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Experience with the Low-Pressure Turbine

The report of the committee on power generation deals largely with the low-pressure steam turbine, which seems now to be coming into extensive use as an auxiliary in railway and other power plants. The philosophy of the use of this device is very simple. Working steam at high expansions is known to be necessary to economy. If this is attempted by multiple-expansion engines much better results can be obtained than with an ordinary compound engine, but as a mechanical fact the low-pressure cylinder of a triple-expansion engine is somewhat clumsy and owing to its great bulk offers considerable added friction. Now the use of a low-pressure turbine in connection with a compound engine merely transfers to the turbine the function that otherwise might be fulfilled by a third or fourth low-pressure cylinder. The turbine, having less friction, is more efficient than the added cylinder for expansion, and also having a higher rotative speed is far less bulky and inconvenient. Its higher speed leads to a lower generator cost so that by adding a low-pressure turbine unit to a compound engine and coupling it merely electrically, there is secured at once advantage in space, advantage in efficiency and advantage in generator cost. Installing such a turbine merely converts a compound engine into a triple-expansion engine of particularly good working properties, and to judge from the committee report the result in economy is just about the same, with great mechanical advantage added in case of working under a highly variable load. There is some additional gain thereto from the fact that with the introduction of the steam turbine has come the use of higher vacua than used to be customary, so that with the improved appa-

ratus now available there has come also improvement in practice and results.

We need not go here into the comparison of various types of turbines for indeed the data for proper comparison have not yet been obtained. It is sufficiently evident from the data given in the report that the practice of installing low-pressure turbines is productive of very material gains both in capacity and in steam efficiency, so that we can confidently look forward to a larger and larger use of this type of combined plant. Just how the efficiency of such a plant compares with that of an ordinary steam turbine plant is a matter not yet determined. The difference, however, cannot be considerable, the point of the whole matter being that existing plants with compound reciprocating engines can be improved in efficiency and economy to a very important extent.

Uniformity in Interurban Statistics

The subject of "Interurban Statistics," discussed by Mr. Rogers in his paper before the Accountants' Association yesterday, has engaged an increasing amount of serious attention during the last year. This is due in part to the accounting requirements of governing commissions and in part to the greater understanding on the part of operating officials as to the value of statistical information of this nature in the regulation of operating schedules and the study of opportunities for the development of special traffic. Mr. Rogers has enlarged upon the possibilities of the topic he discussed by presenting an unusual collection of material gathered by correspondence with accounting officials of various interurban lines. The expressions of opinion make it appear that inquiries were made of both large and small properties concerning the preparation and treatment of traffic and unit statistics, and especially regarding the vital question of whether the importance of the results is commensurate with the time and labor required to produce them. The conclusions of Mr. Rogers that the situation is a complex one and that no unit of comparison exists "that can be applied with equal force and value between companies" bring before the Accountants' Association a problem which it will undoubtedly work out with the same care that it has given to other important questions which have arisen as the art has developed.

Standardizing Rolled Steel Wheels

The first rolled and forged steel wheels were manufactured in 1903 and their first application to electric railway service was in 1904. Their many advantages were quickly recognized and at the present time they are extensively used under both high speed interurban cars and light city cars. As they were made to compete with cast iron wheels, it was natural that the manufacturers at first offered to duplicate the dimensions of any design of cast iron wheels which they were to replace. The result has been the production of a multiplicity of patterns, each differing from the other only to a small degree, yet requiring for its production a separate set of rolls and dies. Needless to say, the cost of these dies and rolls is added to the selling price of the wheels. The value of standardization in this detail of car equipment has been evident for some time to the manu-

facturers and to many of the largest users of rolled steel wheels, but they have been unable individually to bring it about. The committee on equipment in planning its work for this year undertook to bring the manufacturers and users together and to decide, if possible, on a limited number of designs and sizes which would fulfill all of the ordinary requirements of service.

The table of proposed standard dimensions of wheels, which forms part of this section of the committee's report, shows five diameters and a total of 22 different patterns. Wide and narrow treads and extreme or moderate dish of the web is provided for in each diameter of wheel. Except for very unusual conditions this range of designs should meet every real need, but not, of course, every whim. The committee infers that the general adoption of these standard designs would result in a saving in the first cost of as much as \$3 to \$4 per wheel. It is doubtful if standardization of any other part of car equipments could be shown to result in such a large and immediate saving for practically no trouble or supplementary expense on the part of the companies.

Power Distribution

The report of the committee on power distribution is of admirable thoroughness. It covers first and last a large range of pertinent topics. From the standpoint of the inter-urban operator, at least, as well as that of the general engineer, the most interesting section of the report is that dealing with the installation and care of high tension lines. It seems from the committee report, as well as from general experience, that in most sections of the country the steel line construction is preferable to the old wooden pole line, and particularly so as the working pressures and the conductors increase. The steel tower line is subject to troubles of its own, but upon the whole they seem to be less severe than those that afflict wooden construction. High cost, which incidentally rather tends to discourage the use of duplicate lines, is the chief practical objection to the steel construction. It is quite customary to run two circuits on steel towers, but as a matter of experience it is too often found that any serious line troubles involve both circuits. This danger is probably lessened by the employment of the suspension insulators, strongly recommended by the committee. Such insulators can readily be given a much higher factor of safety than is practicable with the pin type of insulator, and the circuits carried by them are less likely to be interfered with.

Another very valuable feature of the suspended insulator construction is that the line is comparatively free to yield longitudinally and consequently the strains upon the towers which must be allowed for in design are very much less than in the ordinary pin insulator construction. If a wire breaks or burns off when firmly fastened with pins, it puts a twisting strain upon the supporting tower, which is liable to do damage, just as in the case of a pole line such a strain may even bring down the pole itself. Very many recent lines, even with pin insulators, have been protected against this particular danger by using lightly tied wires, so that the conductor can slip and relieve the strain. With the suspension insulator the wire either slips entirely freely for a few spans, or if more thoroughly secured to the insulators, merely pulls them out of line to drop the catenary and relieve the strain. Moreover, it is possible to obtain with the suspension insulators a factor of safety which cannot in any feasible way be reached by the pin type. If three or four insulators suspended in series are not enough, then five or six will do the work, and so on. Of course, the towers have to be higher with the suspension insulators than with the pin type, assuming the same minimum allowable distance above the earth at the center of the spans. On the other hand, as we have just pointed out, the longitudinal strains are considerably reduced and the lateral strains are rather reduced than increased, owing to the flexibility of the

suspension, so that on the whole it should be possible to design a somewhat lighter structure for the suspension insulators than for the pin type, enough lighter to compensate for the increased height necessary.

A high factor of safety in the insulation is a very important matter indeed in designing the high tension transmission line. There have been many errors made in the past through false economy on this score. With suspension insulators and steel construction it ought to be possible to get the necessary factor of safety, greater or less, according to the conditions under which the line must operate, at a moderate expense compared in detail with that of the older construction. Where the utmost reliability of service is imperative it would seem that perhaps further improvement in steel construction might be made by using a suitable steel pole adapted to carry suspension insulators, and so lightened for the reasons we have previously mentioned as to permit an actual duplicate pole line at an expense little greater than that of tower lines as ordinarily constructed. In the last resort it is better to have two circuits on separate poles than on the same structure, especially when the dangers of lightning are considered.

We have touched upon one point only in the report under consideration, but it covers a variety of topics and is a valuable contribution to the literature on the subject.

Threats to a Trespasser

That an electric railway company is not liable for the act of its conductor towards a trespasser, unless the act was improper, unnecessarily dangerous, the proximate cause of the injury and done to remove the trespasser, is the gist of a recent decision in New York. At the time of the accident the plaintiff was nine years of age and was stealing a ride on an open car between Brooklyn and Coney Island. Before the car had started plaintiff had climbed upon the running board, which was not in use, as it was on the left hand side of the car. He stood on the edge of the up-turned board, holding on to the rail, but had not gone far when he fell off and was injured. The boy's version of the accident was that the conductor came towards him very fast, between the seats of the car, with both hands extended towards him, in consequence of which he became frightened and fell. He testified that the conductor did nothing except advance towards him in the way described, that he said nothing and had nothing in his hands to throw at him.

At the trial the counsel for the company contended that no negligence on its part had been shown and that the complaint ought to be dismissed because there was no proof of any act of the conductor which would justify the boy in assuming that he was about to be assaulted or which justified him in attempting to jump from the car. The Appellate Division in New York upheld this view, ruling that there was no assault and no order to get off the car. As the decision was by a closely divided court a portion of the opinion delivered by Judge Rich might be quoted:

The conductor had not spoken to plaintiff, and, so far as the evidence disclosed, had not by act or word indicated that he knew the plaintiff was on the car, or that he had any intention of putting him off. This was insufficient to justify a belief on the part of the plaintiff that he was about to be injured, and he does not testify that he had such belief. He simply says he "got frightened and fell off." Plaintiff's conduct was voluntary and intentional. He released his hold upon the bar for the purpose and with the intention of jumping off the car, and his foot tripped or slipped on the running board in the effort. It was a conscious and voluntary act, and there was no evidence which would call for the submission to the jury of the question as to whether there was such a wilful and wanton disregard of human life and personal safety on the part of the conductor as to make defendant liable to the plaintiff, who was a trespasser, knowing and appreciating the danger he was subjecting himself to when he boarded the car, and a non-suit ought to have been granted.

The reasons for the dissent of two judges do not appear, as no dissenting opinion was written by either of them.

Conventionalities

One of the "Don't Forget" things is the Sons of Jove rejuvenation at El Jebel Temple to-night.

With a cash balance of over \$7000 the finances of the Manufacturers' Association are in a very satisfactory condition.

H. C. Eddy, secretary of the District Electric Railway Commission of Washington, D. C., is among the visitors at the convention.

At noon today, but not before, the Denver street railway convention will come to an end. Packing of exhibits may be begun at that time.

While exact figures are not available, it is probable that the total attendance is about 2,800, which is very gratifying. The attendance of ladies is notably large.

In his annual address President Shaw took occasion to pay a deserved tribute to the "magnificent, comprehensive and valuable exhibit" of the manufacturers.

Sightseeing automobiles are kept busy in carrying the swarms of convention "tenderfeet" from the East who want to see all of Denver while they have a chance.

Choice carnations were given away yesterday and the day before by the Carnegie Steel Company. That explains many of the dainty buttonhole floral decorations sported at the convention.

Young in years but an old convention hand, S. W. Mower, general manager of the Southwestern Traction Company, London, Ont., was a member of the Canadian contingent who was warmly welcomed.

Supplementing the efforts of Messrs. Evans and Beeler, Superintendent of Transportation Control of the Denver City Tramway Company has been indefatigable in looking after the wants of convention visitors.

Not waiting for visitors to call at their booths, the Massachusetts Chemical people distributed among the booths acceptable souvenirs consisting of rubber—or something that looks like rubber—mats for ink-wells.

Mr. B. F. Boynton, chief claim agent of the Portland Railway, Light & Power Company, Portland, Ore., announces that the next meeting of the Pacific Claim Agents' Association will be held at San Francisco, on Feb. 11 and 12, 1910.

Some one has noticed that the Stout Street cars are marked "Stockyards," and has expressed the hope, prompted, perhaps, by memory of lusty odors of the old-time "Bridgeport" in Chicago that "Stout" does not mean "strong."

Curtis P. Brown, manager of the Fargo & Moorehead Street Railway Company, Fargo, N. Dak., is apparently the only representative at the convention from the State he represents. Mr. Brown arrived early and will stay until the exhibits are dismantled.

Edwin L. Reed of Chicago, expert in the handling of labor troubles, is renewing old acquaintances among the delegates at the convention. Mr. Reed has in the past few years been at the helm in the settlement of many of the railway labor disputes throughout the United States.

Visitors to the convention are again reminded that the trouble of arranging their Pullman reservations will be taken off their hands by the obliging George E. Armstrong, business manager of the American Railway Guide Company (Western Section). Mr. Armstrong is always on duty at Booth No. 106.

Among the Pool-Bahs of the convention few represent public service utilities of a more varied nature than Samuel

J. Dill, general manager of the Elmira Water, Light & Railroad Company of Elmira, N. Y. This all-embracing company operates the city railway lines, the interurban road to Watkins, the electric light and power service of Elmira, artificial gas, natural gas, the city water works, two theaters and a driving park. Can you beat it?

George B. Tripp of Colorado Springs was circulating about the premises yesterday, mainly interested in the convention of the Colorado Electric Light, Power & Railway Association, of which he is an officer. Mr. Tripp had "blood in his eye" when he showed up, but the troublesome optic readily yielded to Denver treatment.

While particularly active at the National Electric Light conventions, the National Electric Lamp Association does not neglect the street railway conventions. S. E. Doane of Cleveland, chief engineer of the association, arrived on Wednesday evening and hurried over to the barbecue, which pleased him as much as it did everybody else.

Denver is the home of the famous old horse-car in which the horse rides, or did ride, as a passenger on a down-hill trip. A picture of the antiquated vehicle, with the horse and a gay bunch of conventioners, was taken in front of the Annex yesterday noon. The horse wore a slightly bored expression.

W. H. Heulings, Jr., sales manager of The J. G. Brill Company, has fully recovered from an operation which he underwent in July, but is still at his seashore cottage, where he will remain for the rest of this month. He will resume his duties shortly in better health than he has enjoyed for a number of years past. This will be gratifying news to his many friends in the electric railway field.

The following is an exact copy of the statement made by the son of Joseph Kazak, living at 2828 Elliott Street, Baltimore, Md., who made claim for a dog killed by a car of the Pennsylvania Avenue line at Elliott and Patuxent Streets on Aug. 23, 1909, at 10:50 p. m.: "Claims a dog owned by Mr. Kazak was crossing from south to the north side of the street, and the dog stopped and looked both ways before crossing track, and when it saw no car approaching started across the track, when the car came along without ringing the bell and struck the dog and killed the back part of the dog. The S. P. C. A. came next day and killed all the dog. It was a Newfoundland dog, 8 or 9 months old."

A. L. Humphrey, general manager of the Westinghouse Air Brake Company and Westinghouse Traction Brake Company, calls attention to the interesting fact that the three larger Westinghouse companies are under the management of three men who were, at one time, prominently connected with the business interests of Denver. E. M. Herr, vice-president and general manager of the Westinghouse Electric & Manufacturing Company, was at one time connected with the Denver office of the Chicago & Northwestern Railway; his brother, H. G. Herr, general manager of the Westinghouse Machine Company, was also at one time located in Denver, and Mr. Humphrey made this beautiful city his home for many years.

