low cost, efficiency and absence of liability to wear the dust guard seat of the axle. The body of this guard is of canvas of sufficiently greater width and depth than the slot of the journal box to make the edge turn over at the bottom and sides, thus forming an effective joint all around. A close joint is made around the axle by wood segments securely fastened to both sides of the canvas by small wire nails. The top edge is fastened between two wood strips of slightly shorter length than the slot. These strips are driven in the slot in the same manner as the ordinary closing plug, thus sealing the opening into the slot and supporting the upper portion of the guard. Railway officials who are interested in a cheap and efficient dust guard are invited by the T. H. Symington Company to make a careful examination of this device in the company's booth, spaces 552-554.

REPORT OF THE COMMITTEE ON MAINTENANCE AND INSPECTION OF ELECTRICAL EQUIPMENT*

BY E. L. SMITH, CHAIRMAN; E. T. MUNGER, C. C. LONG, L. W. JACQUES, F. P. MAIZE.

This standing committee of the Engineering Association has aimed in preparing the present report to work along the general lines that were followed last year. It has been our endeavor to follow and to develop investigations started last year, also to ascertain to what extent last year's recommendations have been approved and followed by member companies; and further to develop specifications for important items of supplies, and to amplify the rules governing maintenance and inspection. These rules are designed to be of a practical nature so that they may be understood and followed by the average shop man.

The general subject has been divided under various subheads considered separately.

CARBON BRUSHES FOR RAILWAY MOTORS

It has been generally supposed that the physical, chemical and electrical characteristics of carbon brushes bore certain definite relations to their behavior in service. Until recently there has been little definite scientific data brought out to establish or confirm this belief.

The large electrical manufacturing companies have been kind enough to give the results of their testing laboratories, and have called a meeting of all the carbon brush manufacturers and discussed various specifications and tests of carbon brushes which would insure to the operating company a high grade of suitable brush and one which would be consistent in its characteristics. Their co-operation has been very beneficial in assisting your committee to determine and specify tests which will insure these results.

GENERAL CLASSIFICATION OF RAILWAY MOTOR BRUSHES

Railway motor brushes may be separated into three general classes. It will be appreciated that there are actually many classes, but the three general classes will serve to give a general idea of the various brushes.

Class 1—Coke Brushes.
Class 2—Part Coke and Part Graphite Brushes.
Class 3—Graphite Brushes.

Class 1, Coke Brushes. These are generally suitable for railway motors of approximately 50 hp and less, with ungrooved commutators operating on slow speed service, such as city service, switching locomotives, air compressors, or other service where the abrasive and polishing quality of the brush is necessary. The composition of the brush is mainly coke.

Class 2, Part Coke and Part Graphite Brushes. These are medium brushes having characteristics between Classes 1 and 3, generally suitable for motors of 50 to 100 hp in interurban and suburban service and normally used with grooved commutators. Should the commutator require only a moderate amount of abrasive effect to keep it polished these brushes may operate on the above sizes of motors without the side mica being grooved. Since a commutator having grooved side mica requires less polishing effect, Class 2 brush may be used to considerable advantage on motors of less than 50 hp in city or slow speed service, provided the commutators are grooved.

Class 3, Graphite Brushes. These are suitable for general use on grooved commutators and on motors of 100 hp and over. The graphite brush inherently has a large lubrication nature and has the power of carrying a large current per square inch. The lubricating quality of the graphite brush serves to reduce or obviate chattering and constant breakage of brushes. The abrasive effect of graphite brushes is generally low, and it does not have the power to polish the commutator and wear away the side mica, and therefore should be used only on commutators with grooved side mica. The composition is mainly graphite.

SPECIFICATIONS

Each brush should be plainly stamped with the name of the manufacturer and grade of brush. This stamping should be placed on the brush so that the wearing of the brush will not destroy the marking.

The thickness of the brush should not be greater than exact size or less than 0.01 in. under exact size. The width and length of the brush should not be greater than exact size or less than 1/32 in. under exact size. The standard method of box gage should be used. The brush must pass through a box gage of exact size and must not pass through a box gage where the thickness is 0.01 under size and the width 1/32 in. under size.

All copper-plating should be omitted.

The brushes when broken should show a fracture of uniform appearance and fine grain.

Stratification and shrinkage cracks are objectionable and should be avoided, as far as possible. When the brush is broken crosswise and lengthwise the appearance of the two fractures should be similar in texture.

TESTS

Brushes should have certain mechanical and electrical characteristics. The mechanical characteristics may be divided into tests for strength, hardness and abrasive power. The electrical test should show the amount of current the brush is capable of carrying before the glowing is produced.

The abrasive effect, while very important, is not definitely set forth in the tests described below, for the reason that it has not been possible at this time to determine a short, concise method of determining the character of such a test.

The laboratories of the electrical manufacturing companies, as well as the laboratories of the brush manufacturing companies, are at present endeavoring to determine proper abrasive tests to make which will be of general and easy application. Your committee hopes that in the near future it will be able to incorporate such tests in the specifications and tests for carbon brushes.

As determining the abrasive effect of a great many brushes of the present manufacture it has been found that certain percentages of ash are desirable in the various classes of brushes. From analysis it has been found that this ash consists largely of iron oxide, Fe_2O_3 and sand SiO_2. It has been found that Class 1 brushes should normally contain about 5 per cent of this ash in order to get the abrasive effect sufficient for their operation as recommended.

It has been found that Class 2 brushes should contain 2 per cent to 3 per cent of this ash, and that Class 3 brushes should contain not over 2 per cent.

It is not advisable to specify the abrasive effect in percentage of this ash, as this limits the manufacturer to the use of this ash, whereas it is the abrasive effect that is desired, and as this abrasive effect may be obtained in many different ways the abrasive test which we hope later to insert in the specifications will take care of it.

The electrical test is given as a slip-ring test, which is explained in the specifications.

*Read before the American Street & Interurban Railway Engineering Association, Atlantic City, N. J., Oct. 12, 13, 14, 15 and 16, 1908.

The vibrator test is a purely mechanical one. The brush is subjected to a series of mechanical shocks to determine how tough or brittle it may be. The vibrator consists of a ratchet wheel, the principle of which is indicated in Fig. 1. The diameter of the wheel should be 9¼ inches. There should be eight teeth, the depth of each tooth being $\frac{1}{16}$ inch. Adjacent to the wheel a standard brush holder is mounted so as to allow the brush to bear on the wheel with a standard pressure of seven pounds per square inch of the bearing surface or cross section of the brush. The face of the ratchet wheel should be broad enough to take the widest brush. The ratchet or vibrator wheel may be belted from a line shaft or driven by a small motor. The speed of the ratchet wheel should be 250 r.p.m. With this speed the brush will receive 2000 blows per minute. The ratchet wheel revolves backwards so as to slip under the brush, and allow it to drop $\frac{1}{16}$ inch as each tooth passes.

The various classes of brushes should stand a certain number of revolutions of this vibrator wheel before breaking. The values given below are suggested for the different classes of brushes. It has been found that a brush which breaks badly in service will run on this wheel hardly more than 5000 revolutions, and one which is fairly satisfactory in service will run 20,000 to 50,000 revolutions. A brush which is of excellent mechanical quality will run 100,000 revolutions and show no breakage or chipping.

It is suggested that Class 1, coke brushes, should stand 20,000 revolutions on the vibrator wheel. Class 2, part coke and part graphite brushes, should stand 30,000 revolutions. Class 3, graphite brushes, should stand 50,000 revolutions.

HARDNESS TEST

While the vibrator test indicates tensile and crushing strength, and, in a degree, hardness, it is desirable to express in some simple form a hardness test which is not subject to serious error and can be within reach of all. This test consists of comparing the hardness of carbon brushes with various standard "H" drawing pencils. It is recommended that the Johann Faber pencil be adopted as a standard of hardness. This test consists of scratching the brush with pencils of various hardness to determine which hardness of pencil corresponds to the hardness of the carbon brush.

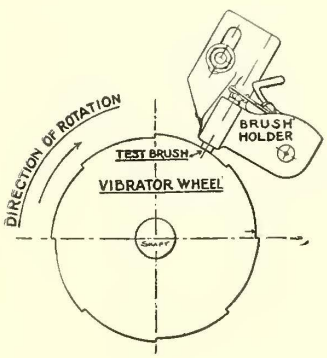

Fig. 1.

SLIP-RING TEST

In this test the current is passed through the brush to a slip ring to determine the maximum amperes per square inch which the brush can carry without glowing. The current from the ring may be conducted by placing copper brushes on the hub of the slip ring. The slip ring should be a wheel of hard copper eight inches in diameter, one-half inch thick, and a width of face sufficient to test the widest brush. The wheel should be mounted and so arranged as to use a standard brush holder, the brush pressing against the slip ring as in the motor.

The speed of the slip ring should be approximately 500 r.p.m. The slip ring may be driven from line shafting or from a small motor.

The pressure per brush should be seven pounds per square inch of bearing surface or cross section.

The periphery of the slip ring should have a true and smooth surface. The slip-ring wheel should run true so that the brush, when once fitted, will maintain a true and perfect-fitting surface.

Twelve or fifteen samples of each quality of brush should be tested The current should pass from the brush to the slip ring; that is, the brush should be positive to the ring. Direct current should be used. The maximum of 25 volts will be suitable for testing ordinary railway brushes. The following requirements are suggested. It is hoped that the exact values will be definitely determined later.

Class 1, coke brushes, 100 amp per sq. in. without glowing.

Class 2, part coke and part graphite brushes, 150 amp per sq. in. without glowing.

Class 3, graphite brushes, 200 amp per sq. in. without glowing.

WIDTH OF BRUSHES

It has been found advantageous on a number of roads to use one brush per holder, even though it is necessary to cut out the bridge in the brush box. Thus a ridge in the middle of the commutator is avoided and, in most cases, longer life of the brush is obtained.

Should there be irregularities of the commutator which would cause the brush to be thrown from the commutator, the entire circuit would be broken if one brush were used and less flashing would be obtained by the use of two brushes; this is particularly true of high commutator speeds. Your committee cannot make a general recommendation on this point because of various conditions met with in actual practice.

Your committee appreciates that the above general discussion and specifications are a radical advance over what heretofore has been done. It has been the effort of your committee to put forward these general discussions and specifications, not with the idea that the definite values given or that the tests specified are absolutely the correct and only tests to make, but rather with the idea that having such a recommendation the subject will be forcefully brought up and that out of the foregoing will develop certain valuable information and specifications which will be of very material assistance to the users as well as the manufacturers of carbon brushes and railway motors.

INSULATING MATERIALS FOR RAILWAY REPAIR SHOP USE

It was the aim of your committee at the outset to prescribe specifications and tests suitable for each class of insulating material, but as comprehensive specifications would lead into very complex details and of laboratory analysis, far beyond the range of practicability for the average electric road, it has seemed best merely to outline a general classification and point out the leading characteristics of each class of material, with a description of practical tests within the reach of all.

INSULATING VARNISHES

Insulating materials may be covered by the following classification:

Air Drying Varnishes: Linseed oil or other drying oils, with such driers and treatment as to dry quickly without necessity for baking.

Baking Varnishes: Linseed oil or other drying oils, with gums and driers. Require baking.

Spirit Varnishes: Animal or vegetable gums, shellac, copal, etc., dissolved in alcohol, amyl acetate, benzine, etc.

Insulating Paints: Solutions of asphalt, and mineral gums in carbon bisulphide, naphtha, etc.

Impregnating Compounds: Petroleum asphalt, melting point 105° to 115° C., used for impregnating motor fields, etc.

Note.—Paraffine and linseed oil are each used as impregnating material, for special purposes as described below.

Descriptive comments on the various insulating materials are submitted as follows:

Air Drying Varnish should be composed of linseed oil or other drying oils sufficiently treated and with proper amount of dryers so that varnish will dry in two or three hours, leaving a smooth, flexible surface. Baking not required. Should be both oil and moisture proof. Should not crack, soften or become tacky at 100° C.

Baking Varnish is composed of high-grade linseed oil, with some gums and dryers. Baking varnish should not be used unless it is baked at 100° C. to 110° C. for 10 or 12 hours. Characteristics of baking varnishes are high melting point, flexibility, smooth, glossy surface. Good filler, high insulating qualities, oil and moisture proof.

Spirit Varnishes are composed of animal and vegetable gums, such as shellac, copal, ets., dissolved in spirits. Characteristics, oil-proof, but not moisture proof; good stickers and binders, but not necessarily good insulators. In general they soften at 100° C.

Insulating paints are solutions of asphalt or mineral gum in naphtha or other solvents. They are moisture proof but not oil proof, lacking in toughness, good as a sticker and paint, but not high in insulating qualities.

IMPREGNATING COMPOUNDS

Asphalt compounds have widely different melting points. The asphalt most desirable for use is one in which the melting point is above the operating temperature, preferably 110° C. At ordinary temperature, the compound should be somewhat pliable, but should not flow. At melting point it should flow freely. Is moisture proof, but not oil proof. Good as a filler, and has fair insulating qualities. Asphalt should be practically free from volatile matter. In order to get a good, penetrating asphalt the committee recommends that the asphalt shall not contain more than 5 per cent constitnents insoluble in carbon bisulphide (CS_2).

Paraffine is a mineral gum of a low melting point, suitable for impregnating wood for outside or low temperature work. Is not suitable for use in railway apparatus where the working temperature is above 50° to 60° C.

Linseed Oil is excellent for filling wood parts of railway apparatus. The parts should be boiled in raw linseed oil until filled and then the oil oxidized by baking. The wood should be finished with either an air drying or a baking varnish. Wood treated in this manner is excellent for outdoor work. Linseed oil hardens under temperature, does not melt, is moisture and oil proof, and is flexible and strong.

On a string band or webbing covering the mica at the outer end of the commutator it is recommended that no varnish be used that will soften at a temperature of 100° C. The following simple tests are recommended for the various substances:

TESTS FOR INSULATING MATERIALS

Without an elaborate testing laboratory, it will be impossible to find the exact values of tests on the various insulating compounds. There are, however, some simple tests which can be made with little or no apparatus and which serve as very good general tests of the material.

Asphalt: The chief consideration in connection with asphalt is the melting point. Asphalt can be obtained with a low melting point or a very high melting point, and the latter is rather in the nature of anthracite coal. By melting the asphalt and using a thermometer the melting point can be determined.

Some asphalts contain as high as 30 per cent of inorganic matter. In order to determine how much inorganic matter is present, a certain definfiite amount of the asphalt can be melted and burned away in an ordinary crucible or gas flame. Comparisons of asphalts can be made by this method, and approximately the amount of inorganic matter be determined.

There is a certain amount of sulphur in asphalt compounds. The presence of sulphur and the proportion may be determined by melting the asphalt and allowing bright sheet copper to remain in the melted asphalt for two or three days. The tarnishing of the bright copper will indicate the presence and quantity of sulphur.

Linseed Oil: When linseed oil is heated up to the boiling point, and there is a foaming and spluttering of the oil as it begins to boil, the presence of water in the oil is indicated.

Linseed oil may have a sediment usually known as "foots." The relative amount may be approximately determined by allowing a sample of the oil to stand in a test tube for about 24 hours and then noting the amount of sediment deposit.

Regular boiled oil has a specific gravity of 0.945 or higher, whereas the ordinary boiled oil which has been produeed by pouring into the bunghole a certain amount of drier, has a specific gravity but little higher than raw linseed oil, this specific gravity being 0.931.

Acids are used during the process of refinement, and in order to test the amount of acids, it would be well to immerse a bright copper strip in the oil for several days.

Japans and Varnishes: These should be tested at a temperature which is ordinarily used in serviee. After the coating has thoroughly dried in the air or by baking, according to which treatment the material is designed to be used, the flexibility of the coat may be determined. It also would be well to test with a bright copper strip for acids.

Shellac: Shellac contains more or less rosin. To determine this requires an elaborate analysis. The quality of the shellac, however, may be determined by painting on bright tin. By making comparisons with other shellacs, the flexibility may be determined. A very flexible shellac has little or no rosin. It would be well to test with a bright copper strip for acids.

Paraffine: Water and sulphuric acid from the refining processes may be incorporated in paraffine. The amount of water can be determined by heating the paraffine. Foaming and spluttering on reaching the boiling point will indicate the presence of water. Sulphuric acid can be detected by the immersion of a bright copper strip, and also by mixing some of the paraffine with boiling water and then pouring off the water and testing with litmus paper.

RECOMMENDATIONS BY THIS COMMITTEE LAST YEAR AND EXTENT TO WHICH THEY HAVE BEEN APPROVED AND FOLLOWED

In order to ascertain to what extent the recommendations have been put in practice, and to get suggestions and recommendations, data sheets were prepared and sent to member companies.

Answers were received from 58 companies, owning 13,319 cars. In the following, weight has been given to the various opinions expressed in proportion to the number of cars represented.

CONTROL EQUIPMENT

Last year's committee recommended that the control equipment of the "K" type be given a thorough overhauling for every 60,000 miles of service. (See 1907 Proceedings, page 44.)

36 per cent approve and follow to some extent.

9½ per cent approve, but prefer to overhaul every 40,000 or 50,000 miles.

29 per cent do not approve of recommendation, and overhaul on mileage basis of 30,000 to 40,000 miles.

10 per cent do not overhaul on mileage basis, but depend on frequent inspections and repairs.

15½ per cent are non-committal.

Inasmuch as the largest percentage approve and are following to full extent, the committee believes the recommendation is practical, and would advise those who are unable to make the overhauling on a 60,000-mile basis to study the weak points of their equipment, with the idea of reducing wear and increasing mileage. If it is the bearing that needs attention oftenest, it may be that this small mileage is caused by grit, and a way may be found that will keep the greater part out. If early attention is required for the brake levers and pins, case-hardening the metal around the holes and pins or inserting a case-hardened bushing in the hole will reduce the wear

Last year's committee recommended an overhauling of M-U control type "M" on a 60,000-mile basis. (See 1907 Proceedings, page 45.)

35 per cent approve and follow to full extent.

13 per cent recommend overhauling on a smaller mileage basis of from 40,000 to 50,000 miles.

52 per cent are non-committal or do not have this type of control in use.

Overhauling on a 60,000-mile basis was recommended for M-U control electro-pneumatic type. (See 1907 Proceedings, page 46.)

27 per cent approve and follow to full extent.

12 per cent do not approve and recommend overhauling on a smaller mileage basis.

61 per cent are non-committal or do not have this type of control in use.

SLACK ADJUSTERS

Last year's committee believed that a satisfactory slack adjuster for brakes on electric cars was very much needed. (See 1907 Proceedings, page 47.)

8½ per cent approve and have some in use as an experiment.

25 per cent approve and have in use on interurban cars.

20 per cent approve but have none in use.

28 per cent are non-committal or have not tried any.

18½ per cent do not approve.

The slack adjusters on the market to-day regulate the piston travel and, consequently, the position of the truck brake lever is constantly varying. This, on a motor truck, causes uneven braking and brakeshoe wear. The committee believes that an automatic device attached to a toggle bar that is simple and reliable is a much-needed mechanism.

SAFETY DEVICES

Last year's committee called attention to the importance of overhead trolley cars being properly equipped with lightning arresters, and that the same be periodically inspected and tested to insure proper working. (See 1907 Proceedings, page 48.)

89 per cent approve and have in use on all cars.

5 per cent are non-committal.

6 per cent have none in use on third-rail cars.

It is evident from the answers to the question, "Have you a reliable arrester?" which was asked by this year's committee, that we have not as yet reached that goal.

The committee is advised that the electrical companies are prepared to supply an aluminum cell valve arrester, with the guarantee that it is vastly superior to any other type of arrester heretofore brought out. Your committee recommends that the members of this association investigate the matter carefully for themselves.

CAR WIRING

Last year's committee recommended car wiring in iron conduit. (See 1907 Proceedings, page 47.)

3½ per cent approve and have in use to full extent.

40 per cent approve and will install or have installed in all new cars.

28 per cent approve but have none in use.

3½ per cent approve and use to some extent.

2½ per cent approve but use a substitute.

22½ per cent are non-committal.

ARMATURE REPAIRS AND TESTS

Last year's committee recommended that cotton-covered and varnished cambric insulation were sufficient for the insulation of armature coils wound with round wire, where the ultimate temperature rise was less than 65° C. (See 1907 Proceedings, page 49.)

74½ per cent approve and follow to full extent.

3½ per cent approve and use partially.

⅛ per cent approve but do not use.

2½ per cent bny all coils.

9 per cent do not approve and use other insulation.

10⅜ per cent are non-committal.

Last year's committee recommended the use of asbestos covering for the wiring where the ultimate temperature rise was 65° to 100° C. (See 1907 Proceedings, page 49.)

4½ per cent approve and follow to full extent.

6 per cent approve and follow partially.

27½ per cent approve but do not follow.

9 per cent do not approve.

53 per cent are non-committal.

It would appear from the above that there is a good deal of skepticism as to the value of asbestos coils, and most companies are waiting for further developments.

Last year's committee recommended a.c., transformer tests for short circuits on wire-wound armatures. (See 1907 Proceedings, page 49.)

55 per cent approve and follow to full extent.

1½ per cent approve and follow partially.

19 per cent approve but do not follow.

1 per cent do not approve.

14 per cent are non-committal.

9½ per cent approve but use other apparatus.

A good many roads expect to be equipped in the near future for this test.

Last year's committee recommended, that, for bar-wound armatures, a test be made by applying full load current through the brushes in their normal position on the commutator at such a frequency as to give approximately full voltage across the brushes; armatures in all cases to be outside of their frames.

3½ per cent approve and follow to some extent.

⅛ per cent approve and follow on new bars.

53½ per cent approve but do not follow.

⅞ per cent do not approve.

42 per cent are non-committal or have no bar-wound armatures in use.

The committee believes that the above is by far the best way of testing armatures for short circuits and open circuits. Open circuits are indicated by pitting on the commutator when the armature is revolved. Short circuits will immediately heat up and indicate their exact location. Poor soldering will be shown by heating of the connections.

Last year's committee recommended, for quick repairs, the use of armature bars insulated with varnished cambric, appreciating that the life is not as great as that of mica and is shorter as the working temperature is higher.

33 per cent approve and follow to some extent.

1 per cent approve and follow partially.

17 per cent approve but do not follow.

¼ per cent do not approve.

48¾ per cent are non-committal.

Last year's committee recommended an insulation test between windings and ground, as follows:

For roads using trolley: New armatures, 2500 volts a. c., 5 seconds. Old armatures, 1000 volts a.c., 5 seconds.

On the above 66 per cent approve and follow to full extent.
9¾ per cent approve but do not follow.
1¼ per cent approve and use partially.
20¼ per cent are non-committal.
1½ per cent use special testing apparatus.
1¼ per cent do not approve.

A good many roads approve this recommendation, but report that they are not equipped for testing with alternating current. The committee wishes to advise these roads that any d. c. motor can be changed to an a. c. generator at almost no expense. This, attached to the line shaft or driven by a motor, would give them the alternating current for testing.

For roads using third rail, where voltage fluctuations have to be taken into consideration:

New armatures—3000 volts a.c., 5 seconds.

Old or partly repaired armatures—1500 volts a.c., 5 seconds.

26 per cent approve and follow to full extent.
10 per cent approve but do not follow.
63½ per cent are non-committal.

Nearly all trolley roads are non-committal on this recommendation.

Last year's committee recommended hard-drawn copper for commutators as possessing greater uniformity in size and hardness over the forged bars, and corresponding superiority in life and service.

44 per cent approve and follow to full extent.
27 per cent approve and follow partially.
5 per cent approve but do not follow.
5½ per cent use both hard-drawn and drop-forged.
9½ per cent use drop-forged only.
9 per cent are non-committal.

The committee wishes to emphasize the great desirability of hard-drawn copper over any other kind.

Last year's committee called attention to the necessity of using a high grade of band wire on high-speed motors, and suggested that for motors not exceeding 75-hp band wire should have an ultimate tensile strength of 125,000 lb. per sq. in.; while for large motors operating at a maximum armature speed of 1,200 revolutions or upward the band wire should have an ultimate strength of 175,000 lb., or a sufficient number of turns of wire of lower ultimate strength to be equivalent thereto.

74½ per cent approve and follow to full extent.
1½ per cent approve but do not follow.
14 per cent use other material.
4½ per cent do not approve.
5½ per cent are non-committal.

Your committee recommends that the above be adopted as good practice by this association.

Last year's committee suggested that on account of higher motor temperature the importance of using solder suitable for these temperatures must not be overlooked, and it recommended for all motor work the use of commercially pure tin solder, owing to its high fusing point and greater reliability.

49½ per cent approve and follow to full extent.
30 per cent approve, but use other solder composed of about 50 per cent tin.
14½ per cent do not approve.
6 per cent are non-committal.

Your committee believes that as the service on motors is becoming harder all the time, the members of this association will find it to their advantage to increase the use of commercially pure tin solder.

FIELD COIL INSULATION AND TESTS

Last year's committee recommended, for fields where the temperature rise is 65° to 100° C., that the wire be asbestos-covered, and the coil impregnated with solid compound and wrapped with asbestos tape, the asbestos tape also to be thoroughly impregnated.

The above recommendation for temperatures between 65° and 100° C. applies to strap wound fields as well as those of round wire.

47 per cent approve and follow to full extent.
40 per cent approve and follow partially.
6½ per cent approve but do not follow.
½ per cent do not approve.
6 per cent are non-committal.