The Colorado Springs & Interurban Railway has a bunch of "live wires" in attendance at the convention. J. N. Henry, assistant superintendent; Andrew Reid, electrician and shop foreman; William T. Richards of the air-brake department, and J. H. Eastwood, master mechanic, showed up on Monday morning. President D. H. Rice and William Lenox and B. M. Lathrop of this company are also in Denver to-day, and A. A. Hawk, storekeeper; George Reid, machinist; Thomas McDonald, line foreman, and Mr. Elliott, track foreman, came up in the middle of the week, accompanied by Superintendent Lathrop, the original bearer of the Colorado Springs invitation, as mentioned in Tuesday's daily. Mr. Lathrop dropped in on Saturday but returned home over Sunday.

AUF WIEDERSEHEN!

The sentiment of the "Mizpah" sign at the Union Station will be sincerely echoed by every departing railway and supply man. Denver will ever have a warm place in their hearts.

They are still talking about that barbecue of Wednesday evening. Was it appreciated? Well, to judge by the way some of the "live wires" at the convention gathered about Mr. Beeler of the Tramway Company and cheered him to the echo, it was, most decidedly. The "bunch" joined hands and danced about the modest general manager, singing "For He's a Jolly Good Fellow!" Mr. Beeler tried to escape, but could not. A. L. Whipple, the singularly capable chairman of the entertainment committee, and a broad-minded chap, too, led the cheering.

FROM THE EXHIBITORS' POINT OF VIEW

"Well, we will be ready to close our account tomorrow morning," said Joseph R. Ellicott, president of the Manufacturers' Association yesterday afternoon. "Nearly everything is cleaned up and we are getting ready to close up shop in fine shape. In my judgment the Denver convention has been one of the best we have ever had. The railway men, particularly the engineers, have taken an especially noticeable interest in the exhibits. I have talked with a number of exhibitors, and they all agree that it has paid them well to come to Denver. We made no mistake, I think, in journeying to the shadow of the Rocky Mountains to hold our 1909 convention. The memory of this year's meeting will long be a pleasant memory."

PROPOSED PLAN FOR CO-OPERATION BETWEEN THE STATE RAILWAY ASSOCIATIONS

On Wednesday morning, Oct. 6, a meeting was held in the Brown Palace Hotel, at which 12 state railway associations had representatives to discuss ways and means for securing co-operative action of the state bodies with one another and with the American Street & Interurban Railway Association, especially in reference to matters of legislation. The conference appointed R. P. Stevens, president of the Lehigh Valley Traction Company, as president and J. H. Pardee, operating manager of J. G. White & Company, as secretary of a committee which will work out the details in harmony with the executive committee of the American Street & Interurban Railway Association. One suggestion that will be proposed in this connection is that a certain period should be allotted at the annual national conventions for discussions on inter-state legislative questions by representatives of the state associations.

PRESENTATION TO MR. WHIPPLE

At a time when, as chairman of the entertainment committee, he appeared before the executive committee of the Manufacturers' Association to present a matter of business which engrossed all his thoughts at the moment, A. L. Whipple was taken completely by surprise yesterday noon by the presentation of a token of esteem from the members of the executive committee. President Joseph R. Ellicott made the presentation and expressed the high esteem in which all the members of the association hold "A. L." Whipple. With his mind full of plans for convention entertainment, Mr. Whipple was entirely taken back, and he could only express his thanks in halting words. The gift, so cleverly timed, is a handsome diamond ring with a blue-white stone in a tight setting. Mr. Whipple has had wide experience in convention entertainment, both at street railway and steam railroad conventions, and he has acquitted himself admirably.

The sentiment that prompted the gift is heartily indorsed by every convention adherent.

MOFFAT EXCURSION TODAY

The official excursion over the Moffat Road to Corona, "the top of the world," and return, will take place today. Special trains will leave the Moffat Station, Fifteenth and Bassett Streets, at 8:30 a. m. returning between five and six o'clock. Basket lunches and hot coffee will be included in the price of the round-trip ticket, which is \$3. A feature of the day will be the taking of a photograph 6 ft. long and 8 in. high of the whole party amid the rugged snow-clad mountain scenery at Corona. A reliable photographer has been engaged by the entertainment committee, and he will collect \$2 in advance from those who wish the pictures. The arrangement is that a print of the photograph shall first be submitted to a disinterested representative of the committee, and if it is not satisfactory it will not be mailed, but the subscribers will receive their money back instead.

A birthday dinner was given at the Albany on Wednesday night in honor of R. C. Cram, assistant engineer of the Connecticut Company, by Fred Weston and H. De Haven Bright.

The Tramway Bulletin, organ of the Tramway Mutual Aid Association of the local street railway company, issued a special handsomely illustrated souvenir edition, and a copy was presented to all delegates. The courtesy was appreciated.

Waldo E. Berry, the only representative from the New York office of the Carnegie Steel Company in attendance at the convention, was glad to find that his cards of admission to the Denver Country Club did not contain any prohibition against starting to play golf with the sunrise.

Yesterday was "Denver Day" at the exhibition, and the people of the city came in large numbers to see the exhibits. Men, women and children were greatly interested in the varied machinery and appliances on display. Tickets were sold at 25 cents, and the proceeds will be given to Denver charities.

An enjoyable dinner party was given last night at the Metropole to the staff of the National Brake Company by its president, G. S. Ackley. In addition to Mr. Ackley, those present included F. D. Miller, W. D. Brewster, Alphonso Wigmore and J. C. Raymond. A number of close personal friends of Mr. Ackley were also present. Mr. Wigmore acted as toastmaster. His playful humor and ready wit enlivened the party and helped to make the occasion a most enjoyable one.

The side-entrance cars of the Denver City Tramway Company are of especial interest to visitors. The car is of the all-the-year-round type, and the seating arrangement is popular with passengers. Non-smokers have the forward closed end and smokers the rear end, which is more nearly of the open-car type. On a 43-ft. car the seating capacity is 53. The cars are not double-ended, having entrance only on one side, and are turned on loops or wyes at the ends of routes. The percentage of accidents is low.

One of the most distinguished of foreign visitors at the convention is Sir James T. Ward, of Belfast, Ireland, indirectly connected with the municipal tramways of that city. Sir James is the guest of A. W. Ballard, manager of the General Electric Company's office at Los Angeles. He says that the Denver electric railway exhibition is a wonderful show and that he is fairly astounded at the arrangements for entertainment, both by the Manufacturers' Association and by the local street railway men. There is nothing like it in his country, he says.

REPORT OF THE COMMITTEE ON TRAINING OF TRANSPORTATION EMPLOYEES*

By J. W. Brown, Chairman; W. R. W. Griffin, C. D. Emmons, C. E. Learned, W. H. Douglass and G. O. Nagle

The operation of electric railways throughout the country during the year which has elapsed since the last report of this committee has emphasized the necessity of more thorough training of the transportation employee. A number of serious accidents have been chronicled, investigations of which have developed facts which point in some cases to lack of sufficient time for training.

The work assigned to the committee appeared to be of such importance and of such wide scope that only a portion of it could be taken up in this report, and the subjects considered follow:

(a) The Necessity of Careful Selection of the Employee

The need of a more intelligent class of men in the electric railway service is apparently due to the increased speed at which cars are operated, the increased complication of equipment and the increased number of cars which are moved against each other, together with the ever-swelling traffic density as the territory adjacent to the various lines becomes more closely built up. It is of the utmost importance that the physical condition of the men be determined, together with sight, hearing and color perception, and that this information be made a matter of record. It does not appear desirable to employ men of too immature age, as few have the necessary judgment to correctly deal with the many critical situations which arise. Neither does it seem wise to employ too old men, whose habits of life are firmly fixed and in whom there exists that lack of co-ordination between mind and muscle necessary to instantly grasp the situation and act accordingly; men who, aside from their lack of ability to take up with facility a new line of work, will certainly confront the management within a few years with the problem of what is to be done with the superannuated employee; this situation arising with the employee hired at such an age makes it impossible for him to give many years of service to the company before retirement. Each individual case of selection of an employee bears with it the possibility of bringing within the organization an agitator, and one dissatisfied, agitating employee may produce more trouble and nullify more work on the part of officials to produce a loyal and contented organization than might be thought possible. The importance of this particular phase of selecting employees is vital. The value of having married men in the service is worthy of consideration, as in perhaps 90 per cent of comparative cases they are bound to be better settled, more contented and giving more loyal service than the unmarried employee, who feels no responsibility after his week's board is paid. Getting the proper material for transportation service is undoubtedly of first importance.

(b) The Necessity of Careful Training of the Employee

The problem of obtaining a sufficient number of well-trained employees is the question which confronts the transportation official throughout his working hours and haunts him in his dreams. Time was when conditions were simple, equipment light, and traffic also, and the traveling public took a trifling accident as a matter of course, instead of immediately placing the matter in the hands of an attorney, as at present; speeds were lower, and the education of the employee was not nearly so serious a matter as it is to-day. To elevate to a higher plane and make more dignified the calling of motormen and conductors is one of the best ways of attracting to the service men of higher moral and mental standard. Too often is the position of motorman and con-

ductor viewed as only a temporary position, and to be occupied only until a better opening appears in some other line of employment, which in itself breeds lack of interest in the work. Anent the statement that more time should be given to the training of employees comes that plea of the transportation official, who has to greatly augment his schedule during certain months of the year, that it is impossible to give to the employee the amount of training which he should have. This condition, while unfortunate, does not seem to be easily surmounted. Frequently, however, more training can be given by anticipating the season somewhat. The great amount of work done, however, is by the regular employees on duty throughout the year, and with a well-trained force of all-the-year-round employees, the short-term men are more likely to give good results.

One of the important points in the training of transportation employees is in giving a clear understanding of what their conduct toward the public should be. Too much care cannot be exercised in instructing men who come in contact with the public of their obligations to the patrons of the road. The conductors, and to a somewhat less extent the motormen, are generally considered the true exponents of the policy toward the public of the corporation they serve. The old adage, "A man is known by the company he keeps," has been aptly reversed by some one to read, "A company is known by the men it keeps." While the management comes in direct contact with the public officials and the policy of the corporation may be known by such public officials to be the broad policy of recognition of the public's rights and an earnest desire to discharge its public obligations efficiently, the treatment accorded to the individual passengers and the personality of the employees have a far greater influence in forming public opinion than can be exercised through any other channel. Once thoroughly established, this impression, whether for good or bad, is of lasting duration and may be the cause, one way or the other, and in many different ways, of working to the benefit or detriment of the company. In the training of the employees this feature should not be overlooked, but to the contrary should be given considerable importance, both in the selection and training of the employee.

The value of both oral and written examinations is recognized by most successful operating men, and has very considerable value from the fact that while many first-class employees do not have the power of expression in a very great degree, it encourages them to further self-education, and is a step toward putting the service on a higher level.

(c) Comparisons of Various Forms of Discipline

The question of discipline is so closely allied with training that it is evident that a man not properly trained cannot in justice be properly disciplined. It does not seem just and right to attempt to educate a man in the duties of trainman in a few days and then treat him in discipline with the full merits or demerits of the case as though he were an experienced employee. Consequently, no matter what the form of discipline used, there should be greater attention paid to the education of the man, and the discipline meted out accordingly. There is no doubt that discipline can be administered to the very best advantage to the men on the property where the superintendent is personally acquainted with each and every man. Knowing his good and bad qualities, the superintendent frequently, and perhaps unconsciously, does more in the way of education than he does in the way of real discipline. His knowledge of the man's personality gives him the opportunity to correct that man's mistakes in a manner which will in the majority of cases do more real good than the simple imposition of a suspension or other penalty. Too frequently, however, there is not sufficient history or record kept of the different individual cases to thoroughly mete out justice in the event or change of management, or change of superintendent. Men educated and disciplined under the personal touch method

*Abstract of report read before the American Street & Interurban Railway Transportation and Traffic Association, at Denver, Colo., Oct. 4, 5, 6, 7 and 8, 1909.

as a rule become contented and valuable men to the company. On the other hand, properties employing hundreds of trainmen make this method practically out of the question. However, the same policy, as far as possible, should be carried out by placing "follow-up" men or instructors on the road to look after the new men, reflecting as far as possible the personality of the superintendent, giving the new man the advice which he needs and keeping the superintendent fully acquainted with the progress made; all of which should be carefully recorded in the man's record. In this way the superintendent has a thorough way of judging the man's shortcomings. One large company adopting this method and following it closely, showing the following:

The average number of men for four years prior to this period who were in the employ of the company less than one year was 40 per cent of the total number of employees. Eighteen months' work has brought that average down to 30 per cent for the past year, while the total number of men in the service has increased 10 per cent.

These figures show that the methods adopted have bettered the personnel of the men.

Forms of discipline whereby men are laid off from work are open to the criticism that the families and not the men are the real sufferers; also it is a well known fact that the majority of men live very closely to their incomes and when cut off they are very apt to contract debts that are hard to wipe out, and they become discouraged, disheartened and at war with their jobs. It also tends to dishonesty.

One of the points in favor of the merit and demerit system of discipline is that it does not deprive the man of work, and it gives a far better history than any other system of the man, and furnishes the superintendent with a knowledge concerning the man that he lacks if not able to form a personal acquaintance.

One large road using the merit and demerit system states that at least 90 per cent of its men are striving for merit marks and take a lively interest in their standing. There seems to be no good reason why a railroad should not be operated, as far as discipline is concerned, on the same basis as any other large employer of labor, and factories and mills do not suspend men for violations of rules.

While this committee as a whole is not prepared to unananimously recommend the installation of the merit and demerit system of discipline, it is recommended that the workings of this system, which is now in force on a number of large properties, be closely followed by the member companies in order that the results obtained be fully understood and its value as a means of discipline completely determined.

Under any system of discipline the heart-to-heart talk with the employee seems to be one of the most valuable features, as it gives the opportunity for education which is always lost when the discipline is simply a notice of loss when the discipline is simply a notice of suspension.

(d) Relief and Pension Work

At the present time with the tendency to reduce hours of labor and increase the cost of service, it may appear quite enough to many operators to contend with these facts, without adding such an expensive feature as a pension system, and that it is not up to them to provide for the future of an employee when the wage paid was sufficient to permit him to take out insurance for his own protection, and that it is asking too much to allow for one's future in their daily wage and at the same time provide for it by the way of pension.

However, the value of the pension system is not only in the benefits which accrue to the employee, but also it is a means of directly benefiting the company. A company providing for disabled and superannuated employees has a

much better standing with its employees, and causes a real return by means of the contented spirit with which it imbues the employee. The sober, thinking class of men are loath to leave the service of a company which assures them support in their old age. There is also that question of moral responsibility, if not legal responsibility, to the employee who has given the best years of his life to the service.

The fact that a large number of the best operated steam railways have a pension system for superannuated employees, and also from the fact that a number of prominent electric railway companies are now working toward this end, indicates the value of the system.

Relief associations have become part of the organization of a great proportion of the companies to-day, and are undoubtedly, where properly administered, a great help in maintaining the standard of employees by means of the assistance rendered.

In order that your committee might know to what extent the practice of the member companies coincided with the recommendations made last year, and which features of the report it seemed best to recommend for adoption as standard, the committee sent out data sheet No. 39. One hundred and ten companies replied, either fully or in part.

Various answers were made. A large number of companies agree with the committee that 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 different subjects pertaining to their respective departments, with which the transportation department has to co-operate, are of considerable value, and while a large number of roads report having no instructions of this nature, recommend it and in many cases indicate that they expect to put such a plan into effect in the near future. One manager pertinently suggests that success is through "living close to the men." 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 men should go hand in hand with their training as transportation employees, and the committee recommends that this subject be given serious and careful consideration as one of the most important parts of the transportation work.

To the question, "What method of discipline do you recommend?" the answers were varied.

Fifty-four companies favored suspension and discharge, while 43 companies recommended the merit and demerit system.

Among the companies favoring the merit and demerit system there seem to be various methods used in its administration. This is also true of the answers from companies favoring suspension and discharge. In both cases the value of personal talks with the employee under discipline was considered important.

A Texas delegate brings news of a refreshing reversal of form in the matter of damage claims. An interurban work train of the Texas Traction Company killed Henry Greer's dog near the village of North Richardson. As soon as Henry heard the sad news, instead of calling on the claim agent with a long face and telling him how valuable the animal was and asking the price of a horse for it, he journeyed to the railway office in Richardson and paid the agent a quarter, asking him to forward the money to the interurban people with his thanks. The honest Mr. Greer said that he had been trying to get some one to kill the dog for a year, offering as high as 50 cents at times when he was vexed to a greater degree than common. He experienced a feeling of genuine relief when the animal went to the "dog heaven" via the Texas Traction.

TRANSPORTATION & TRAFFIC ASSOCIATION--- CLOSING SESSION

The meeting was called to order by President Allen at 10 a. m., and the discussion of the reports on city rules again taken up, beginning with rules 201 to 221.

The rules upon which amendments were offered are given below, and those rules to which amendments were made are marked with an asterisk:

201*, 203, 205*, 208, 214*, 221, 225.

H. S. Cooper, manager, Galveston Electric Company, offered the following resolution:

"Whereas, The committee appointed at the last meeting of this association has prepared and reported a certain code or set of rules governing operation of city cars, which code is intended to include such general rules as represent the best and most modern practice in electric railway operation, and

"Whereas, This association has duly and carefully considered and amended the same in some particulars, and

"Whereas, It is for the interests of the members of this association that the association adopt, approve, promulgate and recommend a code of rules which shall be considered the standard code, except insofar as it may in specific instances be necessary to omit, add to, or change the rules in order to conform to state or municipal laws and regulations or to local conditions.

"Now therefore, be it resolved that the rules reported by the committee and as changed, omitted or amended at this meeting be the standard code of rule of this association, for the operation of city cars, until such rules may be duly amended, or changed at a meeting of this association, and

"That this association request its members to adopt this standard code of rules for the operation of city cars on their respective railways except insofar as such rules may conflict with state or municipal laws or regulations, or be unwise or inapplicable on account of local conditions, and

"That the committee on city rules be continued, to report at the next meeting of the association such proposed changes or amendments as may seem wise or necessary."

Transfers and Transfer Information

President Allen announced that J. V. Sullivan, Chicago Railways Company, was unable to be present to read his paper on "Chicago's Transfer Crusade," and it was read by Mr. Brush. A. A. Ballantine, Boston Suburban Electric Companies, owing to lack of time, was unable to prepare his paper on transfers, and President Allen said it would be taken up at the 1910 convention. The whole question of transfers and transfer information would be taken up again in 1910.

Mr. Sullivan's paper will be found elsewhere.

C. C. Learned, superintendent of inspection, Boston Elevated Railway, said that in Boston, also, the misuse of transfers has caused considerable loss. About a year ago a law was enacted which protected the railway company in the misuse of transfers, but the law was not as broad as the one in Chicago. He thought it would be an easy matter to make as many prosecutions as Mr. Sullivan had given in his paper, provided the same law was in force in Boston as in Chicago. The Massachusetts law did not make it an offense to give away a transfer, or solicit one, but made it an offense to offer a traded transfer for use. The Boston Elevated Railway had probably handled 40 or 50 cases of prosecution for the misuse of transfers, and in every case had been obliged to obtain sufficient evidence to satisfy the judge that the accused person approached the transfer point, not from a car but from some other direction. Then the inspector had to follow him on the car and take note of the fact that a transfer had been presented. They were not permitted under the law to make an arrest. The offense was not considered a misdemeanor serious enough to warrant arrest and imprisonment until bail could be secured or until court convened. In consequence of this the inspectors simply took the names of offenders and had a summons issued to appear in court the next morning. In some instances the names given were fictitious, and also the ad-

resses; therefore, in every case of attempted fraud, a man on the car followed the offender after he had left the car and ascertained who and what he was. When a fictitious name was given the judges were extremely severe, as it was considered self-evident that the offender intended to defraud and deceive. He thought that a law might be enacted in the different cities or states which would cover all the necessary points. He knew of but very few cases where transfers were sold in stores, but had great difficulty with newsboys who would stand in front of the transfer stations and solicit transfers or pick them up after passengers had dropped them. They gave the transfers away to persons who bought papers of them and in that way many people who worked in stores and who were not patrons of the road would go to a transfer point, purchase a paper, obtain the transfer and ride to their homes. In prosecuting these cases almost invariably the defendants would offer in rebuttal testimony that they had just left a car and entered the store to make a purchase, and that the fact that they were seen to come from the store was not sufficient evidence of intent to defraud, as they were patrons of the road and had just left the car. The company was able to show by its close scrutiny, by a number of men stationed at the transfer point, that the offender had approached the transfer station from a distance of from half a block, and that he was not a patron of a car. There were many instances in Boston also where men came from different directions to factories and exchanged their transfers in the shops; men from the north giving their transfers to men from the south, and vice versa. The men would board a crowded car at night and the conductor would be unable to scrutinize the time limit. These factories were located and watched very closely and the men were followed from the factories to the transfer point. When they presented the transfers their names were obtained and prosecution followed. Very few instances of misuse of transfers were now brought to his attention. A notice was posted, as suggested by Mr. Sullivan, at all transfer points, so that persons could be well informed of the law.

Matthew C. Bush, Buffalo & Lake Erie Traction Company, referred to the pamphlet which the association sent out last winter discussing the fare question. A very large percentage of this pamphlet was devoted to the increase in fares on the Newton & Boston Street Railway and other properties in Massachusetts with which he had been connected. The fare was increased from 5 to 6 cents on all their properties except one, which charged one cent for all transfers issued. This increase was approved by the Massachusetts Railroad Commission for a trial period of one year. Within the last three weeks a petition was presented for an extension of that privilege for another year. The extension has been granted by the commission without any opposition. The transfer for which 1 cent is charged reads: "This transfer is issued with the approval of the board of railroad commissioners to the passenger desiring transfer privileges, only upon payment by such passenger of 1 cent additional fare." This move increased the revenue about \$8,000 during the year. The transfer was issued by the conductor at the time of payment of fare, exactly as all other transfers are issued, but in addition the passenger had to pay 1 cent additional for it. These transfers were issued to the conductor in blocks of 50 or 100, and they were charged for the number of transfers taken out. Conductors usually were given one package without charge, but if they took two packages they had to pay for the second package before taking out their car. They got their money for this second package back from the passenger. In addition to this his company took from conductors all transfers collected at the end of every half trip. As far as the conductor knew, the company inspected every single transfer taken up; but not all were inspected, as this was prohibitive on account of the expense. Transfers on each line were inspected practically every fourth

day. At the end of the trip the conductor deposited in a large envelope all transfers and ticket fares, and one the face of this envelope was a printed form containing name, space for entering the conductor's number and the number of the next succeeding transfer that he was going to issue. The envelope showed the number of tickets and the number of transfers enclosed, and at the terminal the envelope was inserted in a time stamp and deposited in the box. Every fourth day all transfers were carefully gone over to see the hour at which they were issued, that is, if transfer No. 27 was issued at 3 o'clock and No. 26 at 3:30 o'clock something was wrong. As a result of this method of collection and checking he believed they had absolutely eliminated the exchange of transfers by conductors at junction points.

C. D. Emmons, Ft. Wayne & Wabash Valley Traction Company, said that Ft. Wayne was a much smaller city than Boston or Chicago, but they had the usual trouble with exchange of transfers at transfer points. The cars all came together at one center, which was known as the transfer corner. The old system was to issue transfers at that point to the passengers desiring to go to other lines. It was found that in the stores adjacent to this corner people were trading transfers. They therefore made the rule that they would only give transfers at the farthest junction points of transfer lines; that it, in the case of lines that passed the transfer corner followed the same route for some distance before branching, passengers would be transferred only at the branching points. The result was that within a year, while the number of passengers carried had increased 100,000 per month, they were now issuing 20,000 less transfers per month. It might be objected that they ran the risk of issuing transfers on transfers by doing this, but the result showed such a material gain that they could run the risk of doing that.

R. I. Todd, Indianapolis Traction & Terminal Company, said his system was practically the same as the one followed by Mr. Brush, with the exception that they only required conductors to turn in transfers once every round trip and not every half trip. The transfers were checked up about once a week. He did not follow Mr. Emmons's system of honoring transfers only at the farthest point, but honored them at the nearest or first transfer point.

S. W. Cantrill, Denver City Tramway, called attention to the transfers used in Denver. It stated on the back of each transfer, the exact transfer point at which the transfer was acceptable and it was not acceptable at any other place. At the bottom of the transfer it was also stated that in case of a controversy, the passenger should pay the fare and apply within three days for redress at the office of the company. In the central loop, where some 24 lines pass is a box for the deposit of an envelope containing all paper fares collected. These are checked up at such times as were seen fit, but so far as the conductors knew they were checked up every day. He liked the idea of a time clock and wanted more information about its use.

Training of Transportation Employees

J. W. Brown, West Penn Railways, read the report.

Charles B. Wells, Denver City Tramway Company, read a paper which will be found elsewhere discussing the committee's report.

N. W. Bolen, Public Service Railway of New Jersey, presented the following written discussion:

Communication on Report of the Committee on Training of Transportation Employees by N. W. Bolen, Public Service Railway Company, Newark

The committee on the training of transportation employees has presented a report which clearly indicates conscientious work on the part of its members and leaves but little to be said on the subject covered. I am sure that no fault can be found with the statements made by the committee upon the selection, training and discipline of employees, nor upon the value of relief and pension work as an aid in raising the standard of men. After a quarter of a

century spent in the street railway service, and all of this time spent in personal contact with a large number of employees, I can but heartily endorse the recommendation of the committee. I have seen carelessness in the selection of employees result in labor agitations and strikes. I have seen both the result of personal contact and of impersonal methods of administering discipline and take this occasion to emphasize the value of the former. As stated by the committee, it is extremely difficult on large systems for the superintendent personally to administer all discipline and to know the individual characteristic of the employees. He therefore must depend upon the good judgment of his subordinate officials and in their selection lies the key to his successfully administering his department. I can see no reason why the transportation superintendent operating in a given city, 500 or 600 cars, cannot personally know all his trainmen. If, however, the superintendent has other duties than those directly connected with the operation of cars he may properly delegate the administration of minor discipline to one or more assistants. If he is wise he will see that these assistants are in all respects qualified for the position of superintendent and that they are thoroughly alive to the importance of properly dealing with the employees and are thoroughly in accord with their superior's policy. The division superintendent who does not personally know every employee in his division, who has been in the service of the company more than four weeks, is not worth his salt. In recommending the employment of instruction or "follow up" men, I would advise that the greatest care be used in the selection of such instructors, and that a very able "follow up" system of following up the instructors be kept in force. It is highly important for the welfare of the company that the operating head be at all times thoroughly familiar with the actions of his subordinate officers as well as the actions and general topics of conversation of the mass of employees, to the end that incompetents may be weeded out, that acts of unfairness or injustice may be promptly remedied, that all cause for complaint on the part of trainmen be reduced to a minimum.

In conclusion I recommend that the report of this committee be carefully studied when the members of this association reach their homes and the facts as brought out by the report of the committee and discussions be placed before the subordinate officials for their inspiration and guidance.

Mr. Learned described the system used in Boston in handling men. He used the follow up system, as recommended by the committee. The men were carefully selected, their references investigated, and the conductors had a bond furnished for them. He had regular instructors to whom he paid 10 cents per day extra the year round whether they had men under their instruction or not. In that way he encouraged these instructors on their part to give the students all the careful instructions that were necessary. After a student had served a number of days, if the instructor thought he was all right, he was turned over to the assistant superintendent of a division who went over his work carefully, and assured himself that the new man was familiar with the rules. He was then sent out over the different routes, after which he was sent back to the superintendent of employment, who carefully reviewed all his work and knowledge of the rules. When a man was put back on a car after this training he was as conversant with the rules and requirements of the company as it was possible to make him in the speaker's opinion. The new man then served 60 days on probation, after which he received permanent employment. Mr. Learned found that the bonus of 10 cents per day to instructors increased the desire on the part of employees to advance to the rank of instructor. He thought it was a small compensation for the services performed, as it took at least half or three-quarters of an hour extra time every day for the first six or seven days with a new man to go over his work. His company employed some 1500 or 2000 new men a year. The instructors were known to the other men by the letter "I" which was attached to the lapel of their coats. Students were paid a \$1 a day. They were formerly given \$1.50 a day, but now they were paid on a weekly basis of not less than \$7 a week.

W. R. W. Griffin, Rochester Railway Company, referred to the recommendation of the committee of last year to adopt standard forms, blanks and methods whereby the

W. R. W. Griffin, Rochester Railway Company, referred to the recommendation of the committee last year to adopt standard forms, blanks and methods whereby the different companies could get information quickly in regard to the men who leave one city to seek employment in another. One of the greatest difficulties in trying to find out about a man who came in, was to get information from the other companies for which he had formerly worked. He hoped the association could get together on a standard information blank form.