A number of replies indicate that high cost is the reason why asbestos wire is not used more extensively. The committee believes that when the production of asbestos-covered wire gets beyond the experimental stage, the cost can be greatly reduced.

Last year's committee recommended that all field coils be impregnated with solid compound.

7¼ per cent approve and follow to full extent.
40 per cent approve and follow partially.
31½ per cent approve, but do not follow.
1¼ per cent do not approve.
15 per cent are non-committal.
5 per cent are experimenting.

The impregnation of field coils renders them oil-proof and impervious to moisture, and makes them good radiators of heat. It protects the coil from vibration and rattling, making it a solid mass so that it cannot become grounded or short-circuited.

The committee recommends that all new coils be impregnated, and that when motors are overhauled the coils that are not actually short-circuited be given this treatment no matter how badly they are carbonized; and believes that when so done repairs to fields with attendant expenses will be practically eliminated.

While the first cost of installation of an impregnating plant is such that only the largest companies can afford to install one, commercial plants are now in operation in New York, Buffalo, Rochester, Cleveland and Chicago.

Last year's committee recommended the use of alternating current in testing fields for short circuits.

48 per cent approve and follow to full extent.
38 per cent approve, but do not follow.
1 per cent do not approve.
13 per cent are non-committal.

Last year's committee recommended an insulation breakdown test for fields for roads using trolley, as follows:

New fields.....3000 volts a.c., 5 seconds.
Old or partially repaired fields..1000 volts a.c., 5 seconds.

For roads using third-rail, where voltage fluctuations have to be taken into consideration:

New fields.....3000 volts a.c., 5 seconds.
Old or partially repaired fields..1500 volts a.c., 5 seconds.
3.7 per cent approve and follow to full extent.
40 per cent approve but do not follow.
34.5 per cent use special apparatus.
1.8 per cent do not approve.
20 per cent are non-committal.

In reply to the question, "What have you done to prevent the fast feeding of controllers?" asked by this year's committee:

39 per cent reply that motormen are instructed, and disciplined if necessary.
21½ per cent are experimenting with automotoneers.
14½ per cent use close adjustment of circuit breakers.
2 per cent use current limiting relays.
4 per cent use fuses only.
2½ per cent use automatic regulators.
2 per cent make no attempt to limit fast feeding.
14½ per cent are non-committal.

The report of the committee at the 1907 convention showed that 42.6 per cent of the commutation troubles was due to fast feeding of the controllers. And this committee again wishes to emphasize the necessity of the motive power and transportation departments working together to educate and discipline the motormen, in order to reduce the expense of maintenance and increase the reliability of the service.

The committee also recommends wherever practicable the use of automatic devices, operated electrically or otherwise, that will limit to a fixed maximum the amount of current the motors may receive.

Last year's committee considered the practice of grooving mica to be correct, and recommended that in cases of "high mica," or troublesome commutation a trial of grooving mica be made.

8½ per cent approve and follow to full extent.
53½ per cent approve and follow partially.
21½ per cent do not approve.
7 per cent approve but do not follow.
9½ per cent are non-committal.

The grooving of mica in commutators is so easily and cheaply done that the committee would recommend to companies having commutator trouble that they follow this plan.

GEAR AND PINION SPECIFICATIONS

In reply to the question, "What specifications have you for gears and pinions?" answers are as follows:

26½ per cent have specifications.
9¾ per cent use special gears and pinions.
52½ per cent have no specifications.
11¼ per cent are non-committal.

Your committee advises that the following specifications on motors of over 50 hp be considered good practice:

SPECIFICATIONS FOR RAILWAY MOTOR GEARS, TO BE USED ON MOTORS OF 50 HP AND OVER

Castings to be of open hearth steel or other approved process. They must be free from shrinkage cracks and spongy portions. The design of gear must be such as to minimize shrinkage strains. The unfinished surfaces must be reasonably smooth and free from sand and scale. The finished surface of the teeth and the finished rim below the teeth should be reasonably free from sand, gas or blow holes and must not fall below specifications as given below.

No tooth or finished surface between teeth shall have sand, gas or blow holes which will reduce the strength of the tooth more than 10 per cent on motors of 100 hp or under, or more than 7½ per cent for motors of 100 hp or over.

When sand holes are detected in a tooth, a chisel with 3/16 in. cutting edge should be used to determine the depth and extent, as frequently a hole which appears on the surface to be very small will be found to contain a great deal of sand.

In the case of gas or blow holes, the chisel should be used to open them up if possible and then a small piece of flexible wire inserted to find the extent of the cavity to which they lead. If this cavity enlarges under a tooth or between teeth in such a manner as to affect the strength of the tooth to the extent mentioned above, the gear will be rejected. The other portions of the gear must not contain gas, shrinkage or sand holes to affect the strength of these portions more than 10 per cent.

It is the practice of some manufacturers of gears to fill gas or shrinkage holes with a mixture or compound which greatly resembles the metal itself. This does not add to the strength of the tooth or gear, and prevents the above inspection being made. Your committee, therefore, recommends that any gears so treated be rejected.

The thickness of the rim between the teeth, measured at a point ⅜ in. from the finished edge of rim, must not be less than ½ in. for 3-pitch teeth, and ⅝ in. for 2½-pitch teeth.

For split gears, the aggregate cross-sectional area of the bolts or studs holding halves together, preferably, should not be less than 4.8 sq. in., measured in the body of the bolt, for the lightest gear, and increase for the heavier gears, consistently with other dimensions.

All nuts must be positively locked by means other than a spring lock washer.

The thickness of the teeth, compared one with another, must not vary more than 0.01 in. and thickness at correct pitch line must not exceed the correct thickness and must not run below correct thickness by more than 0.010 in.

Pitch line must be concentric with bore.

On solid gears with axles up to 6 in. diameter, the bore must not vary in diameter more than 0.001 in over and 0.002 in under given dimensions.

For split gears the bore must not be greater than given dimensions.

All gears should be stamped with the name of manufacturer and date of manufacture in a place not subject to wear and where same can be seen without removal of gear.

The steel in gears must not contain more than 0.06 per cent sulphur or more than 0.06 per cent phosphorus, and must have the following physical properties:

Tensile or ultimate strength not less than 60,000 lb. per sq. in.

Elastic limit or yield point not less than 27,000 lb. per sq. in.

Elongation in 2 in. not less than 15 per cent per sq. in.

Contraction of area not less than 20 per cent. per sq. in.

The bolts used for split gears should have the following physical properties:

Ultimate strength, 60,000 lb. per sq. in.

Elastic limit, 35,000 lb. per sq. in.

The committee recommends the serious consideration of solid gears, and their adoption wherever practicable.

SPECIFICATIONS FOR RAILWAY MOTOR PINIONS, FOR MOTORS OF 50 HP AND OVER

Finished surface of teeth must be absolutely free from flaws of any kind.

The thickness of the teeth, compared one with another, must not vary more than 0.01 in., and thickness at correct pitch line must not exceed the correct thickness and must not run below correct thickness by more than 0.10 in.

Pitch line must be concentric with bore.

The bore must not vary in diameter more than 0.001 in. under and 0.001 in. over given dimensions.

The name of the manufacturer and date of manufacture should be stamped on the pinion in a place not subject to wear; preferably on the end of pinion on which the diameter of bore is smallest.

Their physical characteristics should be as follows:

Tensile strength, 110,000 lb. per sq. in. (minimum).

Elastic limit, 70,000 lb. per sq. in. (minimum).

Elongation in 2 in., 15 per cent.

Reduction of area, 20 per cent.

Specially Treated Pinions: Several supply companies are placing on the market pinions specially treated, with the result that a great degree of hardness and resistance to abrasion is secured, without affecting the specifications given above. Your committee believes that this work is in the right direction, since it affords a resistance to wear from friction which tends to greatly prolong the life of the pinion.

LUBRICATION

The rules and recommendations submitted by your committee have been compiled from data sheets sent out for the year 1908 and answered by 51 electric roads, comprising interurban, elevated and city lines. We have also taken advantage of the reports for 1906 and 1907, as well as other information. Your committee also notes from the data sheets of 1908 that more attention is being paid to the subject of lubrication than formerly. In submitting these rules and recommendations some consideration must be given to the different types of equipment used, kind and quality of materials furnished and climatic conditions.

It would also be well to remember that on some of the smaller roads oil houses, storage houses, shops and cars are subject to low temperature during the winter months, no heat being furnished. These, however, are in the minority, and we believe that the rules and recommendations submitted can be used advantageously and economically to all concerned.

QUESTIONS, ANSWERS AND RECOMMENDATIONS

Question (a).—Do you use oil or grease in journal bearings?

Answers.—Thirty-three use oil, nine use grease and nine use both.

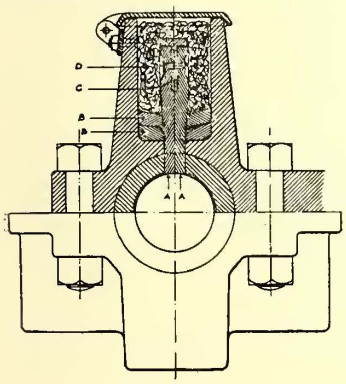

Fig. 2.

Your committee recommends that oil be used for the lubrication of journal bearings wherever it is possible.

Question (b).—Do you use oil or grease in motor-axle bearings?

Answers.—Thirty-one use oil, eight use grease and 10 use both.

Your committee recommends that where it is possible to do so, oil be used to lubricate motor, axle and armature bearings, even in the older types of motors where oil cups can be used successfully.

Question (c).—Do you use oil cups instead of grease in the older types of motors, and if so, do you get good results? Give a description of the cup used. This question brought forth some very interesting data.

Answers.—Twenty-five use oil cups with good results in the older types of motors; 21 do not use oil cups, but prefer grease instead; one has tried oil cups, but was unsuccessful; four use felt in the bottom of the cup, packing above this with wool waste and get good results by using oil; however, it is a noticeable fact that those using oil in the older types of motors are obliged to inspect and lubricate their armature and axle bearings daily.

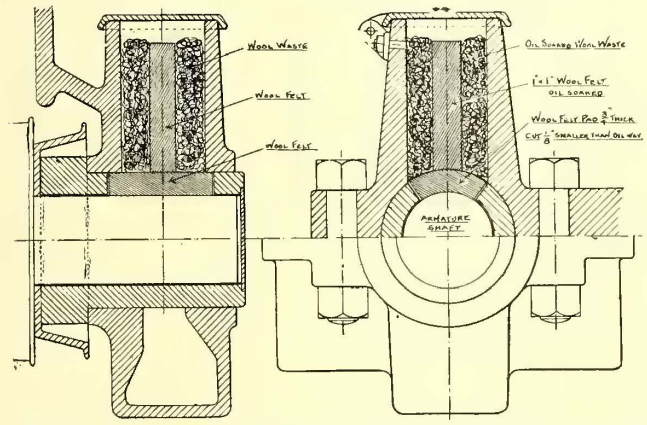

Fig. 3.—Maintenance of Equipment—Oil Cup Used by the Chicago, South Bend & Northern Indiana Railway Co.

In old-style motors designed for grease lubrications, we find that grease as a lubricant, especially on the larger roads, has been very generally discarded. The first step in the line of reformed lubrication was to introduce an oil cup that would slip inside the grease cup. The devices for feeding the oil have been many and various; some with constant feed depending upon the capillary attraction with wicks or yarn strands; others with more or less automatic features. Doubtless some of these types of oil feed are satisfactory, but judging from the growing tendency to adopt a more positive form of lubrication for motors, it would seem that the early forms of oil cup are not ideal for reliability and good results. The tendency is not to depend upon the capillarity of a single thread or a small wick to oil a motor bearing, but to have some medium, such as oil-soaked felt or waste put into actual physical contact with the journal.

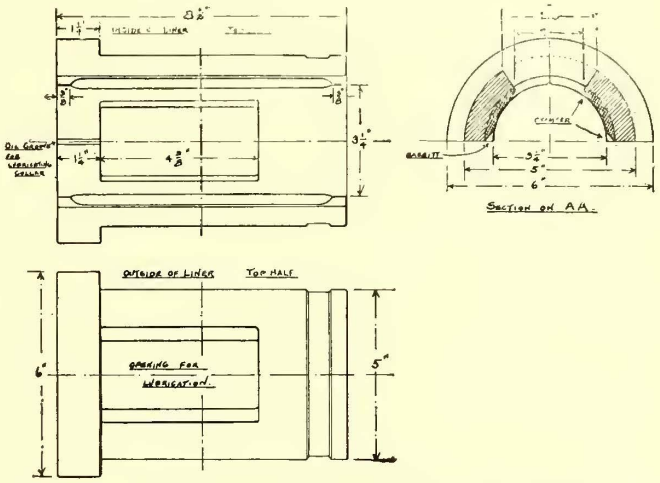

Fig. 4.—Maintenance of Equipment—Armature Liner Used by the Chicago, South Bend & Northern Indiana Railway Co.

The method of the Columbus (Ohio) Railway & Light Company, by which two pieces of ½-in. felt, weighted by a T-shaped brass casting, convey the oil to the journal, is shown in Fig. 2.

Another method in use on the Chicago, South Bend & Northern Indiana Railway is shown in Fig. 3. By this method a good-sized opening is made in the top of the armature liner and an oil-soaked felt pad introduced. De-

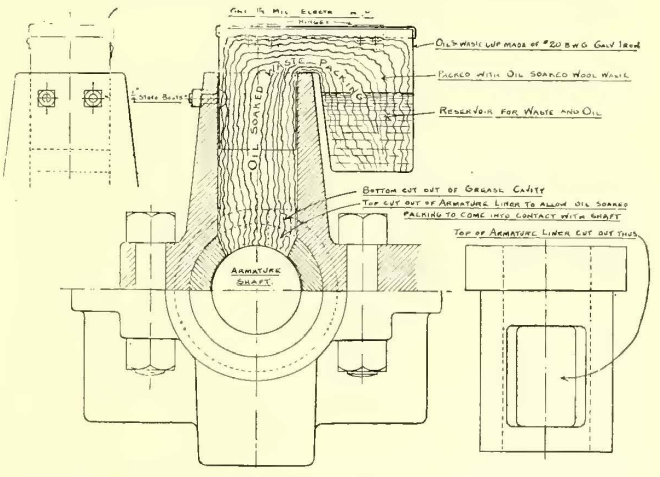

Fig. 5.—Maintenance of Equipment—Oil Cup Used by the Chicago & Milwaukee Electric Railroad Co.

tails of an armature liner used on the Westinghouse No. 56 motor of the Chicago, South Bend & Northern Indiana Railway Company are shown in Fig. 4. Another method which is giving good service on the Chicago & Milwaukee Electric Railroad is shown in Fig. 5. The bottom of the grease cup is cut out, also the top of armature liner, so that oil-soaked waste may come in contact with a fair-

sized portion of the upper surface of the armature shaft. The sheet-iron cup provides an added reservoir for holding oil and waste. The forgoing data tend to show that oil is decidedly the best and most economical lubricant to use in the older type of motors and that it can be, in most cases, used with success for the lubrication of armature and motor-axle bearings.

Question (d).—How often do you lubricate journal bearings?

Answers.—Some roads lubricate daily, while others run as long as six months between lubrications, but the average shows that journal bearings should be lubricated about every 30 days or every 4500 miles on city equipment, while in high-speed interurban service they should be lubricated weekly or about 2500 miles.

Your committee would lay down the following rules for the lubrication of journal bearings in city service:

Lubricate once every 30 days, providing cars do not make more than 150 miles per day, or if on a mileage basis, every 4500 miles. Journal bearings in high-speed service shall be lubricated weekly when cars are making from 300 to 350 miles per day; or, if on a mileage basis, every 2500 miles, and in both cases the journal-box covers, springs and bolts shall be examined to see that all parts are in good condition, that the cover is as nearly dustproof as possible. The sponge should be stirred up in the boxes, and, where it has worked forward, should be pressed back in place, and only a sufficient amount of oil be applied. This can only be done by allowing a certain amount of oil for each car or by thoroughly educating certain men to do this part of the work. This should be more of a form of inspection than lubrication, as a small amount added when necessary at above-mentioned intervals will keep the equipment running in good condition.

Question (e).—How often do you lubricate motor-axle bearings?

Answers.—The data indicate from two to 10 days, and it is readily seen that the older types of motors show the need of lubrication oftener than the newer types, where oil is used.

Your committee recommends that in city service motor-axle bearings, where grease is used in the older type of motors, shall be lubricated every two days, or about every 300 miles. See that grease is pressed down so as to form a firm contact with the axle and take a sufficient amount to fill the cup to within ¼ in. of the top. See that the grease-cup cover is tightly closed. See that the hinge bolt and springs are in such condition as to keep cup cover firmly closed. Where oil cups are used for the lubrication of motor axle bearings on the older types of motors, the operators will be the better judges in this respect.

Motor-axle bearings in city service where the newer types of motors are used, that are designed for oil and waste lubrication, should be lubricated weekly, or about every 1000 miles. Motor-axle bearings in high-speed service with the later types of motors, designed for oil and waste lubrication, should be lubricated every three days, or about every 1000 miles. In high-speed service where grease is used to lubricate the motor-axle bearings they should be lubricated daily.

Question (f).—What mileage do you get between lubrications of armature bearings?

Answers.—The data show that where grease is used on the older types of motors in city service it is necessary to lubricate every two days, or every 300 miles, while in high-speed service, where grease is used in the older types of motors, daily applications are necessary, or about every 300 miles. In city service, in the newer types of motors, designed for oil and waste lubrication, armature bearings should be lubricated every three days, or, if on a mileage basis, about every 500 miles. In high-speed interurban service, with motors designed for oil and waste lubrication, where cars are making over 300 miles to 350 miles per day, armature bearings should be lubricated every two days, or, if on a mileage basis, about every 700 miles. In these cases only a small amount of oil should be used and a man given special training or a certain supply be furnished for each car.

Your committee submits the following rule for the lubrication of armature bearings: Where grease is used in the older types of motors in city service, the armature bearings shall be lubricated every other day, or if on a mileage basis, every 300 miles. Where oil cups are in use on the older types of motors, your committee believes the lubrication should be left to the judgment of the operator. In high-speed service where grease is used as a lubricant in armature bearings on the older types of motors, the armature bearings should be lubricated daily, or if on a mileage basis, every 300 miles. In high-speed service where oil and waste are used as lubricants in the newer type of motors, armature bearings shall be lubricated every three days, or about every 1000 miles.

Question (g).—Do you specify the amount of oil used on the different types of cars?

Answers.—Ten answered "Yes;" 39 answered "No," and two answered "Interurban only."

Of those that answered "Yes" the first specified the amount as follows: One quart daily on armature bearings for high-speed service; 2 qt. every other day for armature and motor-axle bearings, and 2 qt. every seventh day for armature, motor-axle and journal bearings.

The second road specified the amount in high-speed equipment with modern motors as ½ pt. for each armature cup and ¼ pt. for the motor cup and ¼ pt. for each journal box, giving the oiler a certain latitude of judgment in emergency and lubricating all bearings on the 1000-mile basis.

The third road is a city road using an oil cup on the older type of motors and allows 2 oz. of oil for each bearing on all bearings except journal boxes, and lubricates armature and motor bearings every two days, or every 300 miles, and 2 oz. are used on each journal bearing on a 1000-mile basis, or every seven days.

The fourth road uses oil cups in the older type of motors in city service and lubricates every other day, or every 300 miles, and allows ¼ pt. for a two-motor car and ¾ pt. for a four-motor car. It is not stated what amount is used on journal bearings, but they are lubricated every six months, or every 25,000 miles.

The fifth road lubricates armature bearings every day, or every 200 miles, allowing 1 pt. of oil for a two-motor car and 3 pt. of oil for a four-motor car, using the older type of motors with oil cups.

The sixth road specifies 2 lb. of grease for a two-motor and 4 lb. for a four-motor car, lubricating daily on a 100-mile basis, using the older type of motors in city service.

The seventh road uses a motor designed for oil in city service, lubricating armature and motor bearings twice weekly, allowing 1 qt. for two-motor equipment and 2 qt. for four-motor equipment. Mileage not given.

The eighth road uses the older type of equipment with oil cups in city service, lubricating every other day, or on a 300-mile basis, allowing 1 pt. for a two-motor car and 3 pt. for a four-motor car.

The ninth road uses oil on the later type of motors in city service, allowing ½ pt. per bearing for both armature and motor, lubricating every 10 days, or every 2000 miles.

The tenth road uses the older type of motor in city service, equipped with oil cups, allowing ¼ pt. for two motors and ½ pt. for four motors, but states that it is not good practice to specify the amount of oil to use on each type of car.

Question (h).—Is it, in your opinion, good practice to allow oilers a certain amount of oil for each car, specifying the amount for each type of equipment?

Answers.—Nineteen answered "Yes," 20 answered "No," and 12 gave no answer to this question.

Of the 20 which answered "No," most of them are using the older type of equipment and lubricate with grease, and we believe that this should be considered. (See rule for lubrication of armature and motor-axle bearings, where grease is used as a lubricant.)

Of the 19 answering "Yes," it was noticeable that these were mostly interurban roads, using modern motors, designed for oil.

Your committee would recommend giving a certain amount of oil to a certain type of equipment and training certain men to do this kind of work. Where grease is used in the older type of motors, we do not think it would be well to specify the amount that should be given. It is recommended, where a motor is designed so that height of oil in reservoirs can be gaged, that gaging invariably be done as a part of the oiler's inspection; that oil levels be maintained at a height which experience shows is most economical. It is further recommended that where no provision is made in the design of motor for gaging oil, a home-made tube or other device be installed if possible for oil gaging.

(f) GEAR AND PINION LUBRICATION

Question (a).—The gear lubricant you are using comes under the following heads: A—Heavy Oil or Fatty Grease, containing no graphite; B—Adhesive Gear Compound (non-fatty); C—Graphite Grease. Which do you use?

Answers.—Thirteen roads favor a heavy grease, containing no graphite; 15 roads favor adhesive compound (non-fatty), and 20 roads favor a graphite grease.

The data would indicate that an adhesive gear compound (non-fatty) is in favor with nearly all the larger city lines and nearly all the interurban lines, while the smaller city lines using small motors are in favor of a heavy or fatty grease or a graphite grease. This is undoubtedly due to conditions. The congealing of an adhesive gear compound during low temperature would, no doubt, be very noticeable, especially with small equipments, where car barns are not heated. This congealing would also have a tendency to show up in power consumption. Under the above conditions both "A" and "C" have the advantage in low temperature, but during the warmer months there is little or no difference.

Question (b).—Is the presence of wood pulp, cork chips or similar substances in gear lubricants advisable?

Answers.—Nineteen answered "Yes"; 25 answered "No," and seven did not answer the question. No one advised its use with adhesive gear compound, but those using classes "A" and "C" are using it more or less; few of them claim any advantage other than to eliminate the noise in the gears and pinions.

The data would show that with the use of adhesive gear compound the noise is overcome to a great extent, and as the larger roads favor this lubricant, your committee would recommend its use where conditions are favorable.

Question (c).—What difference, if any, have you observed in the rapidity of gear and pinion wear with the different types of lubrication?

Answers.—Three roads get more mileage from "A," 12 get more mileage from "B," and four of the 12 state that they get two-thirds more mileage with the use of adhesive gear compound than they formerly did with "A" or "C." One road states that its increase in mileage since using the adhesive gear compound has been 100 per cent. Seven roads get more mileage from "C," but do not state how much. One answered the question by stating that tight gear pans with heavy oil or graphite will prolong the life of gears and pinions as well as by using any other compound. Your committee heartily agrees with this as far as the tightness of his gear pans are concerned.

Question (d).—How much lubricant is applied in the following horse-power motors: 25, 50, 75, 100 and 125, and how often, and what mileage between applications?

Answers.—The answers vary to such an extent that it is almost impossible to compile any intelligent evidence, except from the larger roads. Nearly all the smaller roads apply the lubricant when necessary and try to keep gears and pinions running in lubricant, giving no mileage, and varying their applications from 10 days to six months. On the larger roads more system is shown, and applications are made on an average of about every 30 days and a lesser amount is used than the smaller companies use, therefore, your committee would submit the following rule as to the lubrication of gears and pinions:

In city service, with motors of 50 hp or under, where the "A" or "C" lubricant is used, 2 lb. should be applied to each gear case every 30 days. Under similar conditions where "B" is used, we would specify the amount of 1 pt. to each gear case every 15 days. In high-speed service with motors of 50 hp or more using "A" or "C" compound, we would specify the amount of 3 lb. to be applied to each gear case every 30 days. Under similar conditions where the "B" compound is used, we would specify the amount of 1½ pt. to each gear case every 30 days, but if, on inspection, the gear and pinion have sufficient lubrication, none need be applied.

The function of a gear lubricant is to provide a thin film of lubricant on the pitch line of the teeth, so that the metals do not at any time come in direct contact. Grease which acts thus reduces friction, thereby reducing the cost of power and cost of renewals, and it aids acceleration when used under a railway car. It also tends to produce noiseless action, which is becoming a necessity in city service.

While the preservation of gears and pinions is always uppermost in the mind of the master mechanic, the railway manager must not lose sight of the fact that a sticky, gummy substance placed on the gears and pinions requires more power to turn the wheels; and, consequently his coal pile is being more rapidly increased than where a lubricant is used that lubricates at all times, but does not increase the friction.

It would, therefore, appear that there should be an intermediate point between what is commonly termed a a "short gear grease," and which is nothing more or less than a hard oil, and a sticky, gummy substance which calls for greatly increased power to move the wheels.