Mr. Bolen said the Public Service Railway had a school of instruction near Camden, one in Newark, and a third in Hudson, in Hudson county. An instructor and an assistant instructor were employed in each school under the direction of the superintendent of transportation. Recently he had asked the claim department to give him a man from that department who had had experience in the transportation department, for the purpose of taking up with the students the method of making out accident reports, and also in going through the details of handling accidents.

C. J. Franklin, Portland (Ore.) Railway, Light & Power Company, referred to recommendations on the merit and demerit system, under which his company had been operating for several years with very satisfactory results, especially in the prevention of accidents. They were more generous in giving merits to the men, particularly when good accident reports were made out, and when they secured a larger number of witnesses than was required, and for many other things relating to the claim department in which they figured. He found that when a man had received a large number of demerits he took advantage of the fact that he could work them off with credit or merit marks much easier by paying particular attention to the rules of the claim department, which were also the rules of the operating department. He had found cases where motormen and conductors had brought in the names of witnesses to accidents in which they in no way participated. He had in mind one case where a conductor was attending a card party and during the conversation heard that an accident had occurred to which some of those present, whom he had not met before, were witnesses, and they were discussing it in a general way. He was very sharp, and without their knowing anything about it, secured their names and addresses and brought them to the claim department the next morning, for which he received a very generous award of merit marks. He recommended the merit and demerit system very heartily as a means of giving information to the claim department and also bringing the accidents down to a minimum.

Dana Stevens, Cincinnati Traction Company, said his company had a school of instruction for motormen and conductors. A school room was fitted up with cars and trucks and various types of brakes and controllers. It was in charge of a regular instructor, who gave the students a general insight into the mechanical and electrical equipment on the cars. In addition to this, blackboards on the wall contained some of the printed forms of accident reports used and also the form of a trip report used. The men were given hypothetical accidents, and instructed to draw up and make a report of such cases on the board. In that way the men got a good idea of the way to do the work required in actual operation. It also gives the conductor a good idea of how to fill out trip reports. The men were kept in the school of instruction for six or seven days, as the necessity demands. Then they were sent out to break-in on the cars under old and trained motormen and conductors. They were kept on a certain division until the motorman or conductor, as the case might be, who was assigned to the car on which the man was learning, considered him fit to operate a car, or that he understood transfer regulations and other rules in connection with that particular line. The man then went to the division superintendent and was allowed to work on that particular line. In the meantime, during his spare time,

he was allowed to break-in on other lines of the same division, and when he had been certified to as being qualified to operate cars on any other line of the same division, then he was allowed to operate cars on that line. That plan was followed until he was broken in on all the lines of any one division. After that he stood on the extra list, and was given work on the cars of any line of that particular division. The speaker found that in this manner he had been able to secure a better class of employees, because a man who was not willing to go through this training and had not the stamina to stick to the end, dropped out, and the company was better off without him. The man who was finally broken in on all the lines of the division, as a general rule, made a valuable employee. His company did not pay the students while under instruction. That had been a matter which had been given serious consideration, and it was something he believed they would have to come to. Especially during prosperous times it was naturally more difficult to secure competent men. When a man took a position of that sort he probably could not afford to wait two or three weeks before he was able to earn anything. He needed subsistence money at least, and in prosperous times he would take some other position rather than wait that long.

P. P. Crafts, Iowa & Illinois Railway, said that about seven years ago he adopted the merit and demerit system on his road. He was trying to combine the systems at that time brought out by Mr. Satterlee of Kansas City, and also the Brown system. Although he had departed occasionally from certain portions of the original scheme, he found it a very good way to discipline the men, on a small property at least. The men seemed to like it, and they were more afraid of its consequences than they were of the lay-off system. They were very proud of their record, and wanted to keep as high a standing as possible. He thought that it had a great effect in the prevention of accidents. He did not employ men less than 25 years of age. Possibly that might be done successfully on a road operating slow-speed equipment, but he found on a high-speed line that a man under 25 rarely had the brain development to give him the necessary amount of judgment, even in ordinary emergencies. As to the instruction of men, he endeavored to instruct men both as motormen and conductors. That was necessary because of the few cars he operated. An extra man who was broken merely as a motorman or conductor did not receive enough pay on the extra list to allow him to subsist. As soon as a man got a regular run he was given either end of the car to which he seemed best adapted. A few months ago he inaugurated a system of having one motorman and one conductor picked out as instructors. These men receive about \$6 or \$7 a month in excess of the regular pay, and they not only break in the new men, but it is their duty to make trips over the road every now and then, sometimes at night, and make runs with a new motorman or new conductor.

At the Atlantic City convention last year the committee on training of employees submitted a report with an appendix showing Form A, application for appointment; Form B, reference inquiry; Form C, reference inquiry; Form D, record of examination of sight, color, and the sense of hearing; Form E, surgeon's certificate of examination; Form F, instruction to surgeons. It was moved that these forms as suggested in the report of 1908, be adopted, as the best practice in the state of the art at the present time. The motion was carried.

The recommendation of the merit and demerit system, as being the best form of administering discipline was referred back to the committee for further consideration.

A number of communications making suggestions for the work of 1910 were referred to the incoming officers for their consideration.

Mr. Cantril asked the president to appoint a committee to take up the matter of stopping of cars, so that the members of the association could standardize this practice.

as much as possible, this committee to communicate with all organizations to get at the concensus of opinion and report at the next meeting. The motion was carried unanimously.

President Allen appointed Mr. Emmons, Mr. Hegarty and Mr. Brown as a committee to present to the American Association in the afternoon, suitable resolutions stating that the Transportation & Traffic Association had adopted the report of its committee on interurban rules, the report of its committee on city rules and the partial report of the committee on training of employees. The parent association was to be asked to ratify the adoption of these rules by the Transportation & Traffic Association, in order to make them the standard of the association.

Election of Officers

The nominating committee presented the following report:

Denver, Col., Oct. 7, 1909.

The American Street & Interurban Railway Transportation & Traffic Association.

Gentlemen:

Your committee on nominations, after careful consideration, begs to submit the following nominations:

President, Robert I. Todd, vice-president and general manager, Indianapolis Traction & Terminal Company, Indianapolis, Ind.

First vice-president, Henry C. Page, general manager, Springfield Street Railway Company, Springfield, Mass.

Second vice-president, N. W. Bolen, superintendent of transportation, Public Service Railway Company, Newark, N. J.

Third vice-president, George Whitfield Parker, general express and freight agent, Detroit United Railway Company, Detroit, Mich.

For members of the executive committee:

J. N. Shannahan, vice-president and general manager, Washington, Baltimore & Annapolis Railway Company, Baltimore, Md.

Dana Stevens, vice-president and general manager, Cincinnati Traction Company, Cincinnati, Ohio.

J. W. Brown, superintendent of transportation, West Penn Railways Company, Connellsville, Pa.

A. H. Mackay, general traffic agent, Puget Sound Electric Railway Company, Tacoma, Wash.

(Signed) E. F. PECK, Chairman
F. I. FULLER,
H. A. NICHOL,
E. C. FOSTER,

Committee on Nominations.

On motion the secretary was instructed to cast one ballot for the election of officers, as proposed by the nominating committee.

Mr. Crafts read the following report of the committee on resolutions, which was received and adopted by unanimous vote:

Denver, Colo., Oct. 7, 1909.

The American Street & Interurban Railway Transportation & Traffic Association.

Gentlemen:

Your committee on resolutions submits the following report:

I. Whereas, the Denver City Tramway Company, through its officers, particularly its president, Mr. William G. Evans, and its vice president and general manager, Mr. John A. Beeler, and the Denver Convention League, have extended to the members of this association an unstinted amount of hospitality and attention during their stay, and have therefore added greatly to the pleasure and profit of the visit of the members of this association to Denver during this convention; now, therefore, be it

Resolved, That the American Street & Interurban Railway Transportation & Traffic Association expresses its thanks and appreciation for the invitation to the members of this association to locate the convention this year at Denver, for the cordial manner in which the members of this association have been received and the pleasure which they have enjoyed while here.

II. Whereas, the officers, the executive committee, entertainment committee, exhibit committee and all of the individual members of the American Street & Interurban Railway Manufacturers' Association have made the visit of the members of this association to Denver most agreeable and instructive, not only by arranging many enjoyable

entertainments and trips, but also by providing an extensive, elaborate and interesting exhibit of electrical apparatus, much of it brought a great distance; now, therefore, be it

Resolved, That the American Street & Interurban Railway Transportation & Traffic Association extends to the Manufacturers' Association, its officers, various committees and members its thanks and appreciation of all these attentions and services and expresses its hearty appreciation of them.

III. Whereas, the officers and members of the executive committee, standing committees and special committees of this association have given most steadfast attention to the affairs of this association during the year, often at great sacrifice of time, and have provided this association with a most instructive program and series of reports; now, therefore, be it

Resolved, That the members of the American Street & Interurban Railway Transportation & Traffic Association extend to these officers, members of the executive, standing and special committees and the authors of the papers presented at these meetings, their thanks and appreciation for their faithful work and valuable reports and papers submitted.

(Signed) P. P. CRAFTS, Chairman
J. H. PARDEE,
H. W. BLAKE,
Committee on Nominations.

The meeting then adjourned.

TURBINE-BLADE GUESSING CONTEST

At 4 o'clock yesterday afternoon the guessing contest on the number of turbine blades in a glass case in the booth of the Allis-Chalmers Company came to an end. The correct number was 6199. J. T. Ross, of the Northern Ohio Traction & Light Company, Akron, Ohio, guessed the correct number and won the first delegate's prize. The second delegate's prize went to Edwin C. Faber of the Aurora Elgin & Chicago Railroad. Milwaukee souvenir spoons were awarded to F. M. Ellis, Rockford & Interurban Railway, Rockford, Ill.; Sydney M. Bamburger, Salt Lake & Ogden Railroad; J. H. Pardee, J. G. White & Company, New York; A. E. Hook, Colorado Springs & Interurban Railway; Thomas A. H. Hay, Northampton Traction Company, Easton, Pa.

In the ladies' delegate class the first prize went to Mrs. W. M. Quakenbush, Mt. Clemons, Mich. Mrs. Ernest Gonsenbach, Sheboygan, Wis., won the second prize. Souvenir spoons were awarded to Mrs. W. H. Collins, Schenectady; Mrs. H. G. Vordenmark, Ft. Wayne, Ind.; Mrs. Thomas Hawkin, Rockland, Me.; Mrs. Russell Howard, Green Bay, Wis.; Mrs. George Radcliffe, Schenectady.

In the manufacturers' class, the prizes were awarded as follows: First, George H. Berg, Illinois Stoker Company; second, A. A. Gray, Electrical Review, Chicago, Ill. Souvenir spoons went to J. C. McQuiston, Westinghouse Companies, Pittsburg, Pa.; Percy Houts, Brecht Company; H. L. Munroe, General Electric Company, Chicago, Ill.; W. M. Lawyer, Whitmore Manufacturing Company, Cleveland, Ohio; H. J. Summers, Planet Company.

The ladies of the Manufacturers' Association secured prizes as follows: First, Mrs. J. M. Griffin, Wheel Truing Brake Shoe Company; second, Mrs. E. D. Batchelor, Pittsburgh, Pa. Souvenir spoons were awarded to Mrs. W. H. Stieglert, John A. Roebling's Sons Company; Mrs. Rollin Gerry, Jones & Laughlin Company; Mrs. E. H. Hammond, American Electrical Works; Miss M. Sampson, Denver, and Miss Helen T. Fuller, Denver.

Those who have not claimed their prizes may secure them this morning by applying at the booth.

Major Evans says none will know that the Mrs. Henry Clay Evans who won the second prize at the bridge-whist party at the Denver Country Club is his wife. He says "Mrs. Harry Evans" might be better, but he really believes the only real way to establish her identity is to describe her as "Major Evans' wife." It would be interesting to know what Mrs. Henry Clay Evans thinks of that.

THURSDAY MEETING OF THE AMERICAN ASSOCIATION

The last meeting of the American Street & Interurban Railway Association was held at Auditorium Hall yesterday afternoon.

The committee on compensation for carrying United States mail presented its report which was approved. The subjects of insurance and public relations were also considered. Paul Winsor of Boston then presented the report of the committee appointed last year on an electric railway dictionary to be published by the McGraw Publishing Company. Mr. Winsor said that the committee had held several meetings with the editor of the dictionary and had decided to confine the subject matter of the volume to rolling stock, including equipment. Progress was being made with the work and before the next convention it was hoped to conclude the compilation and publication of the volume.

Secretary Swenson then read a letter from Samuel M. Curwen, vice president of The J. G. Brill Company, announcing that the committee appointed to award prizes offered by The J. G. Brill Company for the best essay on the subject of "Design of an Electric Railway Car for City Service," had awarded the prizes. The names of those to whom the prizes were awarded are published elsewhere in this issue. Secretary Swenson also said that the three essays which had been awarded prizes had been sent to the convention by Mr. Curwen and were there in the room and could be inspected by anyone present.

The report of the committee on nominations then presented its report, which was as follows:

President: James F. Shaw, chairman board of directors, Boston & Worcester Electric Companies, Boston, Mass.

First vice president: Arthur W. Brady, president, Indiana Union Traction Company, Anderson, Ind.

Second vice president: Thomas N. McCarter, president, Public Service Railway Company, Newark, N. J.

Third vice president: George H. Harries, second vice president, Washington Railway Electric Company, Washington, D. C.

Fourth vice president: Charles N. Black, vice president and general manager, United Railroads of San Francisco, San Francisco, Cal.

The committee presenting the report was as follows: E. C. Foster, New Orleans, chairman; R. T. Laffin, Boston; H. A. Nicholl, Anderson, Ind.; W. G. Ross, Montreal; John A. Beeler, Denver.

These officers were unanimously elected.

The executive committee of the association consisted of these gentlemen and the presidents of the four affiliated associations who were elected as follows:

H. S. Swift, secretary Toledo Railways & Light Company and president of the Accountants' Association.

F. H. Lincoln, assistant general manager Philadelphia Rapid Transit Company and president of the Engineering Association.

E. C. Carpenter, claim agent, Indiana Union Traction Company, Anderson, Ind., and president Claim Agents' Association.

R. I. Todd, vice president and general manager, Indianapolis Traction & Terminal Company, Indianapolis, Ind.

During the election of the officers, the chair was occupied by Charles N. Black. After the election Mr. Shaw was escorted to the chair and was greeted with applause. After a short speech in which he expressed his appreciation of the honor conferred upon him by re-election, he called upon the four vice presidents for remarks, and each of them gracefully responded.

The report of the committee on resolutions was then presented by Gen. George H. Harries (chairman), H. C. Page of Worcester and P. P. Crafts of Clinton, Ia. The committee presented five resolutions.

They first extended the thanks of the association to the

Denver City Tramway Company, its president and vice president and every employee with whom the committee had come in contact, for their generous goodness and effective, yet unassuming courtesy, typical of such an effectively maintained and operated public service corporation.

The second resolution placed on record the grateful appreciation of the association for the deeds done by the Manufacturers' Association which through its spirit of helpfulness and good fellowship and entertainment had more than maintained its high repute for thoroughness and had contributed beyond measure to the success of the convention.

The third resolution expressed the cordial thanks and warm expressions of regard of the association to its co-laborers in the great works of transportation, improvement and public education, the technical press, which had rendered invaluable assistance in the broad field of electric endeavor and had aided materially in this work by its unswerving loyalty to the principles governing the American Street & Interurban Railway Association.

The fourth resolution expressed the gratitude of the association to the mayor of Denver, the city officials, Chamber of Commerce, Convention League and the citizens of Denver generally for the welcome extended and for the many graceful acts "to the strangers within their gates," and also expressed the wish that the city of Denver and her people may have all manner of long-lived happiness and prosperity.

The fifth was an expression of thanks tendered to the members of the American Association and its affiliated associations which had devoted during the last year so much time and highly intelligent energy to the compilation of reports and papers and which had contributed in such practical manner to the efficiency of the association.

After the presentation of these resolutions the following communication from the Transportation & Traffic Association was presented by D. A. Hegarty of Little Rock:

To the American Street & Interurban Railway Association:
Gentlemen: We, the undersigned committee, duly appointed by the American Street & Interurban Transportation & Traffic Association at its meeting held this morning, beg to advise you that at the various meetings of the Transportation & Traffic Association the reports of the committee on interurban rules and the committee on city rules were duly considered and after some slight amendments were, by proper resolution, adopted as the standard rules of that association for the operation of interurban and city cars.

We also desire to report that the report of the committee on training of employees was adopted insofar as it pertains to the adoption of standard forms.

The American Street & Interurban Transportation & Traffic Association therefore respectfully requests the ratification of its work by the American Street & Interurban Railway Association.

Respectfully submitted,

C. D. EMMONS, Chairman.
F. W. BROWN,
D. A. HEGARTY.

The American Association accepted the resolution and approved the rules suggested by unanimous vote. The meeting then adjourned.

PRESENTATION TO MR. ALLEN

C. Loomis Allen of Syracuse, N. Y., retiring president of the American Street & Interurban Transportation & Traffic Association, was presented a set of diamond cuff buttons and a set of diamond studs by the officers and executive committee of the association at a luncheon which was given yesterday at the St. Francis Hotel. R. I. Todd, the incoming president, made the presentation speech. Mr. Allen has in many ways endeared himself to his fellow officers, and they seized the opportunity presented by his retirement to demonstrate their esteem in this tangible fashion.

Colorado produced 9,773,225 tons of coal and coke in 1908.

ENGINEERING ASSOCIATION---THURSDAY SESSIONS

President Winsor called the meeting to order at 9:50 o'clock. Before Mr. Heywood introduced the report of the committee on standards, the president said that the recommendations for specifications were placed before the members more for their information than anything else because it would be impossible, probably, to get a committee actually to agree on every item of a specification. It was not likely a standard dimension for one would not be likely to agree absolutely to every item; although he would consider them good in general.

Mr. Heywood said that the executive committee had laid out certain work for the committee on standards, as follows: (a) Gears and pinions; (b) standard dimensions with particular reference to standard taper for pinions; (c) standard gear ratios; (d) iron for brake riggings; (e) axles; (f) rubber covered wire. At the meeting which was held in Atlantic City it was quite definitely decided that this committee did not have the proper matter before it to make definite recommendations on these subjects, it being the ruling of last year's convention that matters for consideration by the committee should come from one of the other standing committees. It was found that the committee on power distribution was considering the subject of rubber-covered wire, and hence that matter was referred back to the power committee. The manufacturers' representatives were present to give their opinions on the standardization of taper and gear dimensions. The consensus of opinion among them seemed to be that it was practically impossible to standardize the distance between axle and armature shaft centers at the present time. They were also at odds on standard tapers but they thought they could get together on that subject later. The manufacturers said that the standards which had been adopted already were not being used quite as extensively by member companies as they would like to see them used. It was then resolved at that meeting that this matter be brought to the attention of member companies through a circular letter from the president of the engineering association and endorsed by the president of the main association, with the view of getting the member companies to pay more attention to the standards already adopted.

President Winsor praised the standardization efforts of The J. G. Brill Company and then introduced W. G. Gove, superintendent of equipment, Brooklyn Rapid Transit Company, as a man who had done an immense amount of standardization on his system. Mr. Gove said that the Brooklyn Rapid Transit System has approximately 4000 cars for surface, freight, mail and express, elevated passenger and freight service, of which about 3490 cars are on schedules. After describing the improvements in traffic which followed the rehabilitation of the surface and elevated equipments, Mr. Gove spoke on the meaning of standardization. Standardization should not refer to equipment only, but to every detail of organization and management. Much of the success in Brooklyn had been due to the encouragement of the president and vice president who had prevailed upon the directors to spend about \$40,000,000 in the last five years in rebuilding the property. As to standardization, he would cite one instance on the elevated lines in reference to brake shoes. Six years and a half ago, they had on the entire system no less than 29 different patterns, seven of which were on the elevated division. The elevated brake shoe heads were reduced from seven to three. Within the last six months he had arranged to change every brake shoe on the entire system to four different patterns, two on the elevated lines and two on the surface. Only one would be needed on the surface if it were not for the maximum traction trucks, one of the patterns being for the pony wheel.

Mr. Gove said he did not believe that the best standardizing results can be obtained by the head of the mechanical department being the sole judge. The consequences

of any step must also be judged from the standpoint of the management and the transportation departments. There may be little question about the transportation department's standpoint, but the management will not fail to remember that some of the best things in the world are very expensive. Reverting to the surface cars, Mr. Gove quoted one other instance of the kind of work done in the general overhaul. For instance, the detail of window glass had been standardized to such a degree that it is necessary to maintain very few sizes. Brake pins and bolts are standardized and recorded on diagrams for the shops which order them by number and not by size. Double doors that were giving trouble with certain fixtures have been replaced by single doors with one standard fixture. The door locks on the elevated division are the same throughout. As to gears, the question of pitch, etc., was not considered, practically, in the Brooklyn standards, except those that have been adopted in the last year or so, as the others were adopted before any recommendations were made in this respect. The company has adopted such features as a standard wheel and gear that can be used economically with different motors and with different trucks.

Mr. Gove said the co-operation of the manufacturers was essential in the development of standards. He was also a believer in contracting for material on a mileage basis wherever practicable. In conclusion, he mentioned the beneficial effect on the Brooklyn Rapid Transit System of plotting and disseminating all the costs and results in operation through curves. They do not expect everyone of the men to be an engineer, but do believe that even the men in the pits, the trackmen and linemen become interested in these curves because they can quickly tell whether the curve is going up or down, even if they can do no more. Besides that, all instructions of a general nature are issued as bulletins from headquarters. A division shop foreman goes around to the different shops from time to time to check up adherence to standards and determine why any departures were made. Mr. Gove then mentioned the practice of shop gardens as instituted by his company, although that would hardly be called standardization.

President Winsor said in relation to flower beds that the arrangements of the shops are as much a matter of standardization as the equipment. Getting the men interested in the business, in one way or another, is of the greatest value. If the men are given the neat flower beds outside of the shops and interested to keep the shops clean inside, their quality will surely improve. Referring to the report of the committee on standards, he said it related largely to specifications, and he would like to hear from some of the purchasing agents on this subject, as it was interesting to them as well as to engineers. He then called upon P. J. Honold, purchasing agent of the Oneida Railway Company, to give his views.

Mr. Honold said he did not believe that purchasing agents with common sense intend to antagonize their engineers or attempt to dictate to them what they ought to use. They are perfectly willing to work in co-operation with the engineers, but believe the latter ought to furnish specifications covering their requirements exactly so that the manufacturers are placed on an equal basis, thus giving the buyers a chance to get rock bottom prices.

President Winsor then called for discussion on that part of the standards committee's report relative to "Gears and Pinions." (That this subject be continued for another year.)

On motion of Mr. Heywood, the subject of gears and pinions was referred to the committee on equipment for consideration for another year.

The next recommendation was "Standard Taper for Pinions: The adoption as a standard taper for pinions, the proportion of 1¼-in. in diameter to 1 ft. in length." In reference to this Mr. Evans said that it is quite well agreed between the Westinghouse Company and the General Elec-

tric Company that the dimension given is a desirable taper.

President Winsor noted that the proposed taper is very close to 1 in 10. If it is made 1.2 in 12 inches, instead of 1.25 it would be 1 in 10.

Mr. Evans said the committee had no desire to express itself in favor of either the General Electric Company or the Westinghouse Company's methods, although the standard is the same as that of the General Electric Company except that the same taper seemed to be agreeable to the Westinghouse people, and also that Mr. Storer of the Westinghouse Company did not seem to be satisfied with the taper his company was using.

J. L. Evans of the Westinghouse Electric Manufacturing Company thought his company would be willing to adopt any taper recommended by the association, but did not exactly understand the advisability of adopting any standard pinion or any standard taper that might better be left to the motor designers. It seemed sufficient if the axle and the axle layout, the position of the gear on the axle and the pitch of the gear are standardized, but he thought the association should give more attention to the adoption of a standard for the axles and gears and particularly the length of the bearing pin, which had been overlooked and not given in connection with the standard axle. He thought it would be wise to adopt a standard make of bearing pin because with old and worn axles, where the diameter has been decreased by 1-16 in., it would be impossible to interchange motors for different bearings unless one standardized the length of the bearing on the axle. The fit of the pinion, however, should be left to the manufacturers because it cramps the motor design very largely. One motor manufacturer would like to run with a larger shaft in the pinion fit, while another may want to use a special steel in the shaft and a small pinion fit.

The motion was then carried that the question of the standard taper for pinions be referred to the committee on equipment. The next recommendation was on continuing the subject of standard gear ratios for another year. This subject was passed without comment and was followed by the question of "Specifications for Wrought Iron Bars and Limit Gage with Table of Sizes for Round Iron," covering the adoption as standard of the specifications for wrought iron bars, as given in the report; also the adoption as recommended practice of the limit gage for round iron and the table of sizes of limit gages for round iron as given in the report.

Mr. Davis said in regard to the standard axles adopted by the association that both the General Electric Company and the Westinghouse Company have adopted these as their standards and have built and designed their motors to conform to the standards. Of course the companies thought that the American Street & Interurban Railway Association would immediately conform to these standards wherever they possibly could, but in nearly every case where they have brought motors so designed to the operating men they have required some alterations in various details. He felt that the operating end of the American Association should adhere more closely to these standards. The manufacturers have met the association more than half way, not only in fixing the standards, but also in adapting the motor design so as to meet them, and they felt that the association ought to meet them half way. Possibly the matter of standard axles had not yet soaked very deeply into the appreciation of the master mechanics, but it was a step in the right direction. To make two different motors interchangeable on the same gear and on the same axle ought to be sufficient in operation. He hoped that the association would stick more closely to the standard axle lay-outs because the makers were prepared to furnish motors designed along these standard lines.

President Winsor then asked for expressions of opinion as to "Iron for brake rigings," and "specifications for

wrought iron bars." He thought the specifications would be of value even if they were not adopted. After some desultory discussion on this subject, it was decided that the specifications for wrought iron bars and for axles be referred to the executive committee for its special attention and further report.

Referring to the specifications for rubber-covered wire, President Winsor said that the recommendation of the committee on power distribution favored the adoption of the standard specifications of the Railway Signal Association as suitable for this association. This subject would be in the province of the power distribution committee.

Mr. Evans said that in order to secure a more general recognition of the association standards and also to have them more carefully considered and to give them more weight, the committee had decided on the plan of submitting them to letter ballot as a motion to make a standard or not make a standard at a convention session would not have very great weight as representing all of the member companies. It did not seem that there would be anything to submit to letter ballot this year. Consequently this recommendation would not become effective anyhow until after the next convention.

Mr. Heywood said that the large steam railroad associations followed the letter ballot plan. Each company has its own representative at the convention, but all recommendations for standards are voted on by letter. In this way companies not having representatives at the convention have a voice in the adoption of standards. As he understood the matter, it would require not only a revision of the by-laws, but the concurrence of the parent association to carry out the letter ballot. He therefore suggested to the executive committee that during the coming year it prepare a definite plan for the adoption of standards, and if possible, come to the next convention prepared to present that plan as nearly complete as possible.

Mr. Evans said that in talking with Secretary Swensou on the final adoption of standards the plan would be something like this: A member of the engineering association desires a certain thing to become standard. He communicates with the committee which has charge of that department. The latter investigates it, and in the annual report recommends that the subject be reported to the committee on standards, provided the committee finds the subject sufficiently important to merit an investigation. During the next year the committee on standards would investigate that topic farther. The committee on standards as now organized consists of representatives of all departments. For instance, one might recommend a standard wheel which would not be at all desirable for the track department. Mr. Ackerman, as a member of the committee would be there to see that the car equipment men do not recommend a thing undesirable from the rail standpoint and so on. If the standardization committee approves the wheel for a standard, the subject is recommended back to the association which will then by resolution at the convention recommend that it be submitted to letter ballot. It appears entirely proper that these recommendations which have been thoroughly threshed out should be submitted to the main association for their approval previous to the time that they are submitted to letter ballot. By other methods it might be possible to submit something to letter ballot which was not desirable from the viewpoint of the main association. If the main association approves the recommendation to submit to letter ballot, the ballot would be prepared by the secretary, and sent to all the member companies. The engineering officers in charge of the various departments would mark the ballot which would be approved finally by the executive officer of the company. Mr. Evans anticipated that it would not be so easy to adopt standards under the proposed plan as it has been in the past, but he believed that the standards once adopted would be very much more effective.