Your committee wishes to call attention to the fact that a good many of the troubles which are laid to gear grease are due to loose axle bearings and axle-bearing collars.

Loose axle bearings permit the gear to fall away from the pinion, producing poor meshing of the teeth and climbing of the pinion on the gear, and the consequent establishing of a new pitch line at a point not contemplated in the design of the pinion.

Badly adjusted and neglected collars cause the pinion and gear to work out of line. This causes them to wear unevenly, to strike the gear pans on straight track, and, on curves, to run on the points not in regular contact, thereby making an objectionable grinding noise. These are conditions which no gear grease can be expected to take care of.

Your committee would also recommend that where the adhesive gear compound is used it be applied more often and in smaller amounts during the winter months, the idea being to let the gear just come in contact with the grease in the bottom of the case.

Where the adhesive gear compound is used it should be specified that the material shall remain reasonably flexible at all temperatures, that the compound shall not dry out, become lumpy or deposit on the gear case in the shape of a hard crust.

LUBRICATION RULES FOR THE GOVERNMENT OF CAR-HOUSE EMPLOYEES

Your committee in submitting rules for the government of car house employees has endeavored to make them as plain as possible, assuming that good materials are furnished, that oil houses and shops are in such a condition that the ingredients may be handled properly, and that the temperature is favorable to their use.

Rule 1.—Preparing Oil and Waste for Lubrication.—A good grade of wool waste should be used that has a sufficient elasticity to act in a spongy condition after it has been saturated and drained, and also of a sufficient carrying capacity to act as a wick or feeder from the bottom of the box to the journal which is to be lubricated. The oil should also be of a good grade and suitable for the purpose. The waste should be picked apart and saturated in oil, not less than 48 hours before using, allowing 5 pt. of oil to 1 lb. of waste, and the oil should be of such a temperature that it will flow freely. The waste should then be drained or wrung out, remembering that it is to be used as a sponge or wick rather than a hard, solid mass with oil covered over it. The waste should be in such condition that when pressed in the boxes the oil will not overflow and run out over the dust guards or openings in the front of the boxes.

Rule 2.—For Packing Journal Boxes, Motor-Axle and Armature Bearings with Oil and Waste.—Inspect the boxes and bearings and see that dust collar and guard and box cover are in good condition and as nearly dustproof as possible. See that journal bearings are not so badly worn that the two outer edges touch the journal. A bearing in this condition will act as a scraper and a hot-box will result. Also see that there are no threads or waste between the bearing and journal. Place the packing bucket close to the journal box that is to be packed so that no surplus oil will fall to the ground. The first waste applied should be in the form of a roll and packed tightly into the rear end of the box for the purpose of retaining the oil and excluding the dust and dirt from the back of the box. The waste should then be placed between the bottom of the journal and the bottom of the box and packed firmly enough to form a good wiping contact with the journal, but not so tight as to roll or wedge. The waste placed at the sides of the journal should never be placed above its center, and should lie rather loose. Wipe all surplus oil and waste threads from the mouth and edges of the box and close the lid tightly.

The above rules apply to motor axle and armature bearings, with motors designed for this type of lubrication. Boxes should be packed within about ½ in. of the top and all springs, bolts and covers should be examined to see that they are closed tightly and that they are as nearly dust-proof as possible.

The above rule also applies to the packing of journal boxes where a composition of grease and waste is used.

Rule 3.—Lubricating Journal Bearings.—This rule should be as much a form of inspection as lubrication. Examine brass, box, cover and dust guard; stir up the sponging in the box and if it is sufficiently moist no oil need be added; but if found dry, a sufficient amount of oil should be added to give the waste in a condition as described in Rule 2.

Rule 4.—Lubrication of Air Compressors.—Air compressors should be lubricated weekly. Before removing plugs, wipe all dirt and surplus oil from around the openings, then remove the plugs and do not fill to an extent to overflow, thereby allowing the oil to collect with the dust and dirt around the pump frame and case. See that the plug threads are in good condition and oil-tight when closed.

Rule 5.—Lubrication of Trolley Bases and Wheels.—Trolley bases should be lubricated when inspection shows that they require it, and great care must be taken to see that no surplus oil reaches the car roof. Trolley wheels should be lubricated daily, and all surplus oil or grease should be wiped off that none may come in contact with the car roof.

ARMATURE AND AXLE LINERS

The severe service imposed upon armature liner babbitt and the expensive results in the event of its failure have led most operating men to the conclusion that as far as armature babbitt is concerned, "the best is none too good." That it is unwise and false economy to attempt to use a cheap, inferior babbitt for armature liners appears, from the data, to have been generally recognized. An overwhelming majority of the roads submitting data are using a babbitt high in tin, and hardened with copper and antimony, and generally known as "Genuine Babbitt."

The formula principally used is:

Tin 83 1/3 per cent, antimony 8 1/3 per cent, copper 8 1/3 per cent.

Also formulas approximating the following are frequently used:

Tin 89.9 per cent, antimony 7.4 per cent, copper 3.7 per cent.

Also others with minor variations but all high tin base babbitts reported, follow along these lines.

Your committee recommends that a babbitt of not less than 80 per cent tin be used on all armature liners, the hardening constituents, antimony and copper to be apportioned according to the judgment of the user.

The use of any lead or zinc in armature babbitt your committee considers undesirable.

Regarding the possible advantage of substituting bronze armature liners for cast iron, babbitt-lined, on the oldest types of motor, replies show a general opinion that the advantages thus obtained would not ordinarily warrant the expense of changing.

General experience shows that in city service cast or malleable iron armatures liners, with a lining of the high-class, tin base babbitt, recommended above, will give satisfactory results.

Where older types of motor are used in high-speed interurban service, and give trouble from the armature dropping on the pole pieces, it is recommended that special attention be given to improving lubrication, and that a trial be given of displacing the iron liner having a thick babbitt lining, with a bronze liner having a lining not over 1/16 in. thick of high-class tin babbitt. In the opinion of the committee it is imperative for high-speed interurban service that a hard, high-class, tin babbitt be used.

A pronounced advantage in using genuine tin babbitt is found in that the metal may be remelted repeatedly with-

out deterioration. In remelting genuine babbitt, it has been found desirable to introduce a raw potato into the melting pot, to stir up the molten babbitt and assist in oxidizing out lead or other impurities.

It is desirable that a road avoid if possible using a large variety of babbitts, and that the number of grades used be as few as possible. Where more than one grade of babbitt is used, it is of utmost importance that they be kept separate.

Your committee recommends that where total thickness of axle liners is ¾ in. and over, a malleable iron shell be used, with not less than 3-16 in. babbitt lining securely anchored both on flanges and bearing surface.

That where total thickness of axle liner is ½ in. or less, a high class bronze or bell metal be used. That for liners having thicknesses between ¾ in. and ½ in. a somewhat cheaper bearing metal of hard brass may be used with economy. All brass or bronze axle liners should be lined with a genuine babbitt or a tin lining 1-16-in. thick, securely soldered.

In lining brass and bronze liners the liner and lining mandrel should be heated to above the melting point of the babbitt, the surface of the liner should be thoroughly cleaned and wiped with soldering salts, then thoroughly tinned, and babbitt then be poured in while the liner and mandrel are hot. If the surface of brass or the bronze liner is properly tinned, anchoring with drilled holes or otherwise will not be necessary. When finished the work should be tested. It should be found to ring under the hammer.

It is recommended that the same quality of babbit be used on axle liners that is recommended above for armature liners.

A formula for bronze axle liners representing the practice of a Western road is as follows:

Copper, 79 per cent; tin, 8 per cent; lead, 8 per cent; zinc, 5 per cent.

The following also are formulas for bronze and brass axle liners which have been highly spoken of for durability and satisfactory service:

Bronze.—Copper, 80 per cent; tin, 11 per cent; lead, 8 per cent; phosphor-tin, 1 per cent.

Brass.—Copper, 77 per cent; tin, 5 per cent; lead, 6 per cent; zinc, 12 per cent.

It should be borne in mind that in the manufacture of brasses and bronzes that the melting and mixture of these alloys should be done by a capable and experienced workman. It is quite possible for improper foundry treatment to spoil the best of materials.

TROLLEY WHEELS

There seems to be no good reason for a quality of bronze for wheels in city service differing from that in interurban service. Among the formulas submitted are the following:

Per cent	Per cent	Per cent	Per cent
Copper ..90.0	Copper..91.0	Copper ..91.38	Copper..96.0
Tin 8.0	Tin..... 7.0	Tin 6.5	Tin..... 3.0
Zinc 2.0	Zinc..... 1.5	Zinc 2.0	Phos. tin. 1.0
	Flux.... 0.5	Lead 0.12	

For both city and interurban service the bronze and graphite bushing is in almost universal use, the graphite lubricant being supplemented at each inspection by a few drops of oil from a squirt can.

Replies indicate that the larger city systems run to fairly uniform practice with regard to trolley wheels, the wheel principally used being 4½ in. outside diameter, with a ¾ in. V groove, 1½ in. by ½ in. bronze and graphite bushing and weighing all the way from 2 lb. to 4 lb. per wheel.

Some wheels as small as 4 in. outside diameter are in use, but these show materially shorter life than wheels 4½ in. or larger. Your committee recommends for city service a wheel not less than 4½ in. outside diameter.

The use of a 1½ in. by ½ in. bushing is the practice of a very large majority of city roads. There does not seem to be much of a tendency toward a longer bushing than 1½ in., probably because a longer bushing would require a wider harp, which would be more likely, if it should come off, to damage the overhead line particularly at special work.

Your committee would recommend that where a trolley wheel with an axle ½ in. diameter by 1½ in. length in hub proves to be too small for the required service, then its diameter should be increased rather than its length.

Data on interurban trolley wheels show a rather wider diversity of practice than for city wheels. The outside diameter reports follow:

	Dia.		Dia.
Two roads use.....	4¼ in.	Three roads use.....	5¾ in.
Four " "	4½ in.	One " "	5⅞ in.
Two " "	4¾ in.	Sixteen " "	6 in.
One " "	5 in.	Two " "	6½ in.
One " "	5¼ in.	One " "	8½ in.
One " "	5½ in.		

In general the larger the diameter of the wheel used, the better the mileage performance shown. In fact, the best performance reported was that of the 8½ in. wheel weighing 6 lb.

Your committee regards excessive weight of wheel as an element of danger, and would recommend that no trolley wheel weigh more than 5 lb. Also, that the weight of a harp equipped with trolley axle, contact springs, washers, etc., complete, shall not exceed 3 lb. Your committee further recommends that for interurban service, the trolley wheel be not less than 6 in. outside diameter.

Although a number of interurban roads are using ½-in. trolley axles and 1½-in. length hubs, these small axles give rather poor trolley wheel performance compared with wheels using larger axles. Your committee regards ½-in. by 1½-in. axles for interurban service as not the best practice. In view of the performance of wheels with ¾-in. to 1-in. diameter axles, showing mileages from 5000 to 7500, your committee recommends for interurban service an axle not less than ¾ in. in diameter.

Your committee would emphasize the necessity for absolute balance of wheels for high-speed service, and as a simple test for balance on commercial wheels would suggest that wheels to be tested be mounted in harps and held against a rapidly moving belt. If the balance be even slightly imperfect, then it will be found impossible to hold the wheel against the belt.

It is not recommended that an extreme type of interurban wheel be used on a city car or vice versa, but where a considerable number of both interurban and city cars are operated by the same company it has been found desirable, in some cases, to standardize on one harp and wheel for all cars. When this is done new wheels are given their first wear on the high-speed interurban cars, and when partly worn and needing rebushing are rebushed and worn out on the city lines.

AIR COMPRESSOR MAINTENANCE

Your committee thought that, owing to the increased use of compressed air on city and interurban cars, it would be well for it to consider the matter of maintenance of

air compressors. In order to get the ideas of the different members of the association on this subject, several questions were asked. To the question, "How often do you overhaul air compressors?" the answers shown in Table I were received:

TABLE I. OVERHAULING OF AIR COMPRESSORS

No. Roads	Compressors	Overhauling Period
1	7	150,000 miles
1	480	60,000 "
1	18	25,000 "
1	40	5,000 "
1	600	18 months.
16	970	20 "
11	398	6 "
3	145	3 "
6	289	when needed
18	125	non-committal.

The duties of an air compressor on city and interurban cars vary greatly. For instance, a car may be equipped with air doors, electro-pneumatic control and air brakes. The average distance between stops for a car of this character in city service may be every 1500 ft. A compressor under these conditions would necessarily have to be overhauled much more often than one that made stops two or three miles apart, had no air doors or electro-pneumatic control. It also is evident that the first class of service would require a compressor of larger capacity than service of the second class. As a general proposition no air compressor should be required to operate more than 33 1-3 per cent of the time.

The committee believes that with a compressor designed to have sufficient capacity for the service it is to perform, an overhauling for service of the first class should be made every 60,000 miles. A compressor for the second class should be overhauled every 120,000 miles. The overhauling of a compressor should be thorough, and should consist of the following:

Compressor should be taken from under the car and placed on a bench where armature should be removed, oil drained from crank case and all bearings outside of crank case, and then the bearings should be thoroughly washed with gasoline.

If wear is excessive, the crank shaft and connecting rods should have the slack taken up or the bearings should be re-babbitted or re-lined with bronze bearings, as the case may be.

The head should be taken from the compressor, ports scraped out, hair removed from hair strainer and washed in gasoline; and valve and valve seats should be re-ground.

Armature should be taken to the armature room, blown out, cleaned and break-down test applied. Also the commutator should be trued up. Mica retaining rings should be painted with insulating paint. Armature painted with a coat of oil-proof insulating-paint.

Brushholders should be cleaned in gasoline and overhauled, replacing worn tips and shunts that have broken strands.

Field coils should be taken out and insulation carefully looked over, and replaced if necessary.

The inside of the motor shell should be carefully cleaned with gasoline to get oil and dirt out of shell.

The committee recommends the impregnation of pump field coils as tending to cut out all field troubles and greatly prolong the life of the fields.

The piston should be removed from the pump, and the rings should be removed from the groove and carefully cleaned; also, the groove should be carefully scraped out.

Springs from piston rings should be tested to make sure that they have not lost their tension.

If, when the pump is re-assembled and started to work under pressure for five minutes, it be then disconnected and allowed to run free, and oil is discharged from the outlet, it is an indication that the rings are not tight enough in the cylinder, and springs of greater tension should be put in the rings.

The insulators placed between compressors and air piping on car should be taken from the car and cleaned and given a break-down test of 1000 volts.

The oil which was removed from the compressor when it came in should be run through a filter and returned to the compressor, enough oil being added to take the place of dirt, etc., which it contained when removed. In this connection care should be taken to use an oil which does not contain asphalt or which will not carbonize when the pump is given hard usage.

INSPECTION OF AIR COMPRESSORS

The frequency of inspection of air compressors should be determined entirely by the service to which they are subjected. In answer to the question, "How often do you inspect air compressors?" the following replies were received:

13 per cent inspect daily.
6 per cent inspect twice a week.
47 per cent inspect weekly.
1¾ per cent inspect every two weeks.
½ per cent inspect monthly.
25 per cent inspect from 400 to 600 miles.
1 per cent inspect 1200 miles.
5¾ per cent inspect when cars are inspected.

Your committee recommends that air compressors subjected to the severe service described above under Air Compressor Maintenance should be inspected as follows (the inspection period to be based on 600 miles):

Oil plug should be removed and oil added each inspection day to replace that lost in service.

Remove carbon brushes and inspect each inspection day.

Inspect brush-holder tension each inspection day.

Wipe off brush-holder each inspection day.

End of commutator should be wiped off each inspection day.

Hair should be taken out of hair strainer, and strainer washed in gasoline every thirtieth inspection day.

Valves should be taken out and cleaned in gasoline each thirtieth inspection day.

Exterior of pump should be wiped each inspection day.

Compressors should be thoroughly blown out with compressed air each tenth inspection day.

Cars of the second class of service should be inspected as above, only the period of inspection should be 1200 miles.

The committee recommends that the following tests of compressor be made after the above inspection is completed: With all air reservoirs empty and brake valve on release position, start air compressor and note length of time taken in pumping up, and pressure at cutting out point. The inspector will learn to tell when a compressor is not working properly by this method. A test for leakage should then be made, leaving apparatus in same condition as above, and noting number of pounds drop in one minute; the inspector will soon become educated to detect leaks in this manner.

MILEAGE VS. TIME BASIS OF INSPECTION AND OVERHAULING OF ELECTRICAL EQUIPMENT

Your committee, to whom this subject was referred, in order to get a composite opinion of the members of the Association on this question asked for answers to the following questions: "Are you overhauling on the mileage or time basis?" and "Why do you overhaul on the mileage or time basis?" The replies to the first of these two questions are set forth in Table II.

TABLE II. OVERHAULING OF ELECTRICAL EQUIPMENT

Number of roads	Percentage of total number of cars	System of overhauling.
8	38 per cent	On the mileage basis.
30	28.5 per cent	On the time basis.
7	20.6 per cent	On both mileage and time basis.
4	9.4 per cent	When necessary.
10	3.5 per cent	Are non-committal.

The committee also asked for answers to the questions: "Are you inspecting on the mileage or time basis?" and "Why do you inspect on the mileage or time basis?" The replies to the first of these two questions are set forth in Table III.

TABLE III. INSPECTION OF ELECTRICAL EQUIPMENT

Number of roads	Percentage of total number of cars	System of inspection.
8	20.5 per cent	On the mileage basis.
35	50.5 per cent	On the time basis.
3	15 per cent	On both mileage and time basis.
13	5.2 per cent	Are non-committal.

The replies indicate that companies having a large number of cars have found it more profitable and reliable to inspect on the mileage basis, while companies having but a few cars and knowing just what service the cars are performing are using the time basis for overhauling and inspection. The committee is familiar with a number of roads where the inspection and overhauling expenses have been reduced from 25 per cent to 35 per cent by pursuing the mileage system. One of the valuable features of the mileage basis of inspection is that it allows different roads a convenient method of comparison as to the merits of their equipment. Nearly all companies have lines running on different streets where size of cars, speed, etc., are different. To inspect these cars on an equal time basis is obviously wrong, for if a heavy car, runs at a high speed and makes frequent stops, is inspected two or three times a week it should necessarily follow that a lighter car, running at a lower rate of speed will not require as frequent inspections.

It may seem to be an extra expense to have a clerk keep the mileage, but if by doing so a number of the cars that are coming into the car barn are made to stay out a little longer time, it will make a difference of several men in the barn, and as they usually receive as much or more pay than the clerk the expense of a clerk will be amply justified, inasmuch as it would be the means of saving the wages of two men in the inspection barn. It also increases the capacity of a car barn, so that as a road grows and more cars are added the capacity of the car barn is also increased.

An instance of this is a company which five years ago was taking care of 90 motor cars. To-day the same barns and the same men are taking care of 200 motor cars. We believe that if this matter were carefully looked into, and cars inspected by mileage, the results would more than justify any extra expense caused by keeping mileage records.

CAR HOUSE ORGANIZATION

Car house force, in this connection, is intended to refer to those workmen engaged in the inspection, light repairs, cleaning, etc., but not including those employed on heavy repair shop work.

Data sheets on this subject have presented much interesting data, but their most striking characteristic for car houses in general, and for city car houses in particular, has been their total lack of uniformity. For instance, your committee has been unable to establish any fixed ratio for number of cars per man. Each road, and often each car house, presents to the operating man a problem by itself, and the organization must be fitted to each individual case.

One variable feature is whether or not a road's general policy calls for a high standard of excellence in the maintenance, inspection, etc., of its equipment.

The great diversity of operating conditions has much to do with the lack of uniformity in car house forces and work done on different roads. The following are a few of the features which influence the number of men per car and expense of operation:

Lay-over inspection vs. night inspection.
Speed of cars.
Size and weight of cars.
Condition of track.
Number of railroad grade crossings (the jolting over which has a most destructive effect on equipment, especially on trucks and cast-iron wheel flanges).
Hills or grades (which require the most exacting inspection of brake equipment).
Air brakes vs. hand brakes.
Type of control.
Motors (whether of modern or antiquated types).
Physical condition of equipment in general.

Data of all car houses submitted show that in addition to inspection the inspectors also make light repairs. On 70 per cent of the roads the car house force changes armatures, and on 60 per cent of the roads the car house force changes wheels.

THE INTERURBAN CAR HOUSE

Data sheets indicate that on most interurban roads not enough equipment is available to permit inspection to be done by daylight and that it must be done at night and then often much of it is concentrated between midnight and 5 a. m.

The ideal method of inspection would be, when the car house is at the extreme end of the line, to change and hold in cars needing inspection, sending out cars in their places, cleaned and inspected, thus enabling inspection and cleaning to be done by daylight and almost eliminating night work.

Your committee would recommend that owing to the greater advantages of doing work by daylight, night work on inspection and cleaning be eliminated as far as practicable and transferred to the daylight hours.

The following is a typical organization for the night force of an interurban car house, where the inspection work is practically all done at night; the general lines for distribution of work, the size of force depending upon the number of cars handled and local conditions in general:

Foreman.
Motor inspector.
Motor inspector's helper.
Control inspector.
Control inspector's helper.
Brake and truck inspector.
Brake and truck inspector's helper.
Carpenter or general handy man.
Oiler.
Car cleaners.

The foreman's duties are to keep all records, have charge of the men and equipment, make general inspection and repairs when not otherwise employed, assist in switching and have charge of all wrecks that occur in his locality while he is on duty.

The motor inspector's duties are to inspect all motor parts and see that motor leads between motor and car body are in good condition, and to renew brush-holders and brushes, to clean commutators when necessary, to examine armatures for clearance, examine motor axle bearings and see that they are in good condition, to see that all parts of motors are in good safe operating condition, to report to the foreman in charge any defect he cannot overcome, to inspect air compressors, sand commutators when necessary, to clean carbon dust from case and to

see that brushes and holders are in good condition, to trim and inspect all headlights and to test the same and see that they are operating properly.

Motor inspector's helper's duties are to assist the motor inspector and do work as directed by him, such as removing and replacing commutator covers and inspection plates, cleaning out motor case with compressed air, tightening armature and axle cap bolts, or any other loose bolts or nuts in the gear case or around the motor, to clean all headlight reflectors when necessary and see that they are kept in a clean condition, and to clean and fill all marker and classification lamps.

The controller inspector's duties are to inspect all parts of the control apparatus, renew and dress contacts when necessary, clean all parts of the controller, and see that all connections are tight, lubricate such parts as are necessary to test controller, and see that all switches operate properly, to inspect line and limit switches, circuit breaker, reverser and master controller, and see that they are in a clean and safe operating condition.

The control inspector's helper duties are to assist the control inspector as directed by him, and do such work as removing and replacing the outer cases or covers and see that the hinges, the bolts and fastenings of these cases are in good condition, clean all these parts with compressed air and examine all resistance.

Brake and truck inspector's duties are to inspect all brake and truck rigging, tighten loose bolts on trucks, examine wheels and truck springs, equalizers, and all parts of the truck, see that all motor suspension springs, suspension bars and bolts are in good condition, renew any of these parts that are broken or defective, see that all draw-bars, couplers, etc., are in good condition, that a coupling pin and link are on each car, renew brakeshoes and adjust all parts of brake rigging and see that they are in good condition, see that all shoes are in proper alignment with the wheel, and last but not least, to test the air brake by applying the air and see that motorman's brake valve is not leaking nor any of the pipes leading thereto; see that the cylinder piston does not travel to exceed 4 or 5 in. Where slack adjuster is used, he should see that it is operating properly and before adjusting brakes see that it is set to its minimum travel.

The brake and truck inspector's helper's duties are to assist the brake and truck inspector in tightening bolts, renewing brakeshoes, etc., to fill all sand boxes, and see that they are operating properly, to assist car cleaners or help in switching cars when not otherwise employed.

The carpenter's duties are to see that all car-body parts, such as windows, curtains, doors, steps, pilots' seats, platforms, etc., are in good condition; to reset all broken glass and renew lamps, and see that all light circuits are burning; to take all register statements; see that all registers operate properly, and see that all register cords, bell cords, etc., are in good condition and renew them when necessary; see that all signs are properly displayed, and that each car is equipped with trolley pick-ups and the necessary flags and marker and classification lamps.

The oiler's duties are to lubricate all journal, motor axle and armature bearings; see that the air pump has sufficient lubrication; see that trolley wheel and stand are in good condition, and lubricate them when necessary; see that each car has an extra pole, and that the trolley retriever and trolley rope are in good condition; to make watchman's clock report; the balance of his time to be used in cleaning shop and helping the car cleaners.

Car cleaner's duties are to clean all windows, seats, floors, etc., and wash or wipe outside of car body.

COMBINED CITY AND INTERURBAN CAR HOUSE

There is a tendency throughout all car houses to specialize work. Instead of all the men working at all classes of work indiscriminately, it is the general practice to assign certain classes of work to certain men, holding each man responsible for his portion of the work. It is also customary in combined city and interurban car houses to assign certain men to the motor inspection and the control inspection of city cars and to have another set of men look after the motors and control of interurban equipment. This is about as far as the distinction between city and interurban car-house men is carried, the same carpenter putting in glass in city as well as interurban cars, and so on.

The organization of the combined city and interurban car house and the duties of its members are very similar to those of the interurban car house described above except that added to that force is a controller man and a motor inspector for city cars, with helpers, is necessary.

THE CITY CAR HOUSE

The following is as nearly representative data as any received, covering a city car house of average size:

Abstract of data sheet 1A.—Total cars operated out of this car house, 85, consisting of 11 city cars, single truck, 21 ft. long, with two 25-hp motors, K2 controllers; 74 double truck, 21 ft. long, with two 50-hp motors 2B and 29E controllers, hand and electric brakes. Nearly all inspection and repairs made in daytime. Oiling and some light repairs and inspection made at night. Trolley wheels oiled and inspected every night. Controllers inspected and cleaned, commutators and brush holders inspected, circuit-breakers inspected, all twice a week. Lightning arresters inspected three times a year. About 25 armatures are changed here per month. Inspectors of certain classes of cars are responsible for same.

- Day foreman.
- Night foreman.
- Electrical repairman.
- Air-brake repairman.
- Two truck and brake repairmen.
- Two armature changers.
- Two cleaners.
- Two oilers.
- One nightwatchman and cleaner.

Thus it is seen that the city car house organization follows along lines similar to the interurban. The chief difference is that the city car is ordinarily a light-weight, slow-speed car, with simple control, is much more quickly inspected and less expensive to maintain than the interurban with its large motors, complex control apparatus and greater elaborateness throughout.

The small car-house force is generally similar to the foregoing but on a small scale. The forces reported range from one man up.

Data descriptive of a car house in western Pennsylvania, taking care of the equipment of a small city system, seems fairly typical. This car house is manned as follows

Day Force:
- Foreman.
- Two repairmen.
- Carpenter.
- Blacksmith.
- Cleaner.

Night Force:
- Night foreman.
- Helper.
- Cleaner.

A typical third-rail car house force is as follows:

- Foreman.
- Air-compressor inspector.
- Air-compressor inspector's helper.
- Control inspector.
- Control inspector's helper.
- Oiler.
- Commutator inspector.
- Brake-shoe inspector.
- Brake-shoe inspector's helper.
- Carpenter, or rather, handy man.

The duties of an air-compressor inspector and his helper are to inspect and make light repairs on air compressors, feed valves, engineer's valves, governors, air piping, air hose, dummy couplers, whistles, gages and all electric switches connected with the air compressor. They also should look after electric heaters and markers.

The control inspector and his helpers should inspect and make repairs on all control apparatus, such as switch group, reverser, line switch circuit-breaker, cab-control switches and control wiring. The detailed duties of control inspector are enumerated in another part of this paper.

The oiler should oil all motor and journal bearings, grease center plates, side bearings, draw-bar face, truck-pedestal jaws, around journal boxes and all places underneath the car where brake rods or other apparatus is subject to wear.

The commutator inspector should take care of motor brushes and brush holders, keep the commutator in good condition, blow out motors, inspect and repair motor leads, inspect and repair trolley-shoe fuses and wipe off the outside of motor shell.

The brake-shoe inspector and his helper should replace worn-out shoes, and adjust all levers and devices in connection with the air-brake system. He also should thoroughly clean and oil the air-brake cylinder at least once a year.

Carpenter or handy man should replace broken glass, repair doors, straps, advertising frames and make any necessary repairs on the car body that can be done in a reasonable amount of time.

FOREMEN'S MEETINGS

A number of member companies follow a plan for accelerating the efficiency of car-house and shop organizations by holding meetings at stated intervals—monthly, semi-monthly or weekly, as seems most desirable. These meetings are presided over by the head of the department, and there are present the various foremen, storekeepers and sub-foremen. Matters relating to maintenance of equipment, supplies, equipment troubles and recommended improvements are discussed. Minutes of the meetings are recorded and copies sent to interested parties.

Much benefit usually results from such meetings, and your committee recommends that they be held wherever the organization is large enough to make them worth while.

PRACTICAL RULES FOR INSPECTION OF ELECTRICAL EQUIPMENT FOR THE GUIDANCE OF CAR HOUSE EMPLOYEES

Motors.—Remove the commutator cover and inspection plates, take air hose, and after all moisture has passed through, pass the nozzle around the commutator, blowing all dirt and carbon dust to the rear end of the motor case and endeavor to make it pass out through the lower inspection plates. This should be done about once a week. Examine all brush holders, yokes and insulators and see that all these parts are tight and in good condition, and see that the holders are in proper alignment with the commutator, allowing about ⅛ in. space between the brush holder and the commutator. See that brush-holder shunts are not broken or disconnected. Lift brush-holder pressure arms and raise brushes to see if they are in good condition, not sticking in the holders, and are not broken or chipped. Renew brush when worn to within ¼ in. of the limit of pressure-arm travel. Lift pressure arms to see if brush-holder springs have the proper tension. They should have not less than 6½ lb. per sq. in. of brush cross-section on each pressure arm, and if there is more than ½ lb. variation on any motor the holders should be removed for adjustment. Wipe carbon dust off brush-holder insulator or brush-holder yoke, as the case may be. Inspect for loose connections of brush leads at the brush holders or for loose parts in motors, such as screws, tap bolts, etc., that may work down between armature and pole pieces. Examine string bands. If carbonized, wipe with gasoline and give a light coat of insulating varnish. Examine commutator and see that it is bright and smooth and has no flat or rough spots, that it shows no indications of open or short-circuits by the mica being burned between the segments or at the end of the commutator. If slight flat spots occur on the commutator these can sometimes be smoothed down with sandpaper blocks or with commutator stone specially adapted to the purpose. See that armature has sufficient clearance by passing a gage between the pole pieces and the armature and that no armature bands have become loose and are touching the pole pieces or motor frame.

See that field connections are tight and show no signs of the insulation being burned off. Examine motor-axle bearings and see that they are not unduly worn; examine axle collar and see that it is tight upon the axle and is adjusted properly so that the motor will have no undue end thrust; examine gear and pinion, see that they are tight and sufficiently lubricated and not worn to an undue extent; also see that gear bolts are not loose or broken; tighten all loose bolts in gear cases and about the motors, giving the armature and motor axle-cap bolts special attention.

Hints to Inspectors.—The commutator and brush holder are indicators by which nearly all motor defects can be detected. It is a well-known fact that the commutator is the weakest part of the motor, hence any defect that may arise in the fields, brushes, brush holders or armature coils is almost certain to show on the commutator. Therefore, when the commutator is not of a dark, glossy, clean and smooth appearance you can readily conclude there is some defect in the motor. Open circuits are shown by burning or arcing at the end of the commutator. Field trouble is generally shown by severe arcing on brush holders, and commutator has a burned or blackened appearance. Therefore, study the commutator and you will soon be able to detect many troubles without giving the motor a formal test, but if the trouble cannot be located and the commutator has not the proper appearance after brushes and brush holders have been found to be in good condition, give the motor a thorough test.

Westinghouse Pneumatic-Control Equipment.—The inspection of the Westinghouse M-U control, electro-pneumatic type, was considered by your last year's committee. (See 1907 Proceedings, page 46.)

General Electric Type M Contactors and Reversers.—Scrape arc chutes clean of carbon and copper dust and examine the tips, filing up any that are blistered to make sure of good contact on all. Press up under contactor fingers to see if bottom tip wipes or travels on top tip at least one-eighth of an inch. If tip is worn thin or so as to give less than one-eighth of an inch wipe renew the tip. Try all screws which secure the tips to the contractor arms, making sure that all screws are absolutely tight. Examine for loose connections and try all screws and bolts to make sure they are all tight.

A long screwdriver with means to turn same with a wrench at bottom is desirable for this purpose. Inspect interlock fingers and polish up tips of same to insure good contact. If interlocks are bent out of shape, bend back into such shape as to make proper contact. Examine all shunts to see that none are partly broken or any in such condition that they will not have full carrying capacity, thus preventing danger of burning the hinge pins. See that contactors will lift sharply on each point and drop freely when controller is shut off. Before shutting the contactor box take air hose and blow out the contractors and box thoroughly clean.

Try all screws of reverser finger and connections to see that they are tight. Examine all fingers, filing up same and filing contacts so as to insure a good contact. Feel tension on each finger, and if finger has been heated and softened renew same. Make sure that each finger will make square and firm contact with reverser segments. Wipe off all segment blocks, and if there is any indication of shorting across between segments remove segment block and replace with one that has been cleaned and varnished. Throw rocker by hand a few times to see that the fingers will not catch. Throw reverser electrically a few times to see that it throws with strength and promptness without undue arc-

ing and without rebound. When reverser finger is not making good contact it can sometimes be detected by tapping the finger with with a screwdriver handle or by placing a thin strip of paper between the finger and the contact and noting the way the paper pulls. Wipe segments and bearing portions of fingers with a small quantity of vaseline, taking care to remove all excess lubricant. See especially that the small fingers in the master controller circuit have bright contact and are not gummed. These fingers and their contact pieces can be polished by drawing through between them a strip of emery cloth, 2 in. wide and doubled

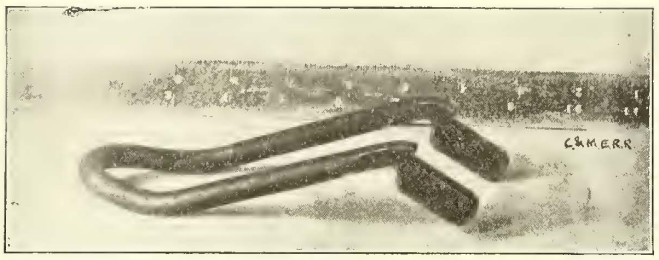

Fig. 6.—Maintenance of Equipment—Lifter for Brush-Holder Pressure Arms

over to bring the emery on both sides. Blow out reverser with air hose and apply oil sparingly to the bearing parts of the mechanism.

Type M Controllers.—Examine the master control fingers, trying tension of fingers, and polishing cylinder and fingers to secure good contact. Scrape carbon dust from arc-deflector division plates. Wipe dust off inside of cover. Examine controller throughout for loose connections and see that each finger is adjusted to make good contact. Lubricate fingers and cylinder with small amount of vaseline. Press down button on controller handle to see that the auxiliary fingers make proper contact, and polish up the same when necessary. Oil sparingly the shaft bearings of cylinder and reverser switch. Wipe off excess lubricant, especially around the blow-oil coil. When finished, try on each point to see if contactors pick up properly and throw reverser two or three times. Blow out controller with air hose.

Motor Rheostats.—Blow all mud and dirt from around the grids weekly. Examine all bolts holding the grids to car body and see that none is loose or lost, and that all nuts are tight; examine grids for open circuits. This can be detected by passing fingers lightly over the bottom end of the grids and noting if any show unusual vibration; examine all wires and connections and see that none is loose

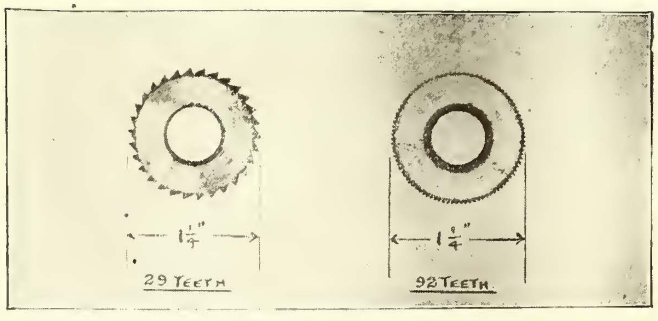

Fig. 8.—Maintenance of Equipment—Saws for Grooving Commutator Mica

or disconnected; see that no dirt, stones, bolts, nuts or other foreign substances are lying on top of the grids or between the frame and grid to form a short circuit; see that none of the grids is burned or warped so it is touching another; examine all parts of frame and rods and see if they show any signs of arcing by mica insulation tubes being burned through; see that they are guarded from water and dirt as much as possible by some suitable protection; see that some suitable means are taken to keep the heat from setting car body on fire, such as placing sheet asbestos or some similar substance between top of resistance and bottom of car body.

Trolleys.—Examine wheel and see that bushing and hub or spindle are not unduly worn and that outer rims are not bent, nicked or worn out; see that cotter keys holding spindle in harp are in good condition; see that contact springs and washers are sufficiently tight between harp and hub of wheel to form a good contact, but not so tight as to allow the wheel to slide on the wire. See that the spindle is tight enough in the harp to form a good contact, and that the spindle holes in the harp are not too badly worn to prevent this contact. Examine the harp and see that it is not loose on the pole and that rivets holding same are tight. Examine pole for cracks, bends or flaws, and see that it aligns the wheel properly with the wire, and if not, loosen the clamp bolts and turn with a pipe wrench until wheel is in proper alignment, leaving wheel on the wire during the operation. See that clamp bolt and nut holding same and base bolts are all tight and in good condition; examine springs and see that they have sufficient tension, allowing sufficient space between the coils for compression when the pole is pulled down to the roof of the car. In bases with more than one spring, see that they are equalized on each side, both sides given the same tension. Give springs sufficient tension so that the wheel will have pressure of about 20 to 25 lb. against the wire in city service and from 35 to 40 lb. on high speed. Make this test where the wire is of standard height. It can be done by using a hook scale, hanging an old brake shoe or other weight of about those dimensions

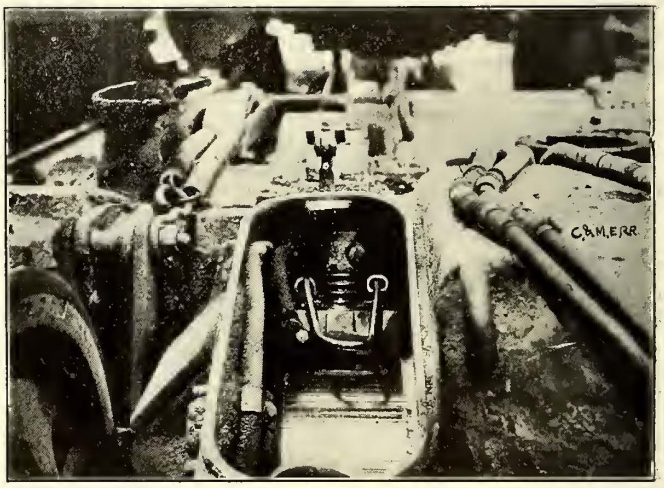

Fig. 7.—Maintenance of Equipment—Brush-Holder Pressure Arm Lifter in Place

to the trolley rope and after a little practice a man will soon be able to regulate this without any scale, with very little variation.

Trolley Lubrication.—Lubricate trolley wheels at each inspection and wipe all surplus oil from wheel hub after lubricating. Lubricate bases when necessary. This can be determined by swinging the pole from side to side below the wire. If the base operates freely no lubrication is necessary. Great care must be taken not to allow any surplus oil or grease to reach car roof while lubricating the bases and wheels.

Trolley Rope.—See that rope has a firm fastening with the harp; that it is not chafed or showing signs of wear where it comes in contact with the hood; that it has not been broken and that it has no unnecessary knots in it.

Trolley Retrievers.—Trip the retriever and see if it operates properly; that the tension in the retriever spring is not so severe as to break the rope or pull the trolley down so severely as to damage the hood or roof; see that rope works freely when resetting, and that it is of such length that it will not pull trolley from wire where the wire is high, such as at railroad crossings, etc.

And last, but not least, see that all interurban cars are supplied with an extra pole, fully equipped, and in good condition, and that the trolley board is securely fastened to the roof of the car.

Brakes.—Start the air pump and allow it to pump to its maximum capacity; see that brake-valve handle is in release

position, and where automatic air is used see that gage hands show a difference between train line and auxiliary of 20 lb. If they do not, the governors need to be reset. Apply brake to show reduction of 40 lb.; place brake-valve handle to lap position; see that air gage operates properly and that

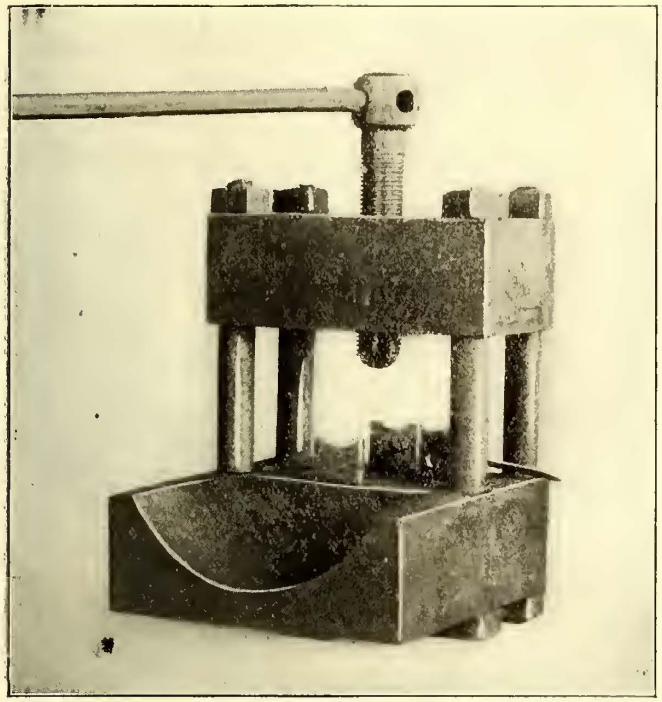

Fig. 9.—Maintenance of Equipment—Screw Press for Straightening Armature Shafts

no leaks are in or around the brake valves or pipes leading thereto; examine all pipes, reservoirs, triple valves, cylinders, etc., while brake is set, and see that none is leaking and that brake does not release while the brake-valve handle is in lap position. If the cylinder piston has a travel of more than 5 in. an adjustment of brakes will be found to be necessary.

Inspect all shoes and see that they are in alignment with the wheel and that none is broken, and renew those that will not give sufficient wear until the next inspection. In renewing brake shoes put shoes of the same thickness on opposite wheels, be they either old or new. See that all brake-shoe keys are in place and none is lost or broken; examine shoe heads and see that none are lost or broken, and that all pins, bolts, etc., that hold same to the beam or truck levers are not unduly worn; that all bolts, cotter pins, nuts, etc., are in good condition. Examine brake beams and see that none is cracked, broken or bent, and that all bolts, pins and holes are not unduly worn, and that all cotter pins and nuts are in place. Examine all hangers and pins connecting brake-shoe head and beam to truck and see that all are in good condition, and that none of the pins and hangers is unduly worn so as to cause brakes to grab or chatter; special attention must be paid to all cotter pins in all parts of the brake rigging. Examine all turn-buckles and see that none of the threads is stripped and that all adjusting and jam nuts are tight and in their proper places. Adjust brakes so that cylinder piston will not travel more than 4 in. or 5 in. When brake is in release, see that none of the shoes binds the wheels, that release springs operate properly so that brakes will be free when released.

Examine all pull-rods for cracks or flaws, lubricate all pins in pull-rods, levers and slides; set hand brake and see that it is in good condition; see that brake staff and chain are not unduly worn; that rod, pins, etc., are in good condition.

Where slack adjuster is used, see that same is placed to its minimum of travel before any adjustment of brakes; see that same is operating properly and that it has not traveled to a maximum position, leaving the correct piston travel. Drain all reservoirs daily.

Miscellaneous Equipment That Should Be on Interurban Cars.—Interurban cars should never be put in service without the following miscellaneous equipment: Three sets of flags (red, white and green); telephone, where standard of the road; classification and marker lamps where oil lamps are used; two trolley pickups; one coupler or pulling bar; one pull rope; coupling link and pin; extra supply of air pump and light fuses (also car and control fuses where used); fire extinguisher in working order; one extra trolley pole, fully equipped, on top of car; one extra trolley rope, or, better still, one extra retriever equipped with rope; one trolley retriever in its place on the rear dash; one headlight in its place on the front dash, for signal use. Fusees and torpedoes should be on each car. The crew should have both red and white lanterns in good condition, and sufficient tools to change the trolley pole or make other light repairs.

HOME-MADE TOOLS AND DEVICES

Lifter for Brush-Holder Pressure Arms—A number of roads, especially in the Middle West, have found the use of a single wide brush to a brush holder to give better results than two narrow brushes, the advantages being:

(1) The elimination of the ridge between brushes on commutators.

(2) More uniform wear across commutator.

(3) Better performance and longer life of the brushes.

Coupled to these advantages however, was at first the disadvantage that the workman had great difficulty in holding up both pressure arms and still have a hand free to lift out and put in the wide brush. To overcome this trouble the lifter here illustrated was devised. Fig. 6 shows the shape of the lifter, especially the portion that engages in the finger rings of the pressure arms. Fig. 7 shows the lifter in place, and it can readily be seen that both pressure arms can be held up with this lifter with the left hand, while the right hand is free to manipulate the brush.

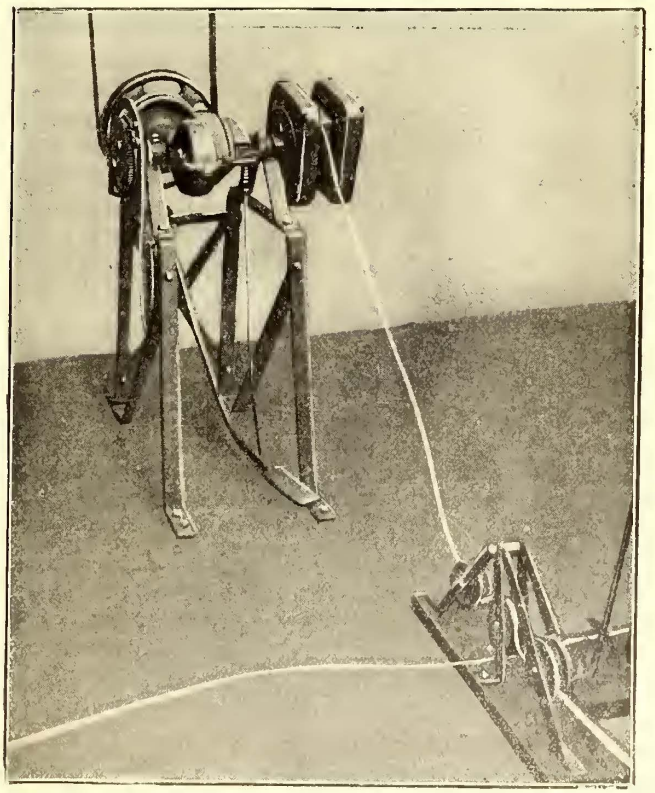

Fig. 10.—Maintenance of Equipment—Home Made Field-Winding Machine

Saws for Grooving Commutator Mica—In the report of this committee for last year, photographs and description were given of a machine for grooving commutator mica.

We find machines following this design have since been built by a number of roads. The saws used when the original machine was built a little over a year ago had fine teeth, 92 in number, and with the fine-tooth saw the time required to groove a 75-hp armature of 117 segments

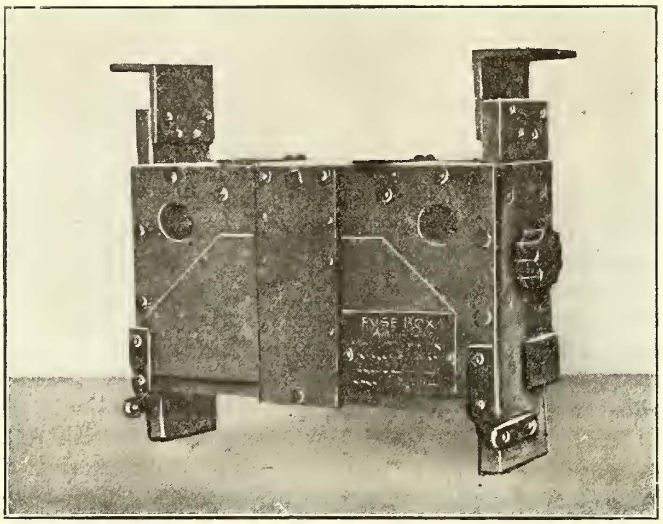

Fig. 11.—Maintenance of Equipment—Improved Main Fuse Box

was, for an average, 25 minutes. It has since been found that saws of coarser teeth are more efficient, and the use of 29-tooth saws has reduced the time to an average of about 15 minutes per armature. The two types of saw are illustrated in Fig. 8.

Screw Press for Straightening Armature Shafts—Fig. 9 shows a convenient press for straightening armature shafts.