Mr. Evans said that since investigating the matter, they found that the constitution and by-laws of the association are based on one vote for each active company; consequently the committee has agreed to eliminate the paragraph which indicates the number of votes to which each company shall be entitled "based on one vote for each million car-miles or fraction thereof made by the cars operated during the fiscal year previous to the convention of the association at which such standards are recommended to be submitted to letter ballot for adoption as the standards of the association." At this time they were decidedly opposed to the plan of one vote for each million car-miles, from the fact that it is contrary to the by-laws of the association and that its use would require an amendment to the by-laws.

The association then approved Mr. Winsor's motion that the subject of the proper method of securing approval of standards be referred to the incoming executive committee, it being the opinion of the meeting that the method proposed is acceptable and should be carried out so far as possible.

Mr. Evans, quoting from the committee's report, called for the acceptance of the following suggestions read by President Winsor:

"Your committee would also recommend the reprinting of the standards and recommended practices in the annual report of the association, * * * and would recommend as a further means of bringing the standards of the association into general use and that the information may be readily obtainable, a reprint of all the standards, recommended practices and specifications that have been adopted up to the time of each convention, together with proper notations as to the time adopted, with any additions or alterations made, all to be embodied with each annual report of the American Street & Interurban Railway Engineering Association as an appendix."

Upon motion by Mr. Heywood, the foregoing recommendations were adopted.

The next paper was the report on power distribution by Mr. Heywood, the chairman of the committee on that subject.

He said the report was classified according to the outline adopted at the last convention but somewhat elaborated. Appendix A had specification for high tension underground cable which was offered simply as a suggested specification which may be of benefit to some members. It was not a perfect specification but the committee should be pleased to have it criticised for the benefit of its successor. The executive committee had asked for an opinion in reference to rehabilitation versus scrapping of underground cables. This opinion was crystallized in the curve Fig. 1 of its report. The gist of that curve is that it is cheaper to scrap all cables smaller in area than 600,000 circ. mils. Fig 2 of the same report shows a furnace which had been used to separate the metals and insulation in underground cables. Other subjects treated in this report are the joint occupancy of poles, supplementary copper and the abolition of wire gages in connection with which a new wire table was given in Appendix "H." The committee offered two recommendations for adoption as standard, one an improved trolley wire section, and the other the new wire table.

President Winsor asked for an opinion on the first recommendation, namely, that the association adopt the American standard section of grooved trolley wire for 211,600 circ. mil wire. Mr. Lincoln moved that the shape of the conductor shown in the report be adopted as standard. The motion was adopted.

President Winsor stated that the other recommendation was the adoption as standard of the copper wire table contained in Appendix "H." In explanation of this, Mr. Lincoln said that the various manufacturers who make material where varieties of gages have been used, have lately requested purchasers to give the micrometer gage

dimension instead of any fixed gage. The Philadelphia Rapid Transit Company is now using that in the size of wires and sheet stock. He believed that if something of this character was taken up by the copper manufacturers it would do away with the considerable confusion now caused by the multiplicity of gages.

Mr. Heywood said that the proposed table is the B. & S. gage with the three significant digit diameters only. The fourth and fifth figures as contained in the American Institute table have been struck off, which of course would change the area, weight, length and resistance to a certain extent. The point was that manufacturers as a rule do not draw wire to a closer dimension than the third decimal place. Consequently the table which gives five decimal places is purely theoretical and not a practical one. The same recommendation had also been made by Committee W of the American Society for Testing Materials, but the latter has not gone so far as to recompute the table, simply recommending the dropping off the last two figures. The relationship between the sizes is practically maintained the same as it is in the B. & S. table, with the exception of the fourth and fifth decimal places.

Mr. Roberts asked whether it would be wise to put down a column for the old sizes as they are familiar to railway men, and then a column of the thicknesses of materials alongside.

Mr. Heywood said the committee thought it wise to leave out the parallels, as this plan had been tried out by some roads, which found that although they had given orders to their men to order wire by decimal diameter, the latter still keep the B. & S. gage in their minds. The only way to get the men accustomed to using the decimal diameter alone was to give them the decimal diameter table without the wire gage, so that they would use diameters and not wire gage. Thus, if a man wanted to get resistance of .162 wire he would have to look up a decimal table and not a B. & S. table for it.

On motion of Mr. Lincoln, the wire table recommendation was referred to the committee on standards in the regular way.

President Winsor then requested H. H. Stannard of the New York Pole Company to take the floor on the subject of reinforced poles.

Referring to Mr. Heywood's report, Mr. Stannard thought it was wrong in stating that steel necessary to reinforce a pole was so great as to be prohibitive. The report said further that the concrete takes a long time to set and in the meantime if the pole is corroded, the corrosion goes on all the time and increases on the outside until the pole is liable to bend or collapse; further, that swaying and vibration of the pole is liable to loosen the bond between the concrete and the metal, thereby greatly decreasing the strength. Mr. Stannard did not know any cases where the vibration of the pole had worked any damage to the reinforcing method. One would hardly expect to find a pole bend or collapse under the conditions cited. Further the report says: "To avoid this wires must be disconnected, thus throwing out of service the poles for a long period of time." His company never had to take off more than one or two span wires in the thousands of poles which it had reinforced. His method is simply to take out the plug at the top of the pole and insert a steel cage with sufficient steel in it to reinforce the pole. It is unnecessary to take off the span wire to reinforce the pole because the steel cage is inserted without removing the plug. As to the statement that "It has also been found from actual experience that in the winter time, when the metal of the pole shrinks, the inside plug of concrete does not permit of such a shrinkage, and the pole splits." Mr. Stannard said he had seen cases where the poles have opened up, but such poles were usually defective poles at the start. He did not believe that the cost of the external method is less than that of the internal method.

because it is necessary to disturb the sidewalks to reinforce externally.

Martin Schreiber, engineer of way, Public Service Railway Company, Newark, N. J., spoke on timber preservation. In treating poles with brushes quite a good deal would be saved by just treating the portions of the pole which absolutely need it; for instance, a 3 ft. band for a 22-ft. pole, starting the band 2 ft. from the bottom, $5\frac{1}{2}$ ft. from the bottom for a 50-ft. pole and 8 ft. from the bottom for an 80-ft. pole. As to the open tank method there was not sufficient data at hand exactly to classify this treatment along the pole line. The greatest trouble is that the last foot of the pole will absorb the greatest quantity of the preservative while the conditions require a lateral penetration. A permanent treatment would be one that would penetrate all of the sap wood in the case of wood like cedar and chestnut. The tests recently carried out by his company to overcome the absorption of a great quantity of preservative in the lower foot of the pole convinced it of the necessity of placing some material on the foot. The company used cement which was permitted to set in 24 hours and also applied some boiling pitch but was unable to solve the difficulty. It might help the situation by putting some sort of copper plate or cup on the bottom of the pole before placing it in the tank. This method is used in Germany and he believed it would work well here. The cost of the brush treatment is about 5 cents for labor and 20 or 30 cents for material so that an additional year or a year and a half of life would pay for the treatment. The cost of the tank treatment as carried out by his company seems to be \$1.50 to \$2 a pole and it would be necessary for the pole to last six years to pay for this treatment.

F. E. Case of the General Electric Company referred to the subject of rail bonds as mentioned in Mr. Heywood's report. The committee favors the use of under-the-fish-plate bonds for T-rail construction as well as for girder rails. He heartily endorsed that suggestion as the concealed type of rail bond has several superior points as it is much shorter than the bond which passes through the web outside of the fish plate and is protected from injury and theft. Unfortunately, however, there is an insufficient amount of room for the bond with an adequate clearance to prevent injury in many instances. A great many roads are satisfied to use a single No. 0000 bond per joint for rails of 80-lb. or 90-lb. weight. A bond of this size has approximately 20 to 25 per cent carrying capacity of the rail. When a road wished to use a greater capacity it would double sizes and bond on each side of the rail. If the railway wished to go still higher, it took up some of the clearance, so that the fish plate actually rested against the bond and was liable to injure it. With all this clearance taken up in the average size of rail, say 70 lb. to 90 lb., it is possible to get from 75 per cent to 100 per cent of the capacity of the rail but at the risk of injuring the bond. He endorsed the suggestion that this matter should be the subject of joint consideration. He hoped that some committee will take action to see that the fish plates are designed to give greater amount of clearance. Many roads do not care to get more than 50 per cent conductivity, but on many other lines like reconverted steam roads or third-rail roads, it is desired to get full capacity. He had collected a considerable amount of data on rails, both of the present standards and one proposed by the American Railway Association. The proposed rail gives a clearance of about 10 per cent greater for the bonding space than is usually obtained but he believed this would still be inadequate.

James Heywood said the committee had suggested that the bond matter be referred for joint consideration to the next committee and the committee on way matters. He thought this subject important enough for the appointment

of a special committee, which would have the power to confer with committees of the other associations as to what this association can do on the subject would hardly influence matters unless it had the co-operation of the American Railway Association. He therefore moved that this matter be referred to the executive committee for special attention. Mr. Heywood's motion was carried.

Mr. Heywood said that the committee had started out with the object in view of trying to arrive at standards for some classes of line material. The time which it had at its disposal was only sufficient to allow it to go as far as shown in this report. He wanted to say for the benefit of the manufacturers that there was no intention in making these tests of trying to show which manufacturer supplied the best class of material. The object was to arrive at a fair average from which standards could be derived. He thought that next year the committee could probably take from the results of these tests enough data to start the standardizing of line materials. None of the manufacturers knows the test sample numbers which were assigned to another manufacturer, but the committee is willing to tell each his own number.

W. G. Matthews, superintendent of line, Denver City Trolley Company, said that, commencing in 1904, his company treated its poles with carbolineum, or the brush treatment. He painted 30-ft. poles with a 6-in. brush, commencing 4 ft. from the ground and painted 3 ft., getting anywhere from $\frac{1}{2}$ -in. to $\frac{1}{4}$ -in. penetration. His company did not start treating these poles until the local telephone company had built a 20-mile line and had treated each alternate pole in the manner described. After five years the telephone company took up these poles to find out how they were behaving. It was found in most cases that the poles laid in concrete had a dry rot anywhere from $\frac{1}{4}$ in. to $\frac{3}{4}$ in. on the outside all around, whereas the treated poles had not started to rot. The railway company started to treat poles in February, 1904, since which time it has treated something like 1300 poles for renewals and new construction, aggregating about 40 miles in all. The company tried two other ways to find out if there was any better method.

It has several miles of heavy feed line with 40-ft., 45-ft. and 50-ft. poles. It put 6 in. of concrete around the pole the entire depth of the hole and crowned on top to throw the water away. These poles are as good as the day they were set in 1902. To find out whether it is necessary to go to that expense it has set another line of poles where the hole is made only large enough to get the shovel in, with concrete 3 ft. below the surface and built up with a concrete cone around the pole. The rotting is usually from 2 ft. below to 6 in. above the ground. With these three different methods applied, the company hopes to draw some conclusions in two or three years. The Denver company has not taken out a treated pole and has only taken out the poles laid in concrete when it had to renew them.

W. M. Scott, superintendent of electric lines, Utah Light & Railway Company, said he had made some treatments from which he expected within the next year or two to gather some valuable data as to results. His method is to treat with hot carbolineum paint. As they are located near Great Salt Lake, he has also experimented to some extent with salt, but did not know whether salt would be a good preservative in their soil. He had inspected poles treated with salt near the top of the ground and found after their being in the ground six years that they showed very little decay. Other poles that were left free and not treated were very badly decayed. He had a mile of poles, the first pole of each trio being treated with carbolineum, the second pole with salt and the third left untreated. From this test he looked for substantial results in a few years.

E. J. Dunne, superintendent of distribution, Public Service Railway Company, said that on that system the overhead line was supported by 30-ft. chestnut and iron poles,

raked about 8 in., and set 6 ft. in the ground in a 6-in. shell of concrete. The standard iron poles were 5-6-7 in. sections and were provided with an extra 30-in. sleeve at the ground line. Poles were spaced 110 ft apart for both double and single track. They used a 5-16-in. double-galvanized steel wire for spans hung with at least a 12-in. sag to get the utmost flexibility. A gage pole with a hook at one end and a weight attached, equivalent to that of the wire to be suspended, was used to get the spans the right height when first putting them up. The pole was simply hooked over the slack span wire, the proper weight was then attached, and the wire drawn up until the weight left the ground. In this way the span wires were at an absolutely uniform height and tension, the tension was never excessive, and the whole job was completed without leaving a single detail to the judgment of the lineman. The spans were insulated with giant or wood strain insulators, and caps and cones were used for primary insulation. The company's standard trolley wire was round No. 00, suspended by 14-in. clinch ears at a height of 18 ft. 6 in. from the top of the rail. The trolley was hung with a 3-in. sag in 110 ft., as the company believed in a tight wire.

Mr. Dunne, continued by saying that in most cases the placing of the wire on the curve seemed to present new difficulties at every location, owing to the difference in car lengths, placing of trucks, placing of trolley, etc., on cars that have to be operated around the curve to be wired. All these factors have been taken into consideration and a simple standard layout with a table of radii was given to each foreman. This print simply showed the distance off-center of the wire on all common radii of curves and contained note that a 4-in. off-set must be added for each inch of elevation of the outer rail. For example, if the foreman found that he had to build a curve on a 50-ft. radius, he would turn to the blue-print which would call for a 9-in. off-set. The outer rail was elevated 1 in., so he must add 4-in. more, or a total off-set of 13 in. That was the extent of the mathematics necessary and nothing was left to the judgment of the lineman. Trolley switches or frogs were located entirely by the track frog, which, of course was located by the radius of the curve. This reduced the location of the trolley frog to one simple measurement, which was the same in all cases. The linemen were told to place the switch so many feet back from the track frog on the line of the straight wire. One degree of frog was used for all curves and only one measurement had to be taken. It should be readily apparent, he thought, that any lineman could do the work without any necessity for using his own judgment and without assistance from an engineer.

Most of the Public Service Railway system, Mr. Dunne said, was arranged for single-end operation and it was found almost impossible to back the cars safely into a "Y" without turning the trolley pole. This meant a great loss of time. To meet this difficulty a flat bronze spring was added to the company's standard trolley switch or frog. This gave exactly the same effect as a spring track switch. In this way the trolley did not have to be turned in backing up and the only thing required of the car crew was for the conductor to see that the trolley rope was free. The operation of the trolley was absolutely positive. All of the company's trolley frogs and acute angle crossings were made with an integral boot-jack or bridge which absolutely prevented the trolley hooking into the frog and pulling down the line. All frogs, crossings, section insulators, etc., were equipped with flexible approach ears, thus preventing the crystallization of the trolley wire at the end of the ear and doing away with the necessity for preventer ears. The company used a special cast steel cross-arm chair for supporting cross-arms on iron poles. This was made up in two halves and bolted around the pole. Two supporting members were used for double-arm construction and one supporting member and a strap when only a single arm was to

be placed. There were chairs on the market, Mr. Dunne said, but he thought they were defective in that they did not offer sufficient surface or resistance to a pull in the direction of the lines supported. The company's special chair had a supporting surface of 2 5-8 by 15 5-8 in., and the bolts fastening the cross-arms to the chair were independent of the bolts fastening the chair to the pole. This was found necessary in preventing the chair slipping under heavy load.