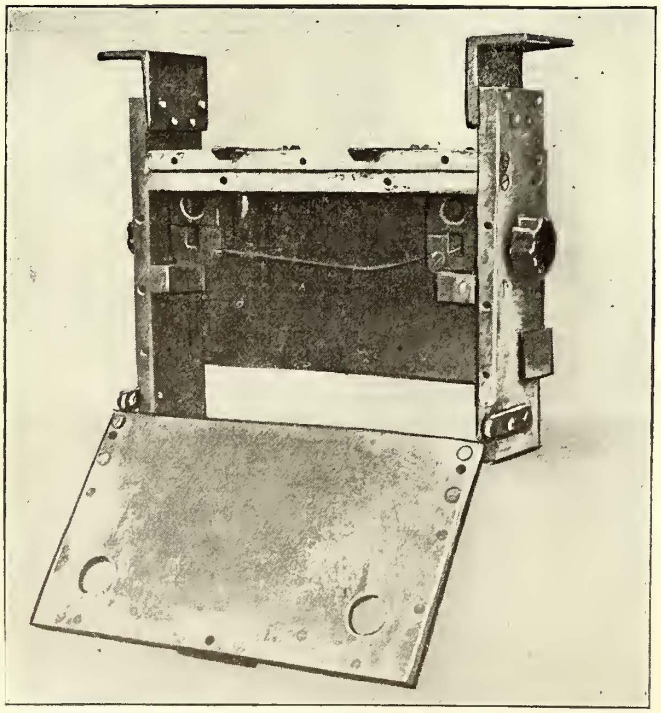

Fig. 12.—Maintenance of Equipment—Improved Main Fuse Box

The screw is 2½ in. in diameter, the columns 2-in. rod, the top and bed block, cast iron, and the bar 1¼-in. octagonal steel 8 ft. long. The bent portion of the shaft is laid on the V-blocks and the screw pressure applied between them. Where the shaft is bent close to or inside the laminated core, the core is carried on a piece of leather on the concave part of the bed block, and the shaft supported by one V-block. For convenience the press is operated on the bed of a large engine lathe. The armature is removed from the lathe centers when pressure is applied,

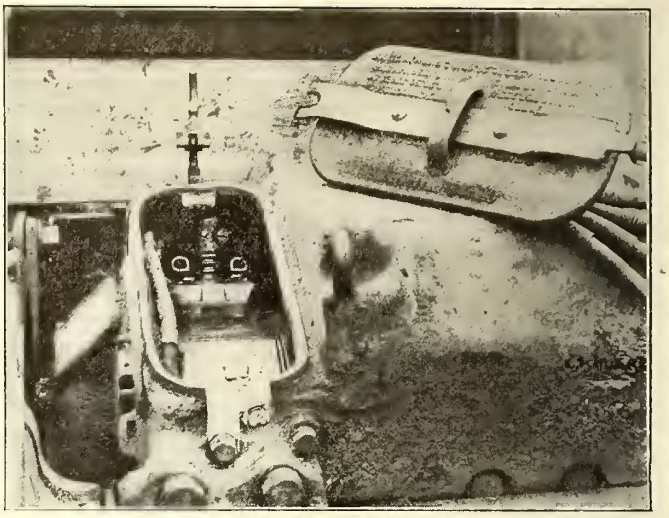

Fig. 13.—Maintenance of Equipment—Improved Motor Lid Fastening

after which it is placed on centers to try the shaft for straightness.

Field Winding Machine.—For the home-made field-winding machines, shown herewith in Fig. 10, as well as for the armature-shaft straightening press preceding it, we are indebted to the New Hampshire Electric Railways, R. L. Jones, master mechanic.

The pulley runs continuously, but the mechanism is thrown into gear at the will of the operator through the treadle and cone friction device forming part of the driving pulley. The gearing and reducing motion mechanism were taken from a scrapped mowing machine. Backlash of the winding spindle is prevented at the left of the

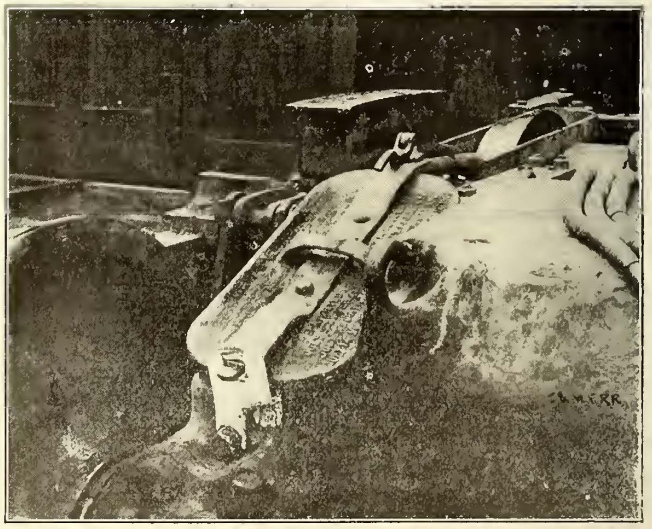

Fig. 14.—Maintenance of Equipment—Improved Motor Lid Fastening

machine by a rachet engaging twin pawls. The balance of the machine is entirely home-made.

A certain type of main fuse box common on interurban equipments was designed with all four sides and top rigidly screwed together. The only means of removing or replac-

ing a ribbon fuse was from the bottom, not an easy task, especially for a motorman with large hands.

By loosening the front of the fuse box, applying a set of home-made hinges, at the bottom, and catches at the top, as shown in Figs. 11 and 12, the front becomes a hinged flap and the replacing of a fuse becomes easy and convenient. This alteration can be made at your own shops at a very nominal expense.

IMPROVED FASTENING FOR MOTOR LIDS

On certain motors where the motor lid rests slantwise on the motor there has been, in the original construction, considerable trouble through the lids shaking loose, sliding off and getting lost. To overcome this the device shown in Figs. 13 and 14 was adopted. A strip of spring steel, 3-16 in. x 2 in., with a fork at the upper and a tongue at the lower end is riveted lengthwise to the lid. The tongue engages in a slotted lug, which is secured to the motor frame by one rivet and takes one of the brush-holder bolts. In lowering the cam wrench at the upper end a slight stress is placed on the spring which holds the lid securely in place and prevents rattling. Since the adoption of this device not a single lid has been lost off. Fig. 13 shows the lid removed and Fig. 14 the lid in position.

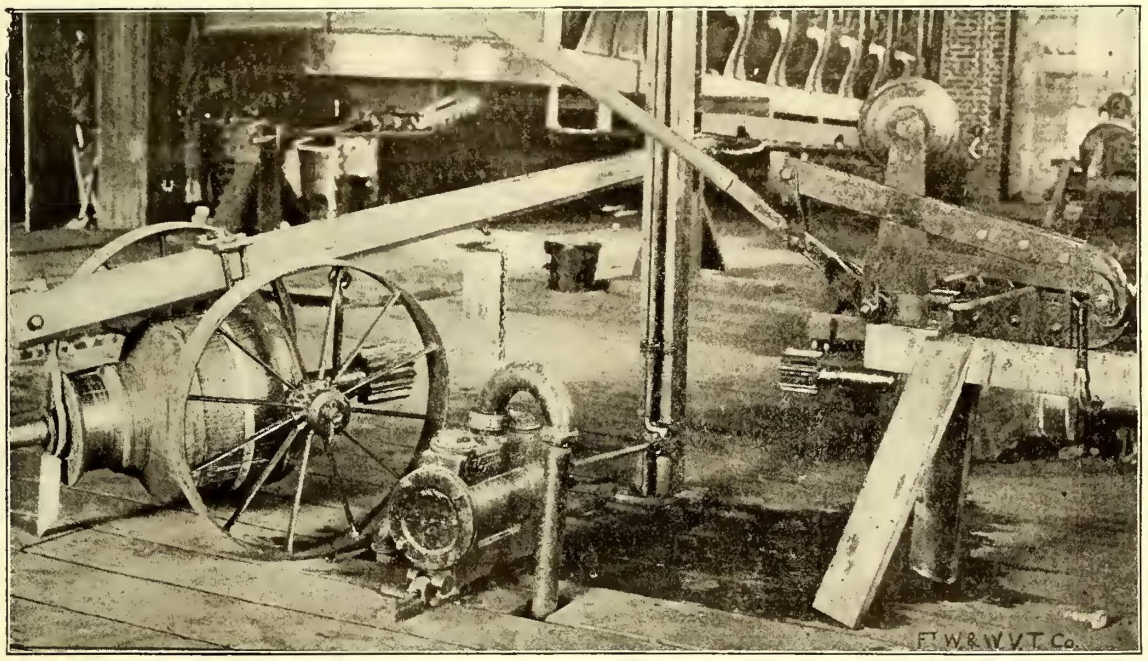

Fig. 15.—Maintenance of Equipment—Motor Pump, Armature Wagon and Shop Shears

WATER PUMP, ARMATURE WAGON AND SHOP SHEARS

Fig. 15 shows a water pump, armature wagon and a pair of shop shears which are used by the Fort Wayne & Wabash Valley Traction Company at its Logansport shops, and which were built almost entirely from scrap, with the exception of the purchase of a small hand pump made by the Barnes Manufacturing Company, Mansfield, O. The conditions at these shops are as follows: There are springs back of the shops, considerably elevated from the bottom of the pits, and this allows the water to run down into the pits during wet weather. Solid rock underneath these shops and barns made a connection with the city sewer a very expensive matter.

Formerly the pump was operated by hand and it would almost keep one man busy to keep the water out of the pits during wet weather, so the foreman, H. M. Crosby, conceived the idea of making this small pump a power pump, which he did as follows: He took 30 ft. of 1-in. gas pipe and making a line shaft, he connected it to the main shaft in the shop by a belt. On the other end of the shaft was attached a bevel gear, which was found in the scrap heap. An upright shaft was then made of ¾-in. iron, 15 ft. long, and an old bevel gear from a brake wheel was used to connect with the bevel gear at the end of the line shaft. This shaft was offset opposite the head of the pump to form an eccentric and set into a plate of iron on the floor, the piston of the pump being connected to the offset or eccentric in the shaft, by which it is operated. Pipes are run from the intake of the pump to the pit, the end being properly screened. A pipe is also run from the discharge of the pump, overground, to the city sewer. This shop contrivance has been in operation for more than a year, giving no trouble whatever, and has required no repairs.

The armature wagon, also shown in Fig. 15, was built almost entirely from scrap iron and is described as follows: Two 24-in. wheels from an old corn planter, which were found in the scrap heap, and an old buggy axle, both bent in the center with the same radius as the armature, allowing ample room for clearance, were used. The journals were bent at right angles with the radius and a piece of timber 6 ft. long by 3½ in. by 3½ in., was then bolted to the top of the axle and tapered down on one end to form a handle, which was then bolted on by clips. A ⅞-in. hole was then bored through this timber 3 ft. from the end of the handle and a ⅞-in. hook bolt, with an eye, so it would swing and adjust itself to the armature was used on the commutator end. Twenty-eight inches from this bolt is a rigid hook which catches under the armature shaft at the pinion end. A block of 4-in. by 4-in. wood is attached to the handle by a small chain near the first hook. This is placed under the pinion when picking up an armature and can then be hooked back upon the handle out of the way. The illustration readily shows how this is operated.

The shop shears also were made almost entirely from scrap iron. They have a double leverage. Two pieces of spring steel taken from an old elliptical spring 2 in. wide

and 6 in. long, were well ground and tempered for the cutters. A piece of pipe was slipped over the handle for leverage. This tool can be moved readily. The shears can be bolted to a bench or anything else convenient by angle irons riveted on the lower cutter bar and a hook bolt over the lower cutter bar through the bench to the floor.

CONCLUSION

In conclusion, your committee is led to believe, through evidence of data sheets and others, that in a number of cases its recommendations of last year have been acted upon by member companies with beneficial results.

It is especially gratifying to the committee to note the increased interest toward its work which has been manifested by the member companies. Last year 34 companies responded by filling out and sending in data sheets, while this year data has been received from no less than 72 member companies, and in nearly all cases, this year, the data sheets have been filled out in an admirably complete and painstaking manner. Your committee wishes to express its thanks for this splendid co-operation on the part of the member companies.

Last year Messrs. E. H. Anderson, of the General Electric Company, and J. L. Davis, of the Westinghouse Electric & Manufacturing Company, sat with the committee rendering most valuable assistance in the preparation of its report. This year the same gentlemen co-operated in the same way to an even greater extent, for which your committee wishes to express its grateful acknowledgment.

UNIFORMITY IN CLAIM DEPARTMENT RECORDS AND ACCOUNTS*

BY JOHN J. REYNOLDS, CLAIM AGENT, BOSTON ELEVATED RAILWAY COMPANY, BOSTON, MASS.

It is not within the province of this paper to teach the art of classification or accounting, but rather to aid if possible in promoting the adoption of such a uniform classification of accounts as will facilitate comparisons of the statistics of various claim departments. I employ the word "account" with a strict departmental meaning, and, used in its broadest and loosest sense, it means not merely a narration, or a statement of facts, but something systematic or orderly, and shall be understood to include that which has to do with the devising and control of systems or methods of classifying, recording and summarizing data relating to the business of claim departments, so that the condition or state of such business at any given time shall be disclosed, and such other information as may be needed for its systematic and most successful administration shall be furnished. It must not be confounded with the auditing department account.

The time has come when there is a demand for comparable statistics. We must have something better in the way of statistics than we have had. Were I to address this subject to those not familiar with the necessity and practice of considering and comparing various kinds of accidents, I should feel that it might be advisable, and perhaps necessary, to illustrate by concrete example what I mean by comparable accident statistics. I will state that a comparative classification will aid you to regard with discriminating attention the character of each accident or group of accidents for the purpose of discovering their resemblance, their differences and their relative cost to each other.

The compilation of comparable claim department statistics is at the present time attended with many difficulties and large expense, owing to the differences in the accounting and recording systems or methods of the various roads. Those systems and methods are almost as numerous as the roads themselves. When this is borne in mind, it seems peculiarly appropriate that our association, with a roll of over 250 member companies, should consider this subject with a view of bringing prominently to the attention of these member companies the necessity of instituting, if possible, a movement toward uniformity in recording and keeping claim department records and accounts and thus furnish the media, so to speak, of giving them a comparable table of accident statistics that will mean the same thing to all, and that shall result in a benefit to all our roads.

Obviously, the adoption of some scheme for summarizing the experience of each claim department will enable us to render promptly and with as little additional labor as possible trustworthy information in the detail desired for our use in compiling the comparative statistics required from day to day. The method thus standardized and accepted will thereupon become the foundation upon which the accumulation of data can be made safely for years to come. The watchword of all claim departments is "Progress." We cannot go forward unless we build on what has been accomplished. The question involved in the successful management of a claim department, under all sorts of conditions, is a vital and urgent one. It can neither be blinked nor shirked. The decisive factor in it is the underlying question of cost of efficient management. This question is already loud and insistent. It therefore requires that the records and accounts be classified minutely, so that if any item shows an unusual deviation from the average, you can hope to find out the reason for it, either in your own or in the operating department, and thus work for the uplifting of the standard of the whole road.

The benefit of comparative experience, intelligently used, can scarcely be overestimated. Conclusions based on incomplete data are often worse than useless. The foregoing are but a few of the reasons why comparative statistics are desirable and why those who recognize this desirability should coöperate with others of like mind in securing the adoption of a standard form of records. In turning this subject over in my mind, I could see that this paper would reach encyclopedic proportions were I to attempt a classification that would cover every account incidental to the business of a claim department. I have therefore elected to present for your consideration five forms that contain some monographs of the more important items. You are invited to discuss them.

Form A is a classification of report for both surface and elevated lines, while Form B is a key to this classification. (Exhibited.)

Form C is a monthly comparative statement of the work of the legal department of the company, Form D is a yearly comparative statement and Form E is a classification of reports.

If Form A is adopted, it will be a simple matter of bookkeeping to carry its numerical order to your expense account and always have before you the cost of the various accidents classified and the means of readily ascertaining the relative cost of each group of accidents. This classification will, it seems to me, meet the requirements of all roads, because there is no road but that will have ac-

*Read before the American Street and Interurban Railway Claim Agents' Association, Atlantic City, October 12, 13, 14, 15 and 16, 1908.

Form A—Boston Elevated Railway Company—Classification of Reports

SURFACE LINES

1. COLLISION WITH TEAM
2. Right angles from side street
3. Same direction: cut in front of car
4. On track
5. Struck in passing
6. Opposite direction: cut in front of car
7. On track
8. Struck in passing
9. Miscellaneous
   Total

10. COLLISION WITH AUTOMOBILES
11. Right angles from side street
12. Same direction: cut in front of car
13. On track
14. Struck in passing
15. Opposite direction: cut in front of car
16. On track
17. Struck in passing
18. Miscellaneous
    Total

19. COLLISION WITH PERSONS
20. On sidewalk
21. Not on sidewalk
22. Coming from behind car
23. Coming from behind vehicle
24. Total

25. COLLISION WITH ANIMAL

26. COLLISION WITH BICYCLE

27. COLLISION OF CARS
28. Rear end
29. Head on
30. On curve
31. Right angle
32. Missing switch
    Total

33. ALIGHTING FROM CAR
34. Closed car
35. Front platform
36. Car stopping
37. Car starting
38. Rear platform
39. Car stopping
40. Car starting
41. Moving
42. Open car
43. Right running board: standing
44. Right running board: moving
45. Car stopping
46. Car starting
47. Left running board: standing
48. Left running board: moving
49. Car stopping
50. Car starting
    Total

51. BOARDING CAR
52. Closed car
53. Front platform
54. Car stopping
55. Car starting
56. Rear platform
57. Car stopping
58. Car starting
59. Moving
    Total

60. Open car
61. Right running board: standing
62. Right running board: moving
63. Car stopping
64. Car starting
65. Left running board: standing
66. Left running board: moving
67. Car stopping
68. Car starting
    Total

69. PNEUMATIC DOORS: SURFACE CARS
70. Struck: leaving
71. Struck: boarding
72. Struck by door while in vestibule
73. Step: closing: leaving
74. Step: closing: boarding
    Total

75. ELEVATOR DOORS
76. Leaving
77. Boarding
    Total

78. SIDE BARS: FALLING
79. Struck: lowering
80. Struck: raising
81. Miscellaneous
    Total

82. CROWDS: SURFACE AND SUBWAY STATION
83. Pushed into pit
84. Falling into pit
85. Pushed into pit: struck by car
86. Falling into pit: struck by car
87. Injured by pushing
88. Property injured by pushing
    Total

89. STEPPING BETWEEN CAR AND PLATFORM
90. On straight rail: leaving
91. On straight rail: boarding
92. On curve: leaving
93. On curve: boarding
    Total

94. STRUCK RIDING ON RIGHT RUNNING BOARDS
95. By car
96. By team
97. By other objects
    Total

98. STRUCK RIDING ON LEFT RUNNING BOARDS
99. By car
100. By team
101. By other objects
     Total

102. FALLING IN CAR
103. Starting
104. Stopping
105. Obstructions
106. Miscellaneous
     Total

107. FALLING OFF CAR ON CURVE
108. On straight rail
109. Open car
110. Closed car
     Total

111. STEALING RIDE
112. Front platform: closed car
113. Right
114. Left
115. Rear platform
116. Rear platform: closed car
117. Right
118. Left
119. Right running board
120. Left running board
121. Miscellaneous
     Total

122. DISTURBANCE ON CAR
123. Assault
124. Ejectment
125. Trouble on account of fare
126. Transfers
127. Miscellaneous
     Total

128. DISTURBANCE IN STATION
129. Assault
130. Ejectment
131. Miscellaneous
     Total

132. STATIONS: APPROACHES OR EXITS
133. Entrance pass meter
134. Exit turnstiles
135. Falling on stairs
136. Falling on station platform
137. Miscellaneous
     Total

138. CAR WINDOWS BROKEN

139. HAND DOORS

140. EQUIPMENT AND APPLIANCES OTHER THAN ELECTRICAL
141. Motors dropping
142. Trolley arm and cord
143. Trolley catcher
144. Bell cords and pulleys
145. Brake rigging
146. Gear casings
147. Seat back dropping
148. Miscellaneous
     Total

149. HORSES FRIGHTENED

150. ELECTRICAL TROUBLES
151. Fuse
152. Overhead switch
153. Controller
154. Lights
155. Heaters
156. Trolley wires
157. Motors
158. Miscellaneous
     Total

159. EMPLOYES INJURED
160. Power house
161. In shops
162. On cars
163. On track work
164. Linemen
165. Miscellaneous
     Total

166. HIGHWAY CASES
167. Between car rails
168. Outside car rails
169. Miscellaneous
     Total

170. MISCELLANEOUS

171. CAR LEAVING TRACKS
172. On curve
173. At switch
174. At straight rail
175. On account of obstructions
176. At special work
177. Colliding with car on other track
178. Miscellaneous
     Total

179. DEATHS: INDICATED BY RED STAR
180. Passengers
181. Employes
182. Other persons
     Total

ELEVATED LINES

183. PASSENGERS STRUCK BY TRAIN

184. TRAINS COLLIDING
185. Rear end
186. At switch
187. At stations
     Total

188. SIGNALS
189. Running signals
190. Starting train without signal
191. Backing train without signal
     Total

192. FALLING
193. Leaving train
194. Boarding train
195. As train starts
196. As train stops
197. In train on account of obstructions
198. Between cars
     Total

199. FALL BETWEEN CAR AND PLATFORM
200. Straight platform: leaving
201. Straight platform: boarding
202. Curved platform: leaving
203. Curved platform: boarding
     Total

204. GATE: OPERATION OF PLATFORM

205. DEFECT INSIDE CAR

206. SEATS AND WINDOWS

207. DEFECT IN TRAIN EQUIPMENT AND APPLIANCES
208. Motor flashes
209. Train and shoe fuses
210. Controllers
211. Air pipes and brakes
212. Pantagraph gates
213. Couplings parting
     Total

214. PNEUMATIC DOORS
215. Boarding center door
216. Leaving center door
217. Boarding end door
218. Leaving end door
219. Hand caught in door: in car
220. Hand caught in door: on platform
     Total

221. EMPLOYES INJUREED IN TRAIN SERVICE
222. Employes injured in track work
223. Employes injured in signal work
224. Employes injured by third rail in yards
225. Employes injured by third rail in stations
226. Employes injured by third rail on system
227. Employes injured in shop
228. Employes injured: struck by train
     Total

229. PASSENGERS INJURED BY THIRD RAIL
230. In stations
231. On system
     Total

232. DEFECT IN TRACK

233. DEFECT IN SIGNALS
     Total

234. BY MATERIAL FALLING FROM STRUCTURE
235. Employes
236. Passengers on surface cars
237. Other persons
     Total

238. DISTURBANCE ON TRAIN
239. Assault
240. Ejectment
     Total

241. DISTURBANCE IN STATION
242. Trouble on account of fare
243. Assault
244. Ejectment
     Total

245. CROWDS
246. Elevated and Subway Stations
247. Pushed into pit
248. Pushed into pit: struck by train
249. Falling into pit
250. Falling into pit: struck by train
251. Injured by pushing
252. Property injured by pushing
     Total

253. TRAIN DERAILED
254. On straight line
255. On curve
256. On special work
257. On switches
     Total

258. DEATHS: INDICATED BY RED STAR
259. Passengers
260. Employes
261. Other persons
     Total

FORM B—KEY TO CLASSIFICATION OF REPORTS

SURFACE DIVISIONS

10. Automobiles .....collision with
25. Animals .....collision with
26. Bicycles .....collision with
27. Cars .....collision of
33. Cars .....alighting from
51. Cars .....boarding from
89. Car and platform .....stepping between
102. Cars .....falling in
107. Cars .....falling off on curve
122. Cars .....disturbance in
138. Car windows .....broken
171. Cars .....leaving track
82. Crowds .....Surface and Subway Station
139. Doors .....hand
69. Doors .....pneumatic
75. Doors .....elevator
140. Equipment and appliance other than electrical
150. Electrical troubles
159. Employe .....injured
149. Horse .....frightened
166. Highway cases
98. Left running board .....struck riding on
170. Miscellaneous
19. Persons .....collision with
94. Right running board .....struck riding on
111. Stealing ride
128. Stations .....disturbance in
132. Stations .....approaches and exits
78. Side bars
1. Team .....collision with
179. Death indicated by red star

ELEVATED DIVISION

199. Car and platform .....fall between
205. Car .....defect inside
245. Crowds .....in station
214. Doors
221. Employes
192. Falling .....in or about
204. Gate .....operation of platform
183. Trains .....passengers struck by
184. Trains colliding
207. Trains .....defect in equipment or appliances
238. Trains .....disturbance in
253. Trains .....derailed
229. Third rail .....passengers injured by
232. Track .....defect in
188. Signals
234. Structure .....material falling from
241. Station .....disturbance in
206. Seats and windows
258. Death indicated by red star

cidents of the kind included in some of its different designations. Form B provides an index for the convenient use of the classification shown in Form A. While it is not exhaustive, it presents a bird's-eye view, as it were, of the proposed classification.

Form C provides for a brief comparative statement of the condition of the claim department from month to month, and will be found a convenient form in which you can keep your monthly statement. It is to be noted that some of the terms used in Form C are the result of laws and practice that are peculiar to Massachusetts. It will readily occur, however, that, if a committee were ap-

FORM C.—COMPARATIVE STATEMENT OF THE WORK OF THE LEGAL DEPARTMENT FOR THE MONTH OF.....

1 Total number of accidents reported.....
2 Number of Elevated accidents reported.....
3 Number of Elevated claims made.....
4 Number of Elevated claims settled.....
5 Amount paid for same.....
6 Number of Surface accidents reported.....
7 Number of Surface claims made.....
8 Number of Surface claims settled before suit.....
9 Amount paid for same.....
10 Number of No Report claims made.....
11 Number of No Report claims settled.....
12 Amount paid for same.....
13 Number of suits brought in the Superior Court, including ( ) appeals
14 Number of Superior Court suits disposed of.....
15 Amount paid for same.....
16 Number of Superior Court suits pending.....
17 Number of Suits brought in the Municipal Court.....
18 Number of Municipal Court suits disposed of.....
19 Amount paid for same.....
20 Number of Municipal Court suits pending.....
21 Total amount paid for claims settled.....
22 Average amount paid for claims settled.....
23 Total amount paid for suits settled.....
24 Average amount paid for suits settled.....
25 Number of suits settled on execution.....
26 Amount paid for same.....
27 Average amount paid on execution.....
28 Total amount paid for all claims and suits settled.....
29 Amount paid by Investigating Department for expense of tracers in preparation of cases, and for doctor's examinations.....
30 Amount paid by Trial Attorneys in preparation of cases for trial, including witnesses' fees, lost time of witnesses and expert testimony .....
31 Amount paid Attorneys for trial of cases in Superior Court.....
32 Total amount paid from October 1 to date.....

FORM E. CLASSIFICATION OF REPORTS.

COLLISION WITH VEHICLES	DIV. 1	DIV. 2	DIV. 3	DIV. 4	DIV. 5	DIV. 6	DIV. 7	DIV. 8	DIV. 9		TOTAL
At right angles from side streets											
Same direction											
On track											
Cutting in front of car											
Struck in passing											
Opposite direction											
On track											
Cutting in front of car											
Struck in passing											
Miscellaneous											
Total											
COLLISION WITH PERSONS	DIV. 1	DIV. 2	DIV. 3	DIV. 4	DIV. 5	DIV. 6	DIV. 7	DIV. 8	DIV. 9		TOTAL
On crosswalk											
Not on crosswalk											
Coming from behind another car											
Coming from behind team											
Miscellaneous											
Total											

pointed, this form might be so arranged that we could all meet upon a common ground and hence render this form available for use by the various roads in different States. Carrying Form C forward a step to Form D, you have a comparative yearly record which will give you at a glance your expense from year to year. This form is worthy of special consideration because you will find it very helpful in getting quickly at your yearly expenditures. Form E is a comparative classification by divisions of accidents other than those occuring upon elevated lines. This form may be extended to include such classes of accidents as

FORM D.—YEARLY COMPARATIVE STATEMENT

	1908	1909	1910	1911	1912
1 Total number of accidents reported.....					
2 Number of Elevated accidents reported....					
3 Number of Elevated claims made.....					
4 Number of Elevated claims settled.....					
5 Amount paid for same.....					
6 Number of Surface accidents reported.....					
7 Number of Surface claims made.....					
8 Number of surface claims settled before suit					
9 Amount paid for same.....					
10 Number of No Report claims made.....					
11 Number of No Report claims settled.....					
12 Amount paid for same.....					
13 Number of suits brought in the Superior Court, including ( ) appeals.....					
14 Number of Superior Court suits disposed of..					
15 Amount paid for same.....					
16 Number of Superior Court suits pending...					
17 Number of suits brought in the Municipal Court					
18 Number of Municipal Court suits disposed of					
19 Amount paid for same..					
20 Number of Municipal Court suits pending..					
21 Total amount paid for claims settled.....					
22 Average amount paid for claims settled....					
23 Total amount paid for suits settled.....					
24 Average amount paid for suits settled.....					
25 Number of suits settled on execution.....					
26 Amount paid for same.....					
27 Average amount paid on execution.....					
28 Total amount paid for all claims and suits settled					
29 Amount paid by Investigating Department for expense of tracers in preparation of cases, and for doctor's examinations.....					
30 Amount paid by Trial Attorneys in preparation of cases for trial, including witnesses' fees. lost time of witnesses and expert testimony.....					
31 Amount paid Attorneys for trial of cases in Superior Court.....					
32 Total amount paid from October 1 to date					

you may wish to place in it. It will furnish a quick method of letting your operating department see what each division is doing in the way of certain accidents.

Your daily book for the entry of accident reports, your office docket and card index for the entry of claims, cross references, etc., are mere matters of office detail and really do not materially affect our subject.

In conclusion, I wish to state that the system of forms and records now being used by the Boston Elevated Railway Company are in large measure due to our general attorney, Russell A. Sears, who at all times takes a keen interest in the work of the claim department.

The city officials and the United Railroads of San Francisco have reached an agreement as to the amount of money which should be paid to the city by the company under the percentage clause of the various franchises by virtue of which the company is operating cars in the city and county. Owing to the percentages and the fact that cars are no longer run as they were at the time the franchises were granted, some lines having been abandoned in part and other lines being operated over what originally formed two or more distinct and separate roads, the task of arriving at the exact amount of money due the city is a rather complicated one. The amounts finally agreed upon are $36,199.67 as the percentage for 1906 and $24,513.21 for 1907.

THE CLAIM AND ITS DISPOSITION*

BY PETER C. NICKEL, CLAIM AGENT, NEW YORK CITY RAILWAY CO., NEW YORK, N. Y.

The writer appreciates the following facts:

That the plaintiff's case is seldom prepared for trial, until it is about to be reached on the calendar, because of the lack of character and responsibility on the part of the client in the great majority of cases, and on the part of the attorney, because of the risk incident to this peculiar class of litigation and for reasons of economy.

That the same conditions exist on the part of the defendant, in so far as the preparation of cases for trial is concerned, because of the great number of suits pending.

In view of the above, one can readily understand how, after the lapse of time, the advantage is with the plaintiff, especially when a physical examination is not forthcoming until just before trial and then resulting often in nothing tangible, so far as the defendant is concerned, except perhaps in finding some old injury or ailment claimed to be the result of the accident. This condition is presented to the court and jury by an unscrupulous attorney, aided by an equally unscrupulous physician and plaintiff, and the trial ends in a verdict in favor of the plaintiff.

Truly the claim agent is confronted with a condition, not a theory, and in the absence of much needed legislation, such as has recently been enacted in the State of Maryland, it is his duty to meet the situation as he finds it.

Of the total number of accidents reported monthly to a claim department of the first class, it is safe to say that about 40 per cent are of no consequence, involving no injury and resulting in nothing more than an inconvenience or delay to the parties involved. The question we, as claim agents, are interested in, is how to dispose of the remaining 60 per cent of possible live claims, in order to prevent litigation, especially that character of litigation which is practiced by the unscrupulous attorney, aided by his physician and the litigant.

As a business proposition, you will concede that every organization, or individual, responsible for damages, arising from negligence, can, after an investigation, honestly afford to pay a reasonable sum of money to every claimant for the injury and damage sustained, if the liability is established; and, in the doubtful cases, to compromise.

We are next confronted with that character of claim where the injury is serious and no liability exists. This is the claim that requires the special attention of the claim agent, because in such cases the unscrupulous attorney frequently induces the claimant to enter court under promise of a large verdict, creating a question of fact on perjured testimony in order to get the case before the jury. I believe these claims should be settled from the injury standpoint.

In relation to the claim where no apparent injury exists, and which appears to be an attempt to defraud, as well as the claim known as "a blind or no report," in the absence of satisfactory proof of the respectability and standing of the claimant or other corroborative evidence, such claims should be declined.

As a matter of insurance in the majority of claims where a public record exists, an ambulance having been called, the injury not being serious, or in cases of women, where the injury is slight and peculiar to their sex, as well as

*Read before the American Street and Interurban Railway Claim Agents' Association, at Atlantic City, N. J., October 12, 13, 14, 15 and 16, 1908.

in cases of children, I deem it advisable to obtain a general release.

Opportunity and knowledge are the foundation of success, and these are the factors which the claim agent must employ in the disposition of each claim.

It is the duty of the claim agent, through the adjuster, to get into prompt communication with a claimant upon the report of an accident, and obtain from him or her a signed statement of the cause of the accident, character and extent of injury, etc., together with the amount of claim made, and the witnesses, if any.

Where the claimant is seriously injured and confined in a hospital or at home, the adjuster must keep in touch with the relatives or friends, inviting an amicable adjustment, and, as soon as the physical condition of the claimant will permit, the signed statement of the claim must be obtained.

The adjuster should be authorized to settle any claim which, in his judgment, is warranted, on first call, up to $100, without a physical examination, and should carry a fund for that purpose. In all cases not settled on first call, where an injury exists, or where an attempt is made to exaggerate, he must arrange for a physical examination, either direct with claimant, or through the attending physician. He must keep in touch with his investigating division in order promptly to submit his cases to the claim agent for his opinion, either negotiating a settlement or notifying claimant in person or by letter, that the claim has been declined. At the close of each month the adjuster must render a report showing the number of cases disposed of and the number of pending cases brought forward.

The investigator, upon assignment of a case, must immediately obtain the blotter or police record containing the names of witnesses who are accessible to both sides; he must obtain signed statements from them, as well as the claimant's witnesses, to ascertain the strength or weakness of claimant's case. His investigation must be honest, for the purpose of getting at the actual facts, and he should report to his chief and the adjuster at once when the result discloses liability or doubt, so that the claim agent may promptly determine the disposition of the claim.

The physician for the claim agent should report, in detail, the injuries claimed either by the claimant or the attending physician, giving his opinion as to the honesty of either or both regarding the injuries. It is his duty to report fully, all the injuries found, after a careful examination based on the history or diagnosis as given by the claimant or his physician, together with his actual findings after a careful examination, giving the time, actual and partial, regarding the disability and permanency of the injury.

In relation to the attending physician, I am convinced that he should be eliminated as a factor in the adjustment of negligence cases, in so far that it is his duty to relieve and administer to the wants of the injured person. For any obligation contracted because of medical attendance, the injured person should be responsible and the physician should look to him for payment. Under no circumstances should a claim agent pay the doctor's bill, because, in determining the amount to be paid to claimant, it is one of the items of damage included in the settlement.

The attorney is a factor, who, by statute, is entitled to a lien, having been retained to prosecute an action for damages. Every effort should be made by the claim agent to induce honorable attorneys to present the claims of their clients for amicable adjustment without suit. Where an attorney has been retained, and by letter notifies the claim agent, it is his duty to extend every courtesy and to recognize such a letter in the nature of a summons, thereby guaranteeing the attorney's lien. All business in connection with the said claim should thereafter be transacted through him.

All vouchers drawn in settlement of claims, except settlements on first call, should be paid by check, and all claims settled should be recorded on one voucher only. No voucher should be drawn allowing a special attorney's fee; all settlements should be flat and a general release obtained for the amount paid in full. The attorney usually has a retainer, insuring him from 33 1-3 to 50 per cent. of the settlement or verdict, together with a provision for an allowance for expenses incurred and the costs.

There is nothing mysterious about the investigation of an accident case; it can be made in one way only. There may be an honest difference of opinion on the part of the witnesses regarding distances, locality or direction, based on their various degrees of intelligence, and also dependent upon the time their attention was attracted to the accident, whether before, just as it happened, or after its occurrence. These situations can readily be reconciled when the claim agent is in possession of a signed statement from the claimant.

With reference to the statement of a prejudiced witness; he is a factor to which the claim agent must give due consideration, in the absence of other witnesses, to prevent litigation.

In regard to the grafter who will not make a statement except for a consideration, he is the ulcer that must be destroyed and should be invited to the office of the claim agent, so that he may be appealed to in person, if necessary. The claim agent should explain to him that the reason for interviewing him is to get at the facts so that the claim may be adjusted, and any money disbursed must go in that direction only. If he then declines to make a statement, turn him loose, and I am sure he will not be a dangerous factor in the case against you.

Having investigated your claim from the fact and injury standpoint, along the lines suggested in the foregoing remarks, is not the order of affairs reversed and the advantage with the claim agent, because the opportunity for the unscrupulous attorneys, physician and claimant is destroyed? This is especially the case when the claim agent is fortified with the additional knowledge that the attorney is not in possession of the facts through an investigation, but is presenting his case on the usual bluff, from the standpoint of the plaintiff's attorney, thereby placing the claim agent in a position to effect an equitable adjustment to the satisfaction of all concerned from the liability, injury or insurance standpoint, or to decline the claim.

Annexed herewith are two copies of literature circulated by the ambulance chasing attorney, clearly demonstrating the extremity to which these people have been driven because of a campaign of education inaugurated as a result of a reorganization of the claim department, inviting the settlement of claims, after an investigation, without recourse to the courts.

One of the gentlemen has adopted the color scheme as employed by us and prints his circular upon a pink slip to conform with our claimant's blank, which is of a salmon color.

LETTERS USED

Having learned of your recent accident and as you have a good claim for damages we wish to offer our services in effecting a settlement for you without going to law.

This company was formed for that purpose, and our method is to effect quick settlements, thereby saving long delays, expenses and loss of time in attendance at court. Under our system you lose no time from your business.

You will be visited by a number of lawyers, mostly inexperienced, and the character and honesty of whom is unknown to you. Should you employ one of them, you will at best have a long drawn out law suit.

We will take your case, make a thorough investigation and obtain a settlement for you in the least possible time. You pay nothing for our services unless the settlement is satisfactory to you.

As this is probably the first matter of this kind that you have ever had, you are naturally inexperienced and liable to make mistakes which you will regret hereafter. Whether you employ us or not, let us give you a few valuable pointers as to what you should and what you should not do.

Advise us by the enclosed envelope and our representative will call on you at once.

It would be wise for you to do nothing and to make no statements about your case to anyone until you have seen us.

Very truly yours,

SETTLEMENT DEPARTMENT

Name	Thos. Jones
Address	248 S. 4th St., Omaha
Date of Injury	12/26/07
Hospital	Bell.
Cause of Injury	Car
Place of Injury	4th Ave. & 3d St.
Injuries	L. Fibula & Ribs

To arrange for a settlement in the above-named case, call at Room ——, —— Broadway, New York City, as soon as possible.

Bring this memorandum with you. H. R.

If it is impossible for you to call at this office, write and a representative will call on you.

TRIAL AND CLAIM DEPARTMENTS

The following is a brief resume of the work of the trial and claim departments during the incumbency of Adrian H. Joline and Douglas Robinson as receivers:

SUB-COMMITTEE ON EXHIBITS

Expressions of approval are heard from all sides on the work of the Exhibit Committee, and of the care with which every provision has been made for the comfort and pleasure of those in attendance at the convention. Those who have never been actively engaged in work of this kind cannot appreciate the tremendous amount of labor and skill involved in the preliminaries required in an exhibit of this kind. Each member of the committee has been engaged for weeks, and many of them for months, in preparing and perfecting plans of which everyone in Atlantic City is this week a beneficiary, and it is only proper to report again the names of the gentlemen to whom the thanks of all are due, and of the companies with whom they are associated, for allowing them to give their services to this public cause.

The Exhibit Committee is, of course, a committee of the American Street & Interurban Railway Manufacturers' Association and is in general charge of Kenneth D. Hequembourg, vice-president in charge of exhibits and general sales agent, Walker & Bennett Manufacturing Company, New York. Some months ago Mr. Hequembourg, with the approval of the Executive Committee of the Manufacturers' Association, appointed as director of exhibits H. G. McConnaughgy, of the Dearborn Drug & Chemical Works, of New York, which donated the use of an office in New York and all of its facilities for a period of two months or more to the association for use in work connected with the convention.

After a survey of the ground it was decided that radical changes would have to be made in the arrangement of the pier over those which were in force at the time of the steam railroad convention, last June. At that time there was no central entrance to the pier. It was decided to install one, and, at the same time, to make the lobby the attractive place which it is for a temporary resting place for delegates between meetings and for the ladies throughout the day. Other features which required active planning and construction work were the trestles for the exhibits of cars along the pier, the general system of decoration adopted, and the entire abolition of the old style of canvas and cardboard signs and the substitution for them of something which would be a guide to the visitors but would not interfere with the harmony of the general decorative scheme.

To work out this general plan, the work of the committee of exhibits, which consisted of sixteen members, was assigned to different sub-committees, as follows:

Committee on Space—L. R. Ashhurst, Jr., of William Wharton, Jr., & Co., Philadelphia, and A. L. Price, of the Ohio Brass Company.

Committee on Cars—Dwight Dean, of the Kuhlman Car Company, Cleveland, O., and Charles S. Ayres, of the Electric Railway Equipment Company, Philadelphia.

Committee on Decorations—E. H. Baker, of the Galena Signal Oil Company, New York, and Charles J. Mayer, of the Electric Service Supplies Company, Philadelphia.

Committee on Whereabouts Register, Check Room and Ladies' Rest Room—W. D. Brewster, of the National Brake Company, Buffalo; Thomas Farmer, Jr., of the Consolidated Car Heating Company, New York, and John C. Jay, Jr., of the Pennsylvania Steel Company, New York.

Committee on Shipments—F. J. Drake, of the Lorain Steel Company, Philadelphia, and Daniel W. Smith, of the Peter Smith Heater Company, Detroit.

Committee on Power—F. H. Gale, General Electric Company, Schenectady, and C. N. Leet, National Brake & Electric Company, Chicago.

Committee on Lighting—Benjamin Hayllar, Westinghouse Electric & Manufacturing Company, Philadelphia.

Stanley Hodgkin, director of the Pulsometer Engineering Company, of Reading, England, now visiting this country for a month, ran down from New York on Tuesday, lunched with friends at the Shelburne grill, visited one or two hotels, glanced nonchalantly at the Boardwalk, and left the same afternoon. An active, vigorous type of his countrymen! When asked to explain the absence of a bored walk in his case, and his genuine interest in the novel sights of Atlantic City, he remarked that all his antecedents were Quaker.

P. P. Crafts, general manager, Iowa & Illinois Railway Company, Clinton, Iowa, is attending the convention. He is accompanied by Mrs. Crafts, and is staying at the Marlborough-Blenheim.

The Chicago special over the Pennsylvania Railroad, getting in at 11.30 a. m. Monday, brought no fewer than 250 people to the convention. Under the management of C. E. Danforth, agent of the road, a smooth and pleasant run was made within the 24 hours. There were seven cars to the train, six Pullmans and the water wagon. Many of the Chicagoans were gratified to find the Atlantic compared favorably with the lake, and generous enough to say so. The only disgruntled member of the party was a little dog, accustomed to gambol on the beach of the lake front parks and now learning for the first time, in disgust, that water is sometimes salt.

At a business meeting of the Municipal Tramways Association of Great Britain, held on Sept. 26, A. L. C. Fell, general manager of the London County Council tramways, was elected president and C. J. Spencer, of the Bradford Corporation Tramways, vice-president for the ensuing year. In accordance with the usual practice, it is anticipated that the next annual conference will be held in London as this is the place where the president holds office.

THE ORGANIZATION OF A CLAIM DEPARTMENT FOR A SMALL OR MODERATELY LARGE COMPANY, INCLUDING A SCHOOL OF INSTRUCTION AS A MEANS OF PREVENTING ACCIDENTS*

BY FRANCIS J. RYAN, M.D., SYRACUSE RAPID TRANSIT RAILWAY COMPANY, SYRACUSE, N. Y.

As the result of circumstances, the claim department has been made a necessity. It having been created, the next question is: "How can the claim department best be organized, managed and conducted?" This, then, gives me a basis for this paper. While my knowledge and opinions will be confined to moderately large companies, yet the same principles underlie both large and small. I trust I will not appear egotistical, for I am ready at the start to confess an inability to practice, at all times, the ideal, as seen from my point of view, or the things which I recommend.

For the sake of order and convenience I will divide the subject into separate headings, as follows:

The claim agent.
The investigator.
The department physician.
The accident report.
The preservation of records.
Relation of claim and legal departments.
Instruction of employees.

THE CLAIM AGENT

The successful claim agent of this year is the one who can prevent the accident of to-morrow and quickly dispose of the accident of yesterday. He must be a man of tact, a good reader of human nature and a congenial fellow at all times. I know of no person in the employ of the railroad company from whom so much is expected.

You all know that the ordinary visitor to the claim department is a person with some grievance, either fancied or real. The claim agent, therefore, must be a good listener. The fact that the company is in no way liable does not justify him in abusing the visitor or incurring his or her displeasure, for the reason that the same person may have a claim against the company to-morrow or some other day, for which this company may be liable. Make a friend, if possible, of every person with whom you talk because one cannot tell how soon such a person may be able to assist the company.

Firmness is an essential requisite and always inspires confidence, if properly exhibited. Do not terminate the discussion of a given case until enough data has been obtained to justify the giving of a positive opinion. If the company is liable, settle quickly and equitably.

THE INVESTIGATOR

The investigator should be an affable, intelligent and courteous man. He must be quick of perception and a good reader of human nature and honest in all of his dealings. Some investigators are inclined to color statements to favor themselves. This is a mistake; let the witness tell his story in the manner he would in a court-room and try to get at the truth at all times. The investigator should strive to obtain an unbiased report. More boomerangs are thrown in the court-room to the disadvantage of railroad companies as the result of colored reports of investigators than can be realized. If the railroad company is to blame for an accident, the claim agent should know it, and be given the opportunity to settle. If the company is liable, let it settle. See all the witnesses named in the report and get more if you can. A successful investigator is one who is on the job immediately after the accident occurs, as this is the time to get witnesses. Everybody is talking about the accident; get in and talk, too. It is often well for the investigator to be present in the attorney's office when the witnesses are discussing the case just previous to trial. His presence often aids the witness to remember the details of the accident, he having talked with him immediately after the occurrence.

In the selection of an investigator it is best to have one who is able not only to do the ordinary routine of investigation, but who is clever enough to act the part of a sleuth if the occasion demands. Endeavor to practice no dishonesty or ungentlemanly tactics in obtaining information, though in some cases it may be necessary and entirely justifiable. The honest way will bear the greatest fruit. Get signed statements in every case possible. Let the people read the statements over before signing them. It is not only their privilege, but it inspires confidence and allays fear. When people are confident of fair play, they are more apt to talk about the case. All the company should expect from a witness is a true story and a square deal. As regards obtaining statements from motormen and conductors I think it is not only well to get statements immediately after the accident happens, that is, in the case of serious accident, but I think they should go to the office the following day to discuss the details of the accident. The excitement attending the first day's experience oftentimes begets inaccuracy, and this is dangerous, especially when it is necessary to make statements to the coroner, police, etc. Sworn statements from both the conductor and the motorman are imperative. Picture taking of accidents is especially serviceable, as in complaints of defective steps, boards, unsafe places to alight, etc. Some care should be taken in the selection of the official photographer because many times his interpretation of the picture, together with the measurements taken at such time as the picture is photographed, become a very important part of the testimony.

THE DEPARTMENT PHYSICIAN

The physician of a claim department is a necessity from the moment the accident happens until adjustment is made. It is to the advantage of the company to know the extent of the injuries from the beginning and to be kept informed as to the progress of the case. For this purpose a suitable blank should be provided, every question should be answered fully, and particular care should be given to the case from the standpoint of the attending physician.

The examiner should make a thorough general examination of the injured person in order that the plaintiff will not be able to spring any surprises in the court-room as to injuries or abnormal conditions which have never existed. The results of the examination should not be disclosed to the family or the plaintiff as many times facts are overlooked by people or the family doctor.

After a suit has been brought and the date of the trial arrives, the same examining doctor should be present at the trial. Let him listen to the evidence of the plaintiff and his doctor, so that afterward he may be able to form questions to be asked by the defendant's attorney of the plaintiff or his doctor in order that the plaintiff's side may

*Abstract of paper read before the American Street and Interurban Railway Claim Agents' Association, Atlantic City, N. J., October 12, 13, 14, 15 and 16, 1908.

carry the least weight with the court. A doctor, and more especially the one who has made the examination, is best fitted to prepare these questions for the defendant. Many times the questions put to the plaintiff's doctor, and even to the plaintiff himself, as prepared by the examining physician will determine in a great measure the result of a case. The questions should be prepared outside of the court-room, because whispering and handling of slips of paper is apt to create an unfavorable impression with the jury. If the plaintiff's attorneys will permit of only one examination, the best time for such to be made is just before the day of trial. The ideal protection, however, from the standpoint of the company, would be an examination immediately after the accident and one before trial. The mere presence of the defendant's physician (especially the one who made the examination) has a good effect upon the opposing doctor and will cause him to be more careful in his testimony.

THE ACCIDENT REPORT

The style of the ordinary accident report does not differ materially in any city, though it is my opinion that the motorman should make out a report as well as the conductor.

Because the usual report is not forwarded to the respective stations until the crews have finished their day's work, I think it is well to have a preliminary report, or emergency blank printed, for the purpose of making an immediate report of each accident. This preliminary report merely provides for a short account of the accident and does not take the place of the regular report, which must be made in writing on the ordinary report blank at the end of the day's work. The preliminary report, however, affords sufficient information for the investigator to begin his work and enables him, if necessary, to make a speedy settlement or disposition of the case.

In Syracuse we have transfer boxes at different points and the conductors are asked to put these emergency reports into the transfer boxes or to hand them to the division superintendent as soon as possible. By following this routine we hear of every accident within an hour.

PRESERVATION OF RECORDS

A suitable blank having been provided, the next step is for the stenographer to make copies of the original report for the use of the investigator, superintendent or general manager. Except for court use the original report should never be removed from the claim department. The wisdom of this rule is fully exemplified when an original report is lost or mislaid. I am so firmly impressed with the value of the original report that I believe the system of pasting such reports in a suitably arranged book is the best means of keeping them from the standpoints of security, convenience and quick reference. The size of the book, of course, depends upon the number of accidents; for instance, a book can be purchased providing for 250 or 500 accidents, or a greater number if necessary. In order that no report requiring investigation and disposition shall be overlooked, I would recommend the use of a paster to be attached to each report. Information found on the slip or paster will at a glance indicate the work of the investigator and the disposition that has been made of the case, thus doing away with the likelihood of a report being pigeonholed and a later discovery that no investigation has been made of the accident.

The report, investigation and all data concerning the accident having been secured, it is important that a safe and convenient envelope be used for their keeping. On the outside of this envelope, which should be durable and of good size, sufficient information can be written or printed to facilitate the work of the clerk who files the records. Each envelope should have a number which corresponds to the name and number on the accident report of the injured person or owner of damaged property.

The entire history and data of the accident having been secured, we now have to determine the best means of filing this information for safe keeping. A steel cabinet arranged to provide for the envelopes referred to is, in my judgment, the safest and most convenient place for the records of the claim department. For the purpose of demonstration I am pleased to have, through the courtesy of the Art Metal Construction Company, of Jamestown, N. Y., one of the filing cabinets referred to.