A. T. Clark, superintendent of shops, Baltimore United Railways & Electric Company, asked Mr. Dunne how he took care of curves where they have single track cars and double track cars with the trolley pole sometimes in the center and sometimes over the trucks?

M. Dunne said he put on a curve for the ordinary car. For the cars where the trolley base is in the center of the car, he introduced a second switch on the straight wire, about 9 ft. ahead of the other and put in a short piece of wire to connect up with the curve wire.

S. M. Coffin, master machanic and electrical engineer of the Mobile Light & Railroad Company said he was pleased with the remarks of Mr. Dunne regarding tight span wires and also as to allowing a given sag, for he had been much amused at times to note trolley men putting on a pair of double sheave blocks and pull tight with all the men at hand, regardless of the length of span or height of pole, and then with a second pair of blocks put the pole in place with the result that the smallest pole or the one in the softest ground gave up the most set. He believed a tight trolley with slack span much the more satisfactory to all interested.

A motion was made and carried that the committee on power distribution take up the question of standardizing overhead material.

Mr. Matthews of the Denver Tramway Company asked if anyone could state prevailing practice regarding the protection of high-tension wires from foreign wires, such as telephone leads, etc., with potentials of say 1300 volts up.

William Roberts, master machanic of the Ohio Traction & Light Company said they used baskets on their 13,200-volt and 20,000-volt systems. Five or six wires are strung across in the form of a basket, with the corner looped over and in every case carried from the wires where his company crosses over. They have had some trouble but not very much. They were ordered from one street altogether because of the telephone wires coming close to, though not touching, the trolley wires. The public in his neighborhood are entirely satisfied with the basket construction adopted. On one property they spread 60 ft. and that basket cost about \$16.00 to put up, but ordinarily a telephone wire can be crossed for \$4.00 to \$5.00

Mr. Matthews said that in Denver they have about 400 crossings of high-tension lines, and in nearly all cases use cradles.

Mr. Dunne then submitted a copy of the agreement on the joint occupancy of poles as made by the Public Service Railway Company of New Jersey and the New York & New Jersey Telephone Company.

W. J. Harvie, chief engineer of the Utica & Mohawk Valley Railway Company, moved that the executive committee be requested to appoint a committee to consider the subject of joint use of poles and to consult the agreement which Mr. Dunne had submitted, together with all other data that is obtainable, and to give this subject special attention during the coming year. The motion was carried.

Mr. Roberts suggested that the incoming executive committee take up the advisability of collecting contracts of this kind from as many points as possible. He then quoted the terms of the agreements his company had with other companies that occupy the poles with them. He thought, however, that it would be a difficult matter to make any standard with reference to the joint occupancy of poles.

Mr. Scott said that in his case, if the pole was owned

jointly, the cost was divided in half and each company paid for its own attachments and maintained them. Where one company rents space from the other, it pays 60 cents per annum for a 10-pin cross arm. Each company has blue-prints showing the location of the wires of each, and the spaces between, and the spaces between the tail pins. There was a clause in the agreement that neither company would make attachment to the other company's pole without first having a written permission from the other company. If the pole was not of sufficient strength, and the line belonged to his company, it would not permit the telephone company to make the attachments to it, and vice versa.

THURSDAY AFTERNOON SESSION

President Winsor called the meeting to order at 2:30 o'clock and said that the first business on the program was the report of the joint committee on shop accounting. This committee was appointed by President Winsor last year to consult with a similar committee of the Accountants' Association to take up the question of shop accounts. The purpose was to see what the operating men wanted in the form of shop accounts and to get the accountants to formulate such accounts. The scope of the work of the committee was consequently extended to cover power stations accounts and forms.

The secretary then read a communication from W. G. Gove of Brooklyn, chairman of the committee, that the committee had considered the subject and had made progress, but as yet had no definite conclusions to report.

On motion of Mr. Lincoln the report was accepted and the committee was continued.

President Winsor then called attention to the question box. Upon motion of Mr. Harvie the question box was accepted and the thanks of the association were tendered to the secretary for compiling it.

Secretary Corning then announced that the following resolutions had been authorized by a vote of the executive committee at its meeting on Monday:

"Whereas, the Engineering Association recognizes the affiliation between it and the American Street & Interurban Railway Association and the hearty co-operation which has been extended to it during the past year; therefore, be it

"Resolved, That the Engineering Association tenders to the American Association an expression of its keen appreciation of the great assistance and co-operation accorded its officers, and the aid rendered its committee in preparing and compiling its reports by the different departments during the past year; and be it further

"Resolved, That we look forward with pleasure to the continuance of these very friendly relations."

Upon motion the resolution was adopted, to be transmitted to the proper officer of the American Association.

The secretary then offered the following resolution:

"Whereas, the exhibits are always an education to delegates, particularly to those of the Engineering Association, the executive committee believes that an expression from the Engineering Association to the Manufacturers' Association should be made.

"Therefore, be it resolved, that the Manufacturers' Association is to be especially commended for its efforts in bringing the exhibits to the usual high standard of these conventions, because the location of the convention city required the shipment of a large portion of the exhibits a greater distance than usual and makes the results shown in the exhibition hall especially gratifying to this association."

Upon motion the resolution was adopted, to be transmitted to the proper officer of the Manufacturers' Association.

The secretary then presented the following resolution:

"Whereas, the city of Denver, has through its citizens, clubs, civic organizations and transportation companies evidenced the broadest and most liberal spirit of good fellowship and hospitality;

"Therefore, be it resolved, that the Engineering Association unanimously tenders its sincere thanks for the splendid reception accorded it, and the many courtesies so freely extended; and, be it further resolved, that it make acknowledgment of the universally gentlemanly conduct and unvarying courtesy of the platform man."

This resolution was also adopted to be transmitted to the proper persons.

The president then called for the report of the nominating committee. The report was submitted by the committee, consisting of W. H. Evans, chairman; W. S. Twining, M. G. Ayres, A. D. Campbell, S. M. Coffin. It nominated for office the following gentlemen:

President, F. H. Lincoln, assistant general manager, Philadelphia Rapid Transit Company, Philadelphia, Pa.

First vice-president, W. J. Harvie, chief engineer, Syracuse Rapid Transit Company and Utica & Mohawk Valley Railway Company, Syracuse, New York.

Second vice-president, E. O. Ackerman, engineer maintenance of way, Columbus Railway & Light Company, Columbus, Ohio.

Third vice-president, J. S. Doyle, superintendent of car equipment, Interborough Rapid Transit Company, New York.

Secretary-treasurer, John W. Corning, electrical engineer, Boston Elevated Railway Company, Boston.

Executive committee:

Martin Schreiber, engineer maintenance of way, Public Service Railway Company, Newark, N. J.

W. H. McAloney, superintendent of rolling stock, Denver City Tramway Company, Denver.

John Lindall, superintendent of rolling stock and shops, Boston Elevated Railway Company, Boston, Mass.

Thomas Elliott, chief engineer, Cincinnati Traction Company, Cincinnati, Ohio.

Upon motion the secretary was authorized to cast one ballot for the officers nominated.

The president then appointed Hugh Hazleton and R. C. Taylor a committee to conduct the new president to the chair.

President Lincoln upon taking the chair said that he accepted the office with the hope that he would be able to carry on the work in the same thorough manner as it had been carried on by ex-President Winsor and that he would endeavor, while holding the office, to do what he could to advance the interests of the association.

Vice President Harvie, the only vice president-elect present, was also escorted to the platform. He extended his thanks to the members for the honor of his election.

Upon motion Mr. Winsor, the retiring president, and Mr. Corning, the secretary-treasurer, were then given a vote of thanks for their work during the past year.

The meeting then adjourned.

LUNCHEON OF AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

To meet Secretary Ralph W. Pope, who has been in Denver for several days, about 40 members of the American Institute of Electrical Engineers sat down to luncheon together yesterday noon at the Brown Palace Hotel. W. E. Goldsborough, who was active in arranging for the luncheon, which was attended by a number of convention visitors, acted as chairman, and introduced as the first speaker Mr. Pope, the guest of honor. Speeches were also made by Charles Hewitt of Philadelphia, J. F. Dostal of Denver, O. B. Coldwell of Portland, Oregon, and James H. McGraw of New York. The speakers reviewed the development of Institute branches. Some of them emphasized the importance of engineers taking a more active part in civic affairs, where their technical knowledge should prove valuable. ble.

THURSDAY SESSION OF ACCOUNTANTS' ASSOCIATION

The concluding session of the Accountants' Association was called to order by President R. N. Wallis at the Hotel Savoy on Thursday morning.

N. E. Stubbs, auditor United Railways & Electric Company of Baltimore, read his paper on "Payrolls and Timekeeping," an abstract of which is published elsewhere.

F. E. Smith, comptroller Chicago Railways Company, asked Mr. Stubbs how long it took him to pay off.

Mr. Stubbs replied that three days were needed.

Mr. Smith said that the company with which he was connected paid twice a month, but every man was paid in one day if there. The money of the men who were not on hand was turned in to the unclaimed wages department. The company had 4400 trainmen. The conductors secured their money and identified their motormen and the employees at the car houses were paid there. Receipts were taken on the payroll sheets from everybody who could write.

H. E. Weeks, secretary and treasurer, Tri-City Railway, had found that in the smaller companies an individual payroll receipt facilitated the work of paying off.

Mr. Stubbs said that the only objection he had to receipts was that he was afraid they would often be lost, mislaid or stolen, and that he could not be certain that a man handed in his own receipt.

Mr. Weeks had been using the receipt system for over three years, and had not had one lost, stolen or mislaid. The receipts were checked the same as a check would be checked. He had them audited periodically to see that they were filed.

Mr. Smith asked Mr. Stubbs how he reached the men on runs.

Mr. Stubbs replied that as the cars reached the various car-houses the men were paid off. The track gangs went to the car-houses located nearest their work.

Will Browne, auditor, Utah Light & Railway Company, brought up the question of the feasibility of a pay-check system such as was used by the steam roads throughout the West. The envelope system had been abandoned very generally on Western steam road properties. On the Utah Light & Railway a pay-check system was in use. The pay-checks were drawn on the auditor by the treasurer and were delivered to the men by the treasurer, who required a receipt in each case. This was a very good way of delivering to each man the token by which he could secure the amount due him from his grocery man or his banker. It also kept in the bank a balance that otherwise would be withdrawn.

H. S. Swift, secretary, Toledo Railways & Light Company, asked if Mr. Browne had any trouble with lost pay-checks.

Mr. Browne issued a duplicate after three months had elapsed from the day on which the notice of loss was filed. Payment was stopped at the treasurer's office and the depository banks. There were very few lost checks.

William E. Humphrey, auditor, Pueblo & Suburban Traction & Light Company, asked if Mr. Browne required a bond from employees receiving a duplicate check issued in lieu of a lost one.

Mr. Browne required a bond with a surety. The checks were generally cashed at savings banks, grocery stores and department stores. The latter made a specialty of cashing such checks to attract trade. Certain savings banks provided themselves with the necessary cash to pay the checks.

H. L. Wilson, Boston Elevated Railway, said that some years ago when he was in the West the road with which he was connected had that system and it was found that most of the cash went to the saloons.

Mr. Browne said that some of the checks were cashed in saloons. This phase justified criticism of payment in cash. Before he was connected with the traction company he was with large railroads in the West and introduced the pay-

check system on several of the properties. On the Southern Pacific road there were 45,000 pay-checks a month, and although some objection was met at first, it very quickly died out, and everyone was extremely well satisfied, and he thought now that this system was very generally used throughout the West.

Mr. Wilson had found it very much better to pay in cash than by check. The statute provided that workmen were to be paid weekly, and there was no question about the man receiving his money. He signed for it then and there. There were 5000 employees, and he did not think there had been five complaints in a year with that system.

Mr. Stubbs' experience had been that where a man could get a check cashed at a store he was allowed to keep an account. Sometimes the account would be overrun and if it was not paid promptly on the next pay-day the store took the matter up with the office.

Mr. Browne had not experienced such difficulties where he was now. On the steam roads there used to be trouble with boardinghouse keepers, but they soon learned that the matter of a man's account was one between them. If a company's representative guaranteed a board bill in any way, they had their remedy by turning in an order on the company at a certain time, whereby they would have the amount due them deducted from the employee's pay.

W. F. Ham, comptroller Washington Railway & Electric Company, said it might be interesting to know that efforts were being made, when payments were made in cash, to reduce to a minimum the time lost by the employee who was to be paid. At the Washington navy yard when several thousand employees in the navy yards were paid, they were divided into squads, so that a certain squad should appear at a specified hour, and then another squad, a few minutes later, and so on, and a man did not lose more than two or three minutes from his work. The track employees formerly had to go to the paymaster's office for their pay and lost from one to two hours. Now the paymaster went to the men. As Mr. Stubbs had said, the larger companies used the cash system and it seemed to him that the question of economy alone was a sufficient answer, because the economy of time in paying off in cash was a pretty important consideration. It was very much easier to pay \$10 in cash than to draw a check for \$10, sign the check and then put the employee to the annoyance and trouble of cashing the check, when it could be done in one transaction. He thought the employees rather considered it a favor to be paid in cash. It was undoubtedly true that there were certain employees that could not be reached in cash payment except at considerable trouble, and exceptions were made of those men. At remote points the men who were on a specified weekly or monthly payment wrote out their own receipts and went to the cashier's office. Men of a little higher rank, who were considered absolutely responsible, were allowed to write out their own receipts, which were cashed at the depot, and then turned in to the cashier as cash.

Mr. Wilson asked if Mr. Ham had discontinued the system of having the conductors and motormen pay themselves.

Mr. Ham said the system was still continued and he felt that it was a great time-saver. But that was not the motive which influenced this practice so much as to have the men have a regular daily income. The business was largely a ticket business. The conductor, in going to work in the morning, was furnished with \$25 worth of tickets, for which he was responsible. When he came in at night he turned in to the depot clerk either the \$25 worth of tickets or its equivalent in cash and then the depot clerk gave back to him the amount of his own pay and that of the motorman, and the conductor handed the motorman his share. The amount to which they were entitled was known by the depot clerk, and was carefully audited in the office.