RELATION OF CLAIM AND LEGAL DEPARTMENTS

I believe that the legal and claim departments should be very closely affiliated. The legal department, however, should have nothing to do with a case until after litigation has been started. When preparation is being made for a trial, I believe it is a good custom for the claim agent, the legal department and the investigator who obtained the statements to discuss the case together, as such general discussion is apt to be productive of much good. As far as the investigation of accidents is concerned it should be entirely done by the claim department and before trial copies of said statements can be forwarded to the legal department. In some cases where the question of liability is doubtful, I think it is well for the investigator to talk the matter over with the legal department in order that he (the investigator) will be better able to question witnesses in a manner which will bring out the most important features of the case should it come to trial.

INSTRUCTION OF EMPLOYEES

The instruction of employees, including the division superintendent, foremen, motormen and conductors and any other employee of a company who might be present or be the cause of an accident, is, in my view, an imperative proposition. Such instruction is, I believe, best given by a member of the claim department for the reason that he comes in personal contact with the injured people and receives, as well, the statements obtained by the investigator from witnesses. He, therefore, hears the different sides in their many phases, not all of which are unwarranted, and, on the other hand, he not only reads the reports of accidents, from the standpoint of the crew, but in most of the cases has a personal talk with the motorman and conductor concerning the details of the accident. With both sides of the story, he is able in most cases to draw a correct conclusion as to the cause and the best means of preventing a similar occurrence. With such knowledge it is but logical to assume that he would be able to suggest some means of preventing most of them, for I doubt very much that many unavoidable accidents happen.

While such work is under the direction of the claim agent, I must admit that only with the hearty coöperation of the transportation department can such a plan of instruction be productive of any good results. This is true because of the absolute necessity of proper discipline. To the minds of some employees the word witness means any person who was near the scene of the accident, but to the instructed mind a far different thought is found. He is after the person who actually saw the passenger leave the car while it was moving.

The main object of this school of instruction is to raise the standard of efficiency, and this should mean the elimina-

tion of certain accidents due to sheer lack of knowledge. The successful instructor is the one who can make the men think for themselves and get them interested in the plans to prevent accidents.

The aim of the instructor should be to bring out all there is in a man. Stimulate him by your honest, clear and heart-to-heart talk, to think for himself, for the best suggestions as to how to prevent accidents have come from the ranks. Personally, I prefer an attendance of about 30 men in each class made up of old and new men in length of service. The old men inspire confidence in the younger men, not only by their presence, but through the character of the suggestions made by them, which are often instructive and timely. Likewise I would recommend motormen and conductors being present together, inasmuch as their work has many points in common. The length of time for classes to be held should not exceed an hour, for the reason that after that the ordinary man becomes somewhat tired of instruction. Their spare time being usually short and uncertain, they are apt to become uneasy and inattentive. Occasionally it is a good plan to intersperse the talk with a smoker.

I would suggest that such general meetings be held just before the open-car season commences and the latter part of September, just before the leaves begin to fall, thus giving a good opportunity for a special talk along the lines of open-car accidents and the necessity of particular care to be exercised by the motormen when the rails are covered with leaves.

The talks during these meetings should be perfectly frank and honest. Figures appear most convincing to some men, so I frequently produce a report, showing the number of accidents since our last meeting, or during the last month, showing the kind of accidents and the cost incurred in their disposition. The instructor should endeavor to inculcate by every possible means a finer standard of loyalty in service and of responsibility in meeting his daily work. I do not believe it is right for the claim agent or company to use the name of the motorman and conductor, when publishing the mistakes or accidents of certain men, among his associates or on bulletin boards. The accident or error may be used by us as an example for others, but the name of the person involved should always be withheld. Men dislike to see their associates held up to ridicule.

The ideal time for the instruction to start is just after the motorman or conductor has finished learning the several duties incidental to the operation of his car and is ready to assume charge of a car. I consider the instruction of division superintendents as to the suggestions made to men to be of vital importance, because they are the ones to see that the thoughts and suggestions, as made by the instructor, are put into force. Such coöperation is indispensable to the success of the school of instruction. In discussing with the men the poor manner in which some of the accident reports are made out, I think it well to produce some of the poorly written original reports because they speak louder than any words the instructor can use. I would suggest, however, that this be done without revealing the name of the writer.

The instructor should always welcome the opportunity of congratulation when the product of the men's work appears on the credit side of the ledger, for every man deserves praise for work well done.

In conjunction with the school of instruction, I would advise the use of bulletin boards and written notices of certain matters pertaining to topics discussed in the school. The success of this school of instruction requires a persistent effort, as the ordinary man forgets easily, hence the absolute necessity of frequent reminders. I have also used with considerable success the mailing of letters addressed to the men individually and sent to their homes instead of the stations, the object being to appeal to the men in an individual and private manner. Such a letter can, in a concise and plain manner, set forth the constant occurrence of certain accidents and the attendant results, together with suggestions as to the best means of preventing a recurrence of the same. In conclusion I will endeavor to suggest several subjects for discussion in the instruction school, which will, I am sure, give sufficient food for an hour's discussion and bring about suggestions as to the best methods of preventing accidents:

SUBJECTS FOR DISCUSSION IN THE INSTRUCTION SCHOOL.—MOTORMEN

(1) Look back into your car before starting.
(2) At railroad crossings, the obligation is just as great in the motorman's case as in the conductor's; both are clearly responsible. Both must look out for the train and look back to see whether or not anyone is getting on or off the car.
(3) Do not stop your car so that passengers can alight in unsafe places.
(4) Be careful that your car does not take curves too abruptly.
(5) Realize that there are no excuses for rear-end or head-on collisions.
(6) It is the duty of every motorman to assist the conductor at the time of an accident, and just as much is expected of the motorman as of the conductor.
(7) Talking with passengers on the front platform is absolutely forbidden.
(8) Employees must not discuss accidents with any person other than an official of the company.
(9) Do not take chances.
(10) Do not drag your car; either stop or go ahead.
(11) Make safety stops.

CONDUCTORS

(1) Railroad crossings—same rules as for motormen.
(2) Keep your passengers away from running-boards and steps, if possible. Get them into a place of safety.
(3) Do not permit your passengers to alight from cars in unsafe places.
(4) The best means of preventing passengers from getting off cars before they stop is for the conductor to call out in a distinct manner: "Wait until the car stops."
(5) Do not be in a hurry with old people and passengers carrying babies. Let them get seated before you give the signal for the car to go ahead.
(6) Report every accident that happens on or about your car.
(7) Talk with no one concerning accidents, excepting an official of the company.
(8) Take your time in making out your report and write so that your story can be read. Make out a preliminary report immediately.
(9) Unnecessary talking to passengers is absolutely forbidden.
(10) Look back before giving four bells to back your car.
(11) Keep your hands off the bell rope until you are ready to give a signal to motorman.

The Peter Smith Heater Company, Detroit, Mich., has on exhibit in spaces 427-29 its new Type C heater, of which it has recently sold 100 to the Twin City Rapid Transit Company, Minneapolis. These heaters are on exhibition at spaces 427-29, Building 1.

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W. R. Kerschner, Allentown, Pa., who is attending the convention in his own interests, is also representing the Columbia Machine Works & Malleable Iron Company of Brooklyn, N. Y.

Among the Exhibits

The Lord Electric Company, New York, has enlarged its shop facilities and improved its methods of manufacture, and states that it is now in a position to make prompt deliveries on all orders for its lightning arresters, trolley retrievers, rail bonds and other devices.

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Train dispatching methods and the handling of freight are two of the important subjects to be considered during the convention by the Transportation and Traffic Association. Train dispatching by proper methods is essential for safe operation. The Egry Register Company, located in the Main Building, space 317, is demonstrating to delegates the advantages of the system of train dispatching advocated by it which it claims is the only proper method. It suggests that an inspection of its devices would be time well spent.

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An order for 96 Jones stokers was received last month by the Under-Feed Stoker Company of America, Chicago, for the new boiler plant "Grand Central" of the Campania Alemana Transatlantica De Electricidad, Buenos Ayres. This corporation, commonly known as the "C. A. T. E.," controls the electric traction, lighting and power utilities in Buenos Ayres. The 96 stokers included in this order are to be installed in a new station of this company on which preliminary work has been started. This is one of the largest single orders ever placed for mechanical stokers and is a repeat order. When the 96 new stokers are installed there will be a total of 171 Jones stokers in the plants of the C. A. T. E., 75 Jones stokers already being in operation or in course of installation.

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High tension transmission has been made possible not only by the hard and patient work of electrical engineers, but by many manufacturers who have developed satisfactory specialties which have gone far toward making high tension transmission a success. The Pittsburg Pole & Forge Company is the manufacturer of one of these specialties, a steel insulator pin known as the Pittsburg standard high tension transmission insulator pin which can be seen in spaces 608-614, main building.

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The San Diego Electric Railway Company which now controls all electric lines in and extending from San Diego has designed a new type of car intended for both city and interurban service and specially arranged for tourist travel and sight-seeing. The Niles Car & Manufacturing Company recently built six of these cars, which are a combination of the well-known "California Type" of open and closed car with the Niles type of interurban car. They are vestibuled at each end with an open section adjoining and a closed compartment in the center having seven windows on each side. The seating capacity is 52 persons, 28 in the closed part and 24 in the open sections. One of these cars was specially prepared as a "sight-seeing" car, the closed compartment being furnished as a parlor car and the exterior painted a special color and more elaborately decorated.

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Wendell & McDuffie Company, of New York, has recently been incorporated with the following officers: Jacob Wendell, Jr., president; R. L. McDuffie, vice-president; Henry E. Oesterreich, secretary; W. C. Bamber, treasurer. The new company takes over the business and good will of the old firm of Wendell & McDuffie, and will act as manufacturers' agents in the East for The Falk Company, Russell Car & Snow Plow Company, D. W. Boseley Company, Jerome & Elliot, Indestructible Fibre Company, Glacier Metal Company and Keasbey & Mattison Company.

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The Rail Joint Company, of New York, announces that its records show total sales of the various types of joints which it has manufactured during the 14 years ending September 30, 1908, sufficient to equip 50,000 miles of track. This output includes shipments made to many steam and electric railways in the United States and foreign countries. Samples of all types of joints made by this company are on exhibit in space 616, adjoining the entrance to Marine Hall.

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One of the many features of merit claimed for the Coleman fare box which is on exhibit in space 304 is its capacity for handling all kinds of fares, coins, tokens and paper tickets. The ribbed glass trays in the hopper prevent damp or sticky tickets and coins from adhering to the surface and clogging the box. Anything dropped in the top opening must fall to the bottom slide of the hopper and drop into the locked safe below when the slide is withdrawn.

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The McConway & Torley Company, Pittsburg, Pa., is showing an adaptation of the Janney radial coupler in spaces 707-713, Marine Hall, and is distributing a novel souvenir by means of which, with judicious use delegates and guests can readily ascertain whether their nerves are in good condition and whether they are suffering from any optical illusions. It is a little puzzle which requires for its solution steady nerves and eyes that do not see double.

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The Globe ticket destroyer in operation at the exhibit of the Globe Ticket Company, spaces 718-22 Marine Hall, has attracted attention because of its simplicity and ease of operation. Tickets, transfers, etc., after being destroyed by passing through this machine can safely be sold as waste. This is a better method than pulping or burning the tickets. The Globe gate cancelling box used by elevated railroads, amusement companies, etc., is an excellent means of insuring all tickets collected from passengers being effectually cancelled. The cancellation is made by punching slots in the tickets, and they can, if desired, be examined and counted after being taken from the machine. Among the other devices of this company included in the exhibit is the Improved Visible Die punch which the company have been selling for several years for street railway work. It has a large open sight so that when punching transfers, the transfer point or time can be distinctly seen. The punches are made of the best steel and can be furnished with practically an unlimited number of forms of dies.

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The National Lock Washer Company, Newark, N. J., is exhibiting at its booth, spaces 216-220, full-sized models of automatic car curtains, equipped with the National cam and balance protected groove curtain fixtures, which are efficient and durable in operation, and pleasing to the eye. These fixtures have been in use for a number of years and have a record for excellent service. It is claimed they overcome many of the defects to be found in other devices of this kind on the market.

For semi-convertible cars, the Curtain Supply Company recommends its closed groove Ring fixture. This fixture is furnished with a confining strip over the grooves which prevents the heads from being pulled out of place. When the windows are removed for summer service locks are furnished for the bottoms of the grooves which make it necessary to give the curtain a sharp pull upward in order to move the heads out from under the locks. This prevents the curtains from being accidentally raised when pulled all the way down to keep out rain. The construction of the head of this closed groove fixture is similar to the standard Ring fixture.

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The new cars being built at the Jackson & Sharp works of the American Car & Foundry Company for the Long Island Railroad are to have Karbolith floors furnished by the American Mason Safety Tread Company.

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The Nachod Signal Company, which is exhibiting in the booth of its western agent, the Climax Stock Guard Company, is showing a new type of automatic signal for electric railways. This signal system uses a single line wire, counts the cars in and out of the block and gives indications by both semaphore discs and colored lights simultaneously. C. P. Nachod and Gifford Scott are demonstrating the operation of the signal with a miniature track plan connected with the signal apparatus.

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The fireproof qualities of asbestos-covered wire and asbestos tapes, twines and packing, used in its manufacture, are being demonstrated by the Heany Fireproof Wire Company, York, Pa., by means of an ingenious thermal test. A miniature arc lamp coil wound with asbestos-covered wire is used. Visitors to the convention, who smoke, are invited to come in and light their cigars with this coil, which is heated to a temperature high enough to ignite tobacco and even wood. The company claims that its product is the only asbestos-covered wire which will withstand this temperature. It is also exhibiting a line of tungsten lamps made by the Heany Lamp Company, of York, Pa. H. L. Owen, T. A. W. Shock and C. L. Hill are in attendance.

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Robert Wilkinson and W. R. Van Steenburgh, of New York, are in Atlantic City in the interest of the New York Car & Truck Company. They are brimming over with information about the good points of the well-known Peckham trucks.

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One of the most encouraging reports of business conditions in the electric railway supply field is furnished by the National Brake Company, Buffalo, N. Y., which, at the present time, is over 1300 brakes behind their orders. This is due, for the most part, to several large orders recently received, among which are an order from the Pullman Car Company for 600 brakes and an order from the Pressed Steel Car Company for 100 brakes for installation on the cars for the Chicago Railways Company. These orders, together with the 600 furnished a few months ago, will make a total of 1300 brakes furnished for this road alone. Another order of 300 brakes has been received from the J. G. Brill Company for installation on the cars for the Third Avenue Railroad of New York City. The Brill Company has also placed an order for 150 brakes to be installed on the cars which it is building for the Metropolitan Street Railway, New York City. The Pittsburg Railways Company has just installed 100 brakes on cars already in service.

The representatives of the Rooke Automatic Register Company, Providence, R. I., George F. Rooke, W. A. Williamson and H. E. Maine, are making their headquarters at the Marlborough-Blenheim. They have no exhibit space, but they will be glad to discuss and demonstrate the Rooke system of fare collection to delegates. The Rooke automatic register can be carried in the pocket, and needs no extensive space to properly show its operation.

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The exhibit of the Western Electric Company includes a cabinet containing the numerous grades of waste manufactured by the J. Milton Hagy Waste Works. The General Electric Company also has on exhibition a bundle of packing waste of a special grade manufactured by the Hagy Waste Works, especially for street railway motors.

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Thomas F. Carey, Boston, Mass., is attending the convention in the interest of his business, which is to act as manufacturer's agent and broker in second-hand equipment.

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The gentlemen in charge of the exhibit of the Auto-Scope advertising device, Building 3, booths 836 and 838, are showing railroad men how to increase their revenue without increasing their investment. The device is not for sale, but the National Advertising Company of America offers to equip cars complete without cost and to take its pay out of the additional revenue made from its use in car advertising. The company is prepared to take complete charge of the interior car-advertising for electric railways.

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The Telegraph Signal Company, Rochester, is exhibiting in connection with the Stromberg-Carlson Telephone Manufacturing Company its selective dispatcher's signal apparatus.

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The exhibit of the American Brake Shoe & Foundry Company in Marine Hall, spaces 763-767, is an object lesson of what standardization accomplishes in reducing the amount of brake shoe material to be purchased and scrapped, and in pointing out the advantages of a standard design of brake shoe and brake head whereby the shoes are interchangeable and reversible. Standardization of brake shoes will result in a reduction in the stock of brake shoes to be carried and in the expense of brake shoe maintenance.

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That the use of frictionless center and side bearings prolongs the life of wheel flanges, lessens the wear on rails laid on curves and saves electric power, is generally admitted, but many electric railway companies have hesitated to put frictionless bearings under their equipment on account of the failure of a number of such devices when subjected to the wear and tear of actual service on steam roads where they were first tried. The T. H. Symington Company's ball-bearing center bearings in the past few years have been extensively applied to electric trucks in all classes of service, and are said to have exceeded expectations in practically every instance by their elimination of the wear of all working parts. An interesting exhibit illustrating the point is shown in the company's booth, spaces 552-554, where can be seen a style B, center bearing removed from one of the heavy interurban cars operating on the Washington, Baltimore & Annapolis Railway. The service on this line is hard on equipment as the cars operate at high speed through a sandy country. The bearing removed shows no wear either of the balls or steel wear plates after running continuously 35,000 miles.

The Pressed Steel Car Company, Pittsburgh, Pa., has just delivered to the Brooklyn Rapid Transit Company a sample all-steel car for elevated service which has the same general appearance and dimensions as the standard wooden elevated cars of this company except that both ends are vestibuled. The car body is built entirely of steel, from under frame to roof. No interior head lining is used, but the steel carlines are finished with mouldings and the roof sheets above are painted a light color. The seat frames, window frames and doors are all made of pressed steel sheets. W. H. Wilkinson, of the New York office, and P. M. Cling, of the Pittsburgh office, who are representing the Pressed Steel Car Company at the convention, have with them some photographs of this car, taken during erection, which show the principal construction features. They are also distributing printed specification sheets describing some of the steel passenger cars for steam and electric railway service, built by this company during the last two years. These include street cars for the Metropolitan Street Railway Company, New York; United Railroads of San Francisco, P. A. Y. E. type car for Montreal, elevated and subway cars for the Boston Elevated Railroad, Philadelphia Rapid Transit Company and the Hudson Companies, New York, and passenger coaches for the Pennsylvania Railroad and the Southern Railway.

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The Denham system of combined cash fare receipt and transfer is designed to overcome some of the attendant evils of existing transfer and collection schemes. Each passenger on paying a cash fare either on a city or interurban line receives a ticket resembling a transfer ticket, and which has time and junction points printed on it, so that if punched it can be used as a transfer—provided the company using the system issues transfers. When punched as a transfer it is canceled as a cash fare receipt and has no value in connection with a premium system which is an essential feature of the general scheme. The Edwin A. Denham Company undertakes to organize merchants in the cities into groups and make arrangements with them to accept uncanceled cash-fare receipts in trade. In addition to this the originators of the plan offer to expend in prizes in connection with these fare receipts, monthly amounts equivalent to ½ per cent of the total gross receipts of the railway company each month, consisting of a number of substantial cash prizes together with a number of small consolation prizes. The company claims that this system prevents in some measure passengers failing to pay fare to the conductor, provides an accurate check of fares collected against receipts issued, and reduces the amount of promiscuous short-ride transfer business.

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The Bayonet Trolley Harp Company, Springfield, Ohio, has just made a shipment of 200 of its detachable trolley harps to Lima, Peru, S. A. As this is a repeat order it speaks well for the utility of the harp. Among the large railway companies which have recently adopted the Bayonet harp are the Winnipeg Electric Railway Company, Winnipeg, Man., and the Dominion Power & Transmission Company, Hamilton, Ont. The Bayonet exhibit is located in space 841, Building No. 3.

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George H. Ford, of the Automatic Ventilator Company of New York, has an interesting exhibit illustrating the action of the Automatic ventilator in actual operation, at booth 609. This ventilator, which is a balanced intake and exhaust system, is now in use on a number of large roads. It can be seen installed in the pay-within-car exhibited by the Electric Service Supplies Company on the trestle on the north side of the pier.

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The demonstration of rail joint welding with thermit will be repeated by the Goldschmidt Thermit Company this afternoon at 4 o'clock, on the Pier, in the open space between Marine Hall and the Annex Building.

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The vibrating machine for testing the strength and chipping characteristics of carbon brushes being operated by the National Carbon Company, space 812, while a little noisy, is attracting the attention of the railway men attending the convention.

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As usual, the booth of the Buckeye Engine Company is fragrant with the odor of fresh cut flowers. Messrs. Weeks, Riddell, Paul Bigelow and Castle are there daily to greet friends and see that the flower girls adorn each lapel with a blossom. It is a graceful little courtesy that is warmly appreciated. Ocular demonstration shows that the booth is visited. Postal cards are also handed out.

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The A. & J. M. Anderson Manufacturing Company, Boston, Mass., has an interesting exhibit near the entrance of Building No. 3. Prominently displayed in its booth is a new remote-control, oil-switch. This is operated by a solenoid and the thrust at opening and closing is taken by an air dash-pot so that fairly quiet operation results. It is also possible to operate the oil switch by hand from the front or rear of the panel board. Featured in the exhibit are two new brush holders intended for heavy railway service. This type of holder is used in Brooklyn and in Boston. Among the other exhibits are composition anchor and third-rail insulators, pure copper castings, a complete line of Aetna railway insulators and Anderson's standard line material. The company also shows a section of a new strain insulator made of drop forged steel and furnished with Aetna insulation. Those present include J. M. Anderson, Alfred Anderson, W. W. Hincher, G. C. Crane and Ernst Woltman.

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The exhibit of the Adams & Westlake Company, space 774, Marine Hall, consists of an interesting display of the specialties manufactured by this company. One of the new devices shown is a detachable bottom, continuous basket rack, the construction of which permits the ready removal of any section independently of the other sections. This feature is of value because it permits a damaged section to be removed for repairs or refinishing without taking the car out of service. Among the other specialties shown are the company's well-known balanced draft signal lamps, for all kinds of service.

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The Joseph Dixon Crucible Company's headquarters are at spaces 516-518 Machinery Hall, near the entrance. The steel exhibition pavilion, which was erected for the steam railway conventions held last June, is located in the open, beyond Marine Hall and contains a large picture showing the Dixon Company's plant. This steel frame pavilion is an example of the wearing quality of Dixon Silica-Graphite paint when exposed to sea air. In the space in Machinery Hall are photographs of railway bridges on which this paint has been used. On some of these structures Dixon paint has given service of more than seven years. The lubricating department of the company is also well represented with an exhibit of graphite products. The company holds

that friction losses are much reduced when the ordinary lubricant has incorporated in it the correct proportion of Dixon's Ticonderoga flake graphite. To meet the requirements of street railway service the Dixon Company offers a special line of graphite greases, which contribute to quiet and easy running and make for economy.

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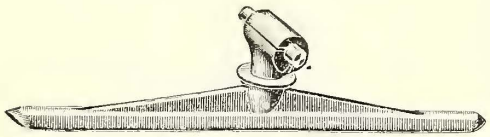
COMBINED FEED-IN AND STRAIN SUPPORT

Dossert & Company, Inc., New York, have brought out an improved combined feed-in and strain support for trolley feeder cables. The device as shown in the accompanying cut, comprises a combination of the Dossert solderless cable tap with a regular soldered ear of the cap and cone type. The feed-in tap is made with a standard threaded stud which screws into the ear. A jam-nut and lockwasher holds the feed-in tap securely in place against the boss of the ear. The advantages claimed for this feed-in are that it eliminates the process of soldering the feeder cable, or fastening it with screws; gives contact throughout its entire length instead of at three points as in case of a yoke; does away with bending and "checking" of the feeder by receiving it in a perfectly straight line; acts as a strain support; is strong and compact, and cannot work loose. The tap is bored to take No. 0, No. 00, No. 000 or No. 0000 round wire or stranded cable and can be furnished with 5/8 in. or 3/4 in. studs.



Dossert Feed-in and Strain Support

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IMPROVEMENTS OF THE PROVIDENCE FENDER

One of the principal advantages claimed for the Providence fender is the rapidity with which it can be dropped to the pavement. A recent improvement which has added greatly to the effectiveness of this feature is the provision which has been made for raising the fender again to its normal carrying position above the rails without requiring the motorman to leave or even stop his car. This eliminates many delays and the motorman is not tempted to avoid dropping the fender in every emergency. It is held that the maintenance cost of the fender is diminished because, since it will always be down when colliding with a vehicle or person, and the damage to it in the service position will usually be less than if struck in its normal carrying position. A further improvement is an automatic pneumatic device for dropping the fender. This consists of a small valve placed close to the motorman's brake valve and connected to the brake valve in such a way that when the brake valve is thrown over to the emergency position, the fender is dropped instantly without any other movement on the part of the motorman, and this secures automatic and reliable liberation of the fender in emergencies. The Providence fender is made by the Consolidated Car Fender Company, which has its exhibit in spaces 764-766.

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The Archbold-Brady Company, Syracuse, engineers and fabricators of steel towers for transmission lines and catenary bridges, is represented at the convention by President W. K. Archbold, who is staying at the Marlborough-Blenheim, and is accompanied by Mrs. Archbold and R. L. Allen, engineer of the company.

WESTINGHOUSE SME BRAKE EQUIPMENT

Where only single cars are to be operated it has often been considered that the simplest form of straight-air brakes are the most satisfactory. But conditions not infrequently arise where some additional protection is required of the brake apparatus, as where a hose breaks or a pipe ruptures. When a trailer is also operated during the rush hours this protection is imperative, as such an accident would leave the rear car helpless without braking power in case a straight-air brake only was used.

In order to provide for these conditions the type SME equipment, on exhibit in the Westinghouse Traction Brake Company's booth spaces, 307-319, is provided with a special emergency valve in connection with a brake pipe or emergency line in which pressure is normally maintained. Any sudden reduction in this pressure due to the bursting of the air hose or an emergency application by the motorman, causes the emergency valve to act and connect the brake cylinder to the storage reservoir and to apply the brakes with full power and hold them applied. The normal service application with this type of equipment differs in no essential from that of any ordinary straight-air system. The emergency valve can be applied to any car already equipped with straight-air brakes as well as to a new car. For the reasons given the SME equipment gives satisfactory service on strictly city or interurban cars where the speeds are moderate and the stops frequent and where normal operation requires but one car, or occasional two-car trains with a trailer.

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The Pressed Steel Car Company, Pittsburgh, Pa., is turning out the first cars of an order for 25 all-steel baggage and combination cars for the Pennsylvania Railroad. These cars will be mounted on the unique six-wheel trucks designed and patented by Mr. Vogt, mechanical engineer of the Pennsylvania Railroad. The Pressed Steel Car Company has acquired the manufacturing rights for this truck and for the four-wheel truck of similar design which was described in the issue of the Electric Railway Journal following the M. C. B. convention last June.

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J. V. Pearse is present at the convention in the interest of the Railway Chemical Sprayer Company, Owensboro, Ky. This company manufactures a tank car from which a chemical is sprayed that will kill growing vegetation on the roadbed. The company does not sell its sprinklers but contracts to do the work at a fixed price per mile, usually $15 per mile of track per year. The company guarantees that its process is in no way injurious to rails, ties, bond wires, bridges, paint, etc. It had a contract last year with the Illinois Central Railroad, for exterminating weeds on approximately 500 miles of that system, between New Orleans and Dubuque, Ia., and will put a second car in service on the lines of this company next year. Mr. Pearse reports that he has also just been awarded the contract by the Government of New South Wales, Australia, for keeping free of weeds 3,000 miles of track for five years. This contract amounts to $225,000.

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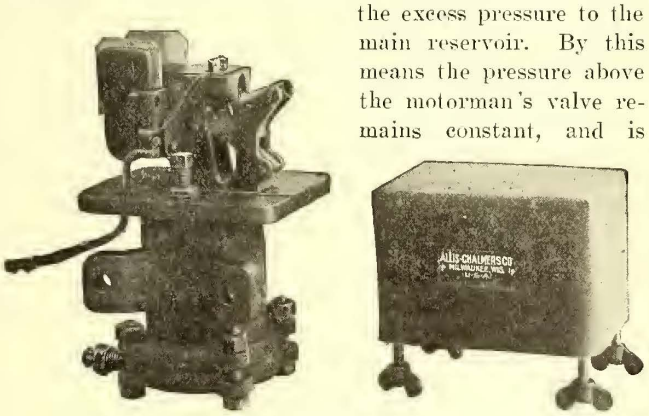
Westinghouse-Church-Kerr and Company, engineers, are represented at the convention by O. S. Lyford, Jr., electrical engineer, and Walter B. Trowbridge, both of the New York office; R. E. Adreon, St. Louis office, and Wallace Franklin, Detroit office. They are staying at the Marlborough-Blenheim, and are making their headquarters on the pier in the Westinghouse Company's booth in the Main Building.

ALLIS-CHALMERS QUICK ACTION AUTOMATIC BRAKE APPARATUS

One of the new pieces of apparatus exhibited this year by Allis-Chalmers Company is a quick action automatic brake equipment embracing a style "B-4" enclosed motor-driven compressor, of 25 cu. ft. capacity, especially adapted to heavy interurban cars hauling trailers and for trains operating on elevated and underground lines. The motor on this compressor is entirely enclosed, with large doors at the commutator end, making it accessible for adjusting brush-holders, field terminals, etc. Consequently it is not necessary to take down the compressor from the car to remove such parts.

Other important features of this compressor are the improved cylinder head, low over-all height, allowing maximum rail clearance, phosphor bronze bearing linings in crank shaft and connecting rods, impregnated armatures and field coils. The new "OB" pneumatic governor is also shown in connection with the compressor. In addition to the compressor and governor, this equipment embodies many new and important features not heretofore used in the ordinary automatic air brake designed for electric service.

A control valve is located in the service pipe between the main reservoir and motorman's valve. It is adjusted to the maximum train pressure desired, and at all times confines the excess pressure to the main reservoir. By this means the pressure above the motorman's valve remains constant, and is



Allis-Chalmers "OB" Pneumatic Governor

never subjected to a pressure in excess of the brake pipe pressure, which permits the valve to work easily and uniformly. This control valve prevents overcharging the train pipe and the life of the hose is lengthened by confining the excess pressure to the main reservoir.

The triple valve is of the quick recharge, quick action type, and is so designed that only a small variation of pressure is required to operate it in actual service. It has a quick recharging feature, which permits the auxiliary reservoir to be charged with sufficient rapidity to insure the maximum brake cylinder pressure at all times, no matter how frequently applications are made. The number of times the brakes may be applied in rapid succession is only limited by the capacity of the compressor.

In connecting the auxiliary reservoir to the main reservoir line, a non-return check valve is used, to prevent the air from feeding back from the auxiliary reservoir into the main reservoir line.

A reducing valve is also placed in the auxiliary reservoir pipe in front of the non-return check valve to maintain a pre-determined pressure, say 50 lb., in the auxiliary reservoir. By this arrangement, it is impossible at any time to deplete the pressure in the auxiliary reservoir below that of the maximum brake cylinder pressure. With every full service or emergency application the maximum brake cylinder pressure is secured and maintained, regardless of the piston travel or brake cylinder leakage, up to the capacity of the compressor. Between the check valve and reducing valve is located a safety valve set at 55 lb., to take care of any leakage that might occur through the reducing valve on account of its being defective.

The retain feature has important advantages in train service as well as in single-car service. By its use on the first motor car in a train of five or six cars, it assists materially in holding the slack in the train together, as well as holding the train while standing at a station with all brakes released, except on the first car. As the retaining feature on the first car is under the control of the motorman, it is possible for him to keep any portion of the brake cylinder pressure in the brake cylinder of the first car at the time of release. All motor cars are equipped with this feature and the triple valve exhaust is piped direct to the motorman's valve on both ends of the car. With either one of these motorman's valves in release position, the triple valve exhaust is open to the atmosphere through it. In all other positions of the handle the retain pipe is closed so that when both motorman's valves on a car are in lap position, it is necessary to have an opening from the retain pipe, to allow the air to escape from the brake cylinder to the atmosphere when releasing brakes. To accomplish this a ½ in. main reservoir drain cock or cut-out cock is located near the motorman's valve. The retain feature is obtained on the head car by closing this cock, which places the release of air from the brake cylinder on this car under the control of the motorman. As all other motor cars in the train have their brake valves in lap position the ½ in. cock in the retain pipe must be open so that the air may be released form the brake cylinder.

The combination of the new features in this equipment makes the automatic brake operation equally as good for a single car as for multiple-car train service. A considerable saving of air is also made with this equipment, due to the combination of the quick recharging triple valve and pressure controller. By the introduction of these two parts, prompt equalization is always obtained after the release of brakes, and because of this equalization of the brake pipe in the auxiliary reservoir, no air is wasted in getting the triple valve to respond. The air feeding from the main reservoir line at the reduced pressure of 50 lb. to the auxiliary, makes it impossible for the motorman at any time to lose his maximum brake power, whether in single car or multiple-car train operation. As soon as the motorman depletes his brake pipe pressure to a trifle below 50 lb., the triple valve will remain in full service applied position, and the air from the main reservoir will flow through the reducing valve to the auxiliary reservoir, through the service port in the triple valve, and then to the brake cylinder, holding this maximum pressure constant against all brake cylinder leakage limited only by the capacity of the compressor.

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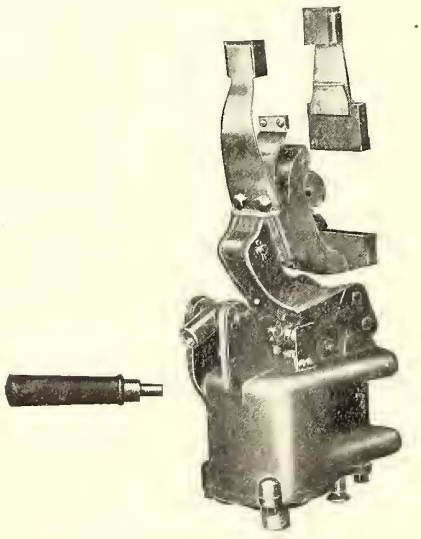
Improvements in the rolling mill machinery used by The Rail Joint Company, of New York, in the manufacture of its base-supporting rail joints are constantly being made in order to turn out joints for new sections of rail and for special purposes. In addition to its extensive line of plain joints for standard T and girder rail sections and electrically insulated joints it has recently added a number of new compromise or step joint patterns for connecting rails of odd sizes. Samples of all the standard and special joints made by the company can be inspected in space 616, adjoining the entrance to Marine Hall.

SOLENOID-OPERATED CIRCUIT BREAKERS

Self-contained solenoid operated circuit breakers, sometimes known as "electrically operated" or "remote control" circuit breakers, have become an essential part of central station equipment. By their use marked economics in cost of installation, in space and in time, may be affected. Solenoid operated circuit breakers may be placed where most convenient, thus reducing the length of the main conductors and at the same time the space required at the point of control. The controlling devices are small and may be located not only on the controlling board, but at any number of other points convenient to the operator.

The types of self-contained solenoid operated circuit breakers, manufactured by the General Electric Company, range in current values from 100 amperes upward, for potentials of 650 volts and less, and embody all of the essential and distinctive features of the well-known hand-operated circuit breakers with the addition of the solenoid operating mechanism, This consists of a closing and a tripping coil, which operate the breaker through a powerful toggle, the entire device being compact and requiring a



Solenoid-Operated Circuit-Breaker

minimum amount of space. A removable handle is furnished with each breaker for hand operation in case of failure of the operating circuit.

Perfect contact is secured on the main contact by the use of a specially constructed laminated brush, which is protected by a solid pivoted carbon secondary contact (eliminating trouble due to breakage of carbon secondaries) and a secondary copper or "shunt" contact.

The mechanism is of the toggle type, powerful, quick-acting and positive. The overload trip on the automatic circuit breakers is positive in its action and may be readily set and locked for any predetermined value within a wide range of calibration.

The main line to be controlled by the circuit breaker may be either direct or alternating current, the solenoids being operated by direct current. The coils are wound for standard voltages of 125, 250 and 600.

These circuit breakers are made in both automatic or non-automatic patterns. In the automatic circuit breakers, two types of overload trip are used. Circuit breakers for 500 amperes and under are tripped by means of a plunger and coil in series with the line. In the 800 and 1200 ampere sizes the tripping magnet surrounds the lower stud of the circuit breaker at the back of the panel and by means of a small auxiliary switch, closes the circuit on the tripping coil of the solenoid mechanism. The control switches are of the twin-pull button type with a mechanical indicating device, and indicating lamps, showing whether the circuit breaker is closed or open.

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Wm. Wharton Jr. & Co., Inc., Philadelphia, are showing switches, mates and frogs and crossings of manganese steel construction, both of the solid and renewable center types. The solid manganese steel pieces are attracting much attention, as since the adoption of this construction by the Board of Supervising Engineers Chicago Traction it has become more and more in demand. This company has previously supplied it to other cities besides Chicago, but only to a limited extent. The switch, mate and frog of this construction on exhibit are of the latest Chicago type, and are to be shipped there as part of a crossover at the close of the convention. A street-over-steam railroad crossing of the same construction is also shown. It is made entirely of solid manganese steel castings and is a modification of similar crossings furnished by this company since 1899, in which, however, only the steam railroad arms were of manganese steel and the street railway arms of carbon steel. Samples of solid manganese steel special work for T-rail construction are also shown. The type of switch used by this company in all girder rail work and solid T-rail work, known as the Wharton heel-less tongue switch, was shown in full size and by a model. Over 3000 of these switches are now in use. The model demonstrates the ease with which the tongue can be tightened or removed altogether, as desired. In connection with the switches, locking devices and springs are shown, one of which operates like a pneumatic door spring. This device, while throwing the tongue back to its original position after the passage of the car wheel, retards the motion, so that there is no splashing of mud or water in the switch slot, as is the case with ordinary spring switches. A similar device was also attached to a double-spring T-rail frog. One of the most interesting features is a "Restored" manganese steel steam railroad frog which was installed several years ago in the Philadelphia & Reading tracks and after outlasting a number of regular bolted frogs, was removed from the track because the wing rails were worn out. By a "rejuvenation" process, patented by this company, the frog was made practically as good as new and is to be shipped back to the Philadelphia & Reading Railway for further use. Several hundred frogs have been restored in this way, and it has been found that they give as efficient service as the original frog, the restoration process not affecting in any way the wearing qualities of the manganese steel of which they are made.

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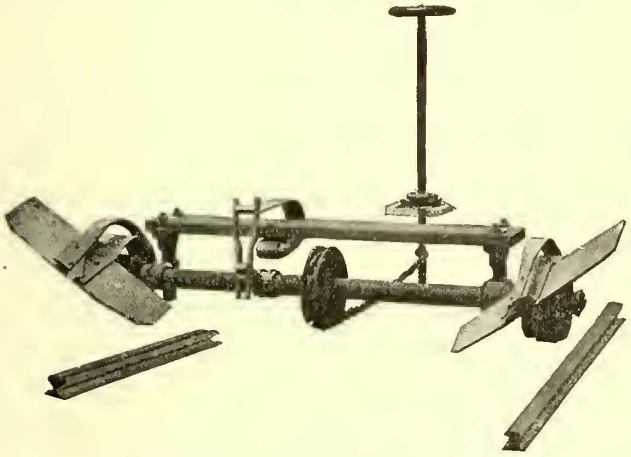
The Whitmore Manufacturing Company, in its booth in Machinery Hall, is demonstrating of the effect of applying Whitmore gear protective composition to railway motor gears and pinions with a gear and pinion which have been in use for more than three years, during which time they have made a total mileage of 194,700 miles, are shown. The pitch line of both is still preserved, and it is estimated that they are good for five times the mileage they have already made. As a little reminder, the company is distributing a blue-print showing the original and existing contours of the gear and pinion, which presents graphically the small amount of wear which has taken place. There is also on exhibit a pinion taken from service, from which the protective composition has not been removed. This illustrates the effect of the composition on the pinion and the way it protects the metal surface from wear.

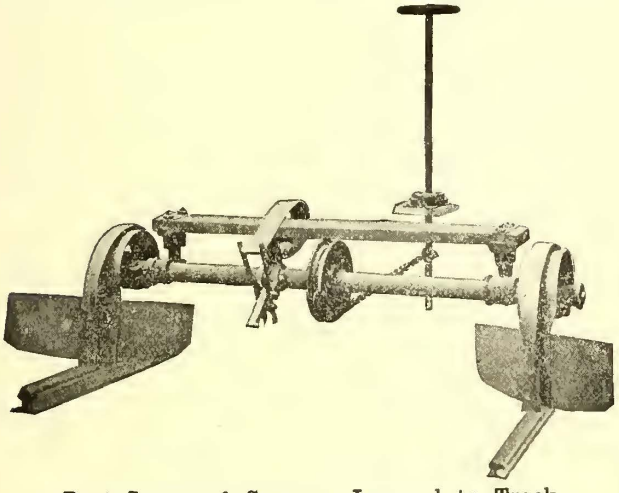
IMPROVEMENTS IN THE ROOT SCRAPER

The Root Scraper Company, Kalamazoo, Mich., has recently made a number of improvements in the well-known Root scraper which are designed to overcome an objection which was raised against the original form of this device. This was that the motorman might fail to raise the scraper at the end of the line and reverse the direction of movement of the car while the scraper was lowered on the rails. This would result in damage to the scraper. There was



Root Improved Scraper—Raised

also the objection that a scraper on the rear end of the car might be lowered by a passenger and be damaged or that it might not be securely fastened in a raised position and would drop down while the car was running. The improvement added to this device consists of a spring attached in such a way as to always hold the scraper free from the track when in use. It prevents the scraper from accidentally dropping down on the track when the car is running in either direction. The spring is bolted to the under part



Root Improved Scraper—Lowered to Track

of the hanger board and the arm on the operating shaft is fastened on the shaft by clamps so that the spring can be installed on a car in service without having to take the scraper apart. The improvement can be attached to any Root scraper in use on any type of car. The advantages claimed for this improvement are that the rods which connect the spring and the arm on the shaft are loosely connected to the spring above by a swivel pin and to the arm on the shaft below with the roller. As this roller lies close to the shaft when the scraper is lowered it decreases the leverage required for holding the scraper to the rails when in a working position. Also the old form of the Root scraper required two chains running from the pulley on the shaft to the operating rod on the platform. In the improved form of this device, the top chain is dispensed with and only the chain holding the scraper to the rail is required. The only instructions necessary to give motormen for operating the scraper are to release the holding dog on the platform operating shaft at the end of the line or at any other point where it is desired to cease cleaning the rails, which allows the spring to raise the scraper from the track.

The Root Scraper Company is about ready to put on the market an entirely new form of scraper which, it is said, will embody a number of improvements in design and construction over the older type.

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SAMSON SPOT TROLLEY CORD

Trolley catchers and retrievers require the best quality of trolley cord because the constant tension maintained by them in cord produces wear on the cord where it passes over the platform roof and where it enters the retriever box. To meet the demand for a high-grade cord free from roughness and with a water-proof finish, the Samson Cordage Works, Boston, Mass., makes a special quality cord woven with fine yarn into a smooth hard braid. It is distinguished by the colored spots woven into the braid which form the registered trade mark name of "Spot" cord. This brand has been sold in large quantities to electric roads all over the country. Samples will be sent on application to the manufacturers.

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ALUMINUM CELL LIGHTNING ARRESTERS FOR DIRECT CURRENT CIRCUITS

The success that has attended the operation of electrolytic or aluminum cell lightning arresters on alternating current circuits has led to their adoption on direct current circuits. The electrical characteristics of both types are the same; that is, the film opens at a definite pressure and allows the discharge to take place. The 600-volt aluminum cell lightning arrester manufactured by the General Electric Company for operation on direct current circuits, consists essentially of two glass jars, each containing a positive and a negative plate of aluminum in the form of concentric cylinders immersed in an electroyte. The positive plate is always the outer, and the negative plate the inner one. The plates are supported at a fixed distance apart by glass buttons fastened between them which makes a rigid construction and prevents the plates from short circuiting against each other due to jarring, vibration, etc. The jars are enclosed in a weatherproof wooden box, the interior of which is padded sufficiently to prevent breakage. This arrangement provides two cells which are connected in series without an air gap, directly across the 600-volt terminals. This allows a leakage current of only about .001 ampere at normal voltage. The arresters will discharge more than 1000 amperes at double normal voltage.

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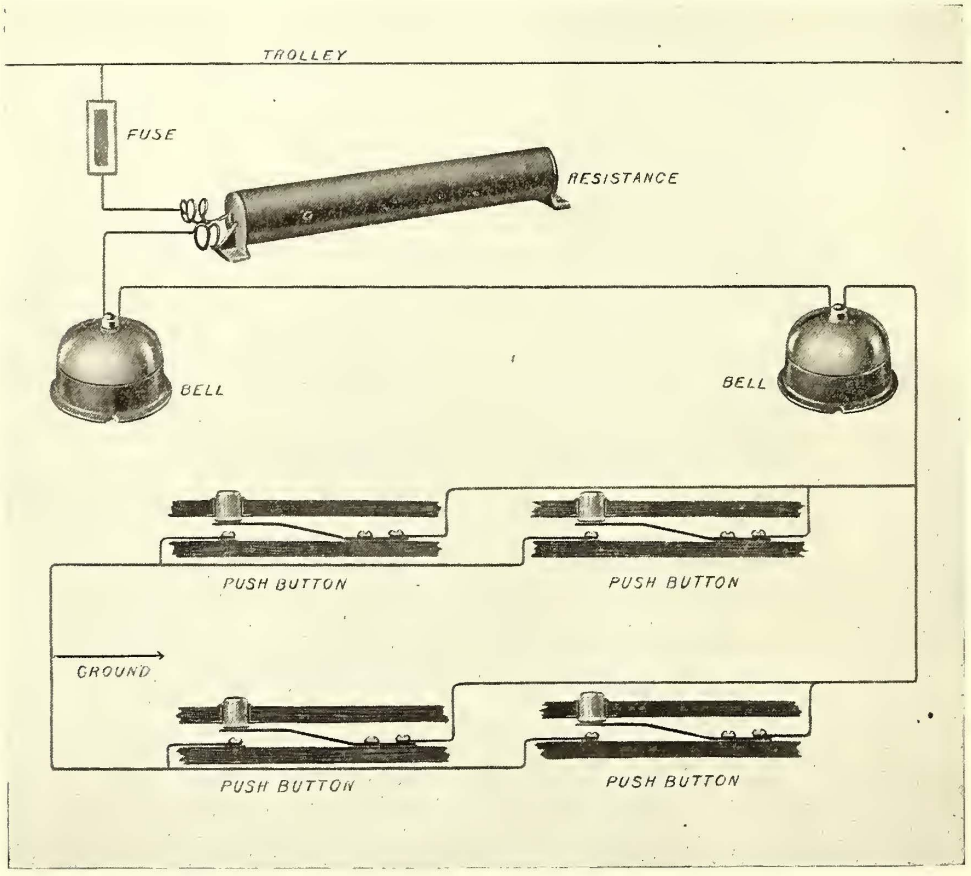
The Standard Paint Company, New York, is well represented at space 735 by C. E. Smith, J. G. Satterthwait and J. H. Thomas. Ruberoid roofing, P. & B. paint and P. & B. insulating varnishes and compounds are the lines they advocate.

CONSOLIDATED TROLLEY VOLTAGE SIGNAL BELL SYSTEM

The operation of signal bells on cars with dry batteries is often unsatisfactory because of the short life of the batteries and the necessity of constant inspection and maintenance. The Consolidated Car Heating Company, Albany (N. Y.) has designed a signal bell system which does away with batteries and their attendant troubles and maintenance costs and employs current from the trolley suitably reduced in voltage by means of a specially constructed non-inductive resistance. It is claimed that this system shows marked economy over dry battery installations and as trolley current is always available it affords a simple and reliable means whereby a passenger on approaching his destination can signal the conductor to stop the car.



Wiring Diagram for Consolidated Trolley Voltage Signal Bell System

Push buttons are placed between every window or in any other convenient place. Upon pressing any one of the buttons in the car, the bells ring simultaneously at each end. On some roads using the system it is the practice for the motorman to stop the car on push button signal from the passenger, thus making the passenger himself responsible for giving the signal in ample time to make the stop. Other roads use the push button bell simply to warn the motorman and the conductor that someone is going to get off. The motorman does not stop, however, unless he receives the signal from the conductor in the usual manner with the hand bell.

This system utilizes the trolley current instead of the familiar dry battery, and therefore can be relied upon at all times, as the trolley current is always available. Marked economy is effected over the dry battery system with which constant inspection, frequent repairs and replacements are necessary on account of the short life of the battery.

The non-inductive resistance, which has been successfully worked out after several years of experimenting, constitutes the most important feature of this system. The destructive sparking in the bells and at the push button contacts which would ordinarily attend any short-circuiting with current of from 400 to 600 volts is overcome by the use of this resistance to such an extent that the spark is scarcely visible. The construction of the resistance is such that it is well insulated and water and weather-proof. The dimensions of the interrupter are 3⅛ in by 3⅛ in. by 15⅜ in., and owing to its compact form it can be placed in any convenient location in the car, as, for examples, under a seat, above a door, on a side panel, or at the head lining.

The bells are of the Monitor type and all current carrying parts are completely enclosed, thus making them weather and dust-proof. The magnets are specially wound to make it possible for the bells to operate with a low current consumption. The gongs give a clear and distinct tone at any line potential varying between 400 and 650 volts.

The push buttons are of simple construction, consisting of a flat spring of sufficient strength to resist the pressure of the finger in operating the button. The spring is always connected to the ground wire, thereby making it impossible to receive a shock when pushing the button, even when the porcelain button is removed.

It is recommended that the system be wired with No. 16 B. & S. flexible wire, insulated for 600 volts, and the same care should be taken in wiring the bell system as is exercised in installing other electrical equipment on the car. From the wiring diagram presented herewith it will be seen that the resistance, both bells, and any one of the push buttons are all in series and across full trolley voltage, and that the pressing of any one of the push buttons will complete the circuit and ring both bells.

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The Pittsburg standard span wire pole is a tubular iron pole made by the Pittsburg Pole & Forge Company's patent hot process which forms a joint 18 in. to 24 in. long. It is said that this joint will not telescope either by hydraulic pressure or under the drop test, that it is proof against corrosin and is so reinforced that it is impossible to loosen the joint without breaking the tubing. Demonstration tests of these poles are being made daily by the Pittsburg Pole & Forge Company at its exhibit booth in the main building, spaces 608-614.