President Wallis said that the same system was used in Denver.

W. A. Doty, auditor, Denver City Tramway Company, said that the conductor noted on his sheet at night the number of hours run and 10 minutes' time off was allowed for taking a car out of the car-house. The sheet showed the number of the conductor, his name and the rate he was entitled to draw and the same information for the motorman. At the end of his day's work the amount due was deducted from the cash receipts, and the balance turned in. One man in the auditors office checked those sheets with the train dispatcher's sheet, and, in general it was found that this system worked admirably.

Mr. Ham thought the system worked out very satisfactorily. Part of it ran practically automatically, because the depot clerk was the one who was the timekeeper, and he and the man came to an agreement as to the amount.

A. L. Linn, Jr., general auditor, New York State Railways, asked Mr. Doty if he checked his time with the use of the Ohmer register.

Mr. Doty said he did.

Mr. Swift asked Mr. Ham how he accounted for the money. Mr. Ham replied that the dispatcher's sheet, or the depot clerk's sheet, showed the exact amount paid for each run each day. It was simply what would be a daily timekeeper's report. Any variations from the schedule must be fully accounted for by the depot clerk. It was audited by the schedule each day.

Mr. Swift asked whether a pay-roll was made up every day.

Mr. Ham answered that the amount of the deposit in the bank was the net amount between the cash collection and the pay-roll.

Mr. Stubbs asked whether members in larger companies who paid off by cash and did not take receipts from their men had any difficulty from men who claimed not to have been paid, and also how many men they could pay in an hour by the cash system.

J. J. Duck, auditor, Chicago City Railway, said that on one steam road running into Danville, Ill., about 4000 men were paid in cash in about three hours. These men came in the order shown on the pay-roll, and were identified by their foremen.

Mr. Stubbs thought that was a splendid system.

J. M. Smith, comptroller, Toronto Railway, said that company had been considering the question of using checks, but it was found that the men took exception; they raised various objections so that the company paid by the envelope twice a month. The day before the envelope was delivered, identification cards were issued. These cards were sent out from the office to the various car houses, shops, etc., the day before, and as the men were leaving they received the identification cards which simply had numbers corresponding with the pay-roll numbers. In the morning the paymaster was sent to the various shops, and the car starters went to the cashier's office and received the wages for their divisions all arranged in the order in which each route ran out. The conductor presented his card, signed it, and the number on the envelope was then identified with that on the pay roll. The men were paid twice a month. The arrangements were all made in the afternoon and the men were all paid during the runs of the next day.

W. H. Forse, Jr., treasurer, Indiana Union Traction Company, remarked that the arguments for payments in cash seemed to predominate, but he wanted to state a few of the advantages of paying by check, particularly in the case of interurban lines. This company formerly paid in cash, but for several years had paid by check. The employees were pretty well scattered over the central part of Indiana, and numbers of men were stationed at the car houses and shops, and when the pay car was used it was found that

considerable time was needed. It required trouble and expense to cover the entire system, and the men lost considerable time in meeting the pay car at various points. Since using the check system there had been no complaints from the men with regard to the cash on their checks. It was true that a good many were cashed in saloons.

Mr. Wilson said that if some of the companies having trouble because employees' checks were cashed in bar-rooms were to adopt the system followed in Boston, namely, that any man that went into a bar-room with his uniform on was discharged, there would be less trouble in this direction.

B. E. Bramble, general auditor, Illinois Traction System, said that for the past four years and a half that company had paid in checks. The signature on the checks was sufficient evidence that the money had been received. There had been no trouble with outstanding checks or on account of checks cashed in saloons. Most of the pay-rolls were made up by the different departments. It required very little time for a couple of clerks to write the checks. They were signed by the auditor, not by the treasurer, although the disbursements rightly came under the jurisdiction of the latter.

J. C. Collins, secretary and auditor, New York State Railways, used the check system and had found it very satisfactory; there had been very few complaints from the men and quite a few comments from the wives of those men who were inclined to spend their money in other than a right and proper way.

Mr. Ham was satisfied that in a large property everything in the way of economy was in favor of the cash system. As smaller bodies of men to pay were reached, the argument was more in favor of the check system; but if there were several hundred men that could be paid at one place, they could be paid more quickly in cash than in envelopes.

Mr. Browne asked whether the Washington Company required a receipt from the men.

Mr. Ham answered that each employee turned in a ticket showing the time he had worked, and that acted as a receipt, and when signed was an indication that this man had received his pay.

E. S. Pattee, secretary and comptroller, Twin City Rapid Transit Company, used the check system, and had found it very satisfactory.

C. S. Mitchell, auditor, Pittsburgh Railways Company, said that that company had about 5000 employees, and they were paid in cash excepting the general office men. They were paid twice a month and a separate receipt was taken from each employee. These receipts were prepared in the auditor's office and sent out the day before the pay-car went around and were distributed by the foremen, so that the men generally had their receipts signed before the pay-car reached the car-house or shop. Motormen and conductors were paid over the counter in the pay car. The shopmen and car-house men were paid in envelopes, which, as a general rule were carried through the shops by the paymaster.

H. E. Vordermark, auditor, Ft. Wayne & Wabash Valley Traction Company, had used the check system for about four and a half years, and found it superior to the cash system. The track and section men all along the line were paid by check.

Mr. Wilson took a receipt on the original pay-roll. These pay-rolls were bound each week with the proper classification, so that there was a complete statement of what every man had done every day of the week. Not over five complaints had reached the office in a year.

P. V. Burington, secretary and auditor, Columbus Railway & Light Company, asked how receipted pay envelopes were accounted for.

Mr. Linn said that no two of the companies with which he was connected used the same plan. Where the individual

receipt was used and made out and signed by the conductor or motorman, the paymaster on his return was checked up. The envelopes were turned over to the cashier and held by him 30 days, when he was checked up and the money re-deposited in the account to which it was originally credited.

The receipts were not taken on the envelope. A blank receipt was furnished to the employee and on the back of it there was a space for a statement of his time. He filled out the receipt himself, and when he went to the pay car window received his pay. Mr. Linn did not believe in the envelope and would like to see the employees paid in cash. It was a check against the timekeeper for errors. If the employee's receipt called for more time than was shown on the pay-roll he was paid what the receipt stated and was sent to the office.

President Wallis asked if there was anyone who did use the receipted envelope system referred to by Mr. Burlington. No one responded.

M. R. Boylan, general auditor, Public Service Railway, said that company had 7000 men and paid weekly. The system outlined by Mr. Linn was followed.

W. H. Burroughs, secretary and treasurer, Memphis Street Railway, had found that the system of paying in cash facilitated matters; the men liked it.

Mr. Forse said in answer to a question of Mr. Wilson that one of the rules of his company was that employees should not assign wages, and that such assignment would be cause for dismissal, consequently there was no trouble with this condition.

Mr. Wilson said the legislature of Massachusetts had passed an act providing that no assignment of wages was legal unless it was accepted by the employer, and if the man was married it must always be signed by his wife.

President Wallis added that the act provided that an assignment must always be accompanied by a statement of the account, so that it showed whether it was bona fide or not and for what purpose.

Mr. Mitchell said he had noticed from the discussion on this subject that in a good many cases the auditing was done after the employees were paid. With his company all auditing was done before the money was disbursed.

Robert Morrison, Jr., secretary and auditor Michigan United Railways, paid twice a month by pay-roll, using a special form check limited to \$100 and payable "to order" consequently it required the employee's name on the check to be cashed. The officials of the company preferred to have the employees sign the pay-roll. There was just one endorsement on the pay-roll.

Mr. Forse moved that the recommendation in the paper be referred to the executive committee for further consideration. The motion was adopted.

The paper of W. B. Brockway, general auditor, Birmingham Railway, Light & Power Company, on the subject of "The Electric Railway Auditor, His Duties and Relation to the Organization," was then read, in the absence of Mr. Brockway, by Mr. Ham. An abstract of this paper is published elsewhere in this issue.

After the reading of the paper, President Wallis stated that he had asked Gen. George H. Harries, second vice president, Washington Railway & Electric Company, and third vice president of the American Association, to discuss the subject.

General Harries said that when he accepted the offer to discuss the paper he did so without realizing that the convention would call for from 18 to 20 hours' work daily, necessarily leaving but little time to discussion of papers, but he had read the paper with a great deal of interest. He endorsed very heartily the conclusions reached in the paper and was in accord with all the suggestions made. It seemed to him that the paper must have been framed under conditions with which he was familiar. The views expressed were so couched that it was extremely difficult to criticize

the paper. If the principles as laid down could be really made effective—and he had no doubt there was a pretty strong movement in that direction—the auditing department would then take its proper place. He did not know that he could do any more than recommend to the association the views contained in the paper.

Mr. Forse believed that the duties of the auditor in his relation to the organization depended largely upon the personality of the man himself. A successful accountant should keep his brain clear and free from cobwebs, and have a mind that worked as fast as a piece of well-oiled machinery. The Interstate Commerce Commission had promulgated classifications and then promulgated rules regarding the tariffs of interstate railroads, and the auditor of an interstate railroad must keep posted on these in order to be familiar with the rates. An accountant who was valuable to his organization must be thoroughly familiar with the affairs of the company, and should be familiar in generalities.

In the Indiana Union Traction Company meetings were held twice a month in the general manager's office, and attended by department heads and the active operating officials. After several meetings had been held it was found that the chief accountant had made some good suggestions about operating matters. The operating officials were rather surprised, of course. One day an accounting officer may be working at a plan connected with the safeguarding of the company's pay-roll, and perhaps the next day on stores accounts, and then again on bonds of the company.

Mr. Linn said the roads with which he was connected operated approximately 669 miles of track, and he could give a rough sketch of almost every building embraced within the properties. He always managed to find some time to look over the properties and see if something new could not be learned regarding them.

President Wallis also read a letter addressed to him by J. F. Calderwood, vice president and general manager, Brooklyn Rapid Transit Company, on the subject of Mr. Brockway's paper. Mr. Calderwood said:

"I have read this paper with a great deal of care and as it will not be possible for me to be present at the convention, I wish to acknowledge receipt, heartily approve of it and add a word.

"I have been on the accountants' side of the question and from that viewpoint fought with original quota of street railway accountants for a proper recognition of accounting and also for an intelligent, honest and uniform system of accounts, but I am sorry to say that in those days we did not receive the hearty support and co-operation of many of the street railway managements of this country. But conditions have since changed; the men who recognized the accountants of 10 years ago and the necessity of a proper system of accounting have the successful properties and are the successful managements of today. Whatever has been the outcome of my opportunity as an operating manager, I attribute it primarily to my early appreciation of accounts and of the cordial and harmonious relations necessary between the accounting and operating departments.

"If you will study the street railway managements of the past decade that have been unsuccessful you will readily see that their difficulty was their failure to understand, intentionally or otherwise, the condition of their accounts."

Mr. Pattee then read his paper on "Stores Accounting and Inventory." This paper is published elsewhere.

F. E. Smith asked Mr. Pattee whether, if he made trolley wheels, he would charge them to equipment of cars with an overhead charge.

Mr. Pattee said he would. It made no difference whether the company did the manufacturing or the material was bought manufactured. If the company could not manufac-

ture as cheaply as it could buy, it would not manufacture.

Mr. Smith asked whether material should be charged out at the last purchase or manufactured price instead of the price at which it was actually bought.

Mr. Pattee said he had no sympathy with the lot-number system.

Mr. Weeks said that although his company did not handle as many stores as Mr. Pattee, it handled between \$150,000 and \$200,000 worth, and had the lot number, or the bin number, and the folio number. He found that it saved a great amount of confusion in charging out.

Mr. Mitchell used the lot number system throughout all store rooms, whether in street railway, electric light or gas entries, and found it a great convenience. The material was charged out at the cost price in order to get away from shortages at the time of inventory. He had what was called a perpetual inventory. Two men connected with the auditing department were furnished each morning with cards for a certain store room. On those cards appeared the lot number of each article of which they were to take inventory on that day. Their cards, handed in at night, were compared the next day with the records on the books. If there was any shortage or overage it was taken up at once. The store-room books were balanced every month, and must balance to the cent with the general ledger.

President Wallis announced that the paper on the program by W. M. Stewart on "The Census and Electric Railway Statistics" would not be presented. Mr. Stewart had promised to present the paper, expecting that the census would be out by this time. As it was not, he felt it would be improper for him to write the paper and make the address.

President Wallis said that action upon the report of the classification committee had been left open until this session.

Mr. Swift moved that the report be accepted and the recommendations adopted. The motion was carried.

President Wallis then read the report of the joint committee appointed as the result of action at the last convention on shop accounting. The report was signed by William G. Gove, chairman of the joint committee on shop accounting of the Accountants' and the Engineering associations and said in part:

"Upon a preliminary discussion of the subject at issue it was decided that before further action could be taken it would be necessary to obtain the existing classification of accounts from various street railways of the United States and to this end B. V. Swenson, secretary of the Engineering Association, was communicated with and a proper circular letter signed by the chairman furnished him for printing and to be sent to the various street railway companies, requesting that eight copies of their schedules for operating expenses be forwarded to the office of the secretary.

"To facilitate matters, the chairman appointed a sub-committee, consisting of Messrs. Lindall, Hewitt and Gove, to consider the question of 'shop work, power-house and track work' from an engineering standpoint and in their relations to the standard classification of accounts.

"More delay was encountered in obtaining schedules of operating expenses than had been expected, and it was not until July 10, 1909, that all street railway companies had been heard from, and on July 20 the eight copies of these schedules were forwarded from the office of the secretary to that of the chairman, properly classified, and on that day were sent therefrom to each member of the committee with a notice stating that another meeting would be held.

"However, as the chairman of this committee was unable to continue at his office after July 31, 1909, until Sept. 1, it was found necessary to postpone the meeting indefinitely and to refrain from considering the report of the sub-committee upon shop and power-station practice which had been received.

"The chairman is keenly disappointed at the unsuccessful

termination of such preliminary work as has been done, but the time remaining makes further investigation with the few remaining weeks impossible and more time must be had for this work."

Mr. Linn moved that the report be accepted and the committee continued. The motion was carried.

W. J. Thorp, auditor, Little Rock Railway & Electric Company, chairman of the committee on resolutions, reported a resolution "that the hearty thanks of this association be extended to the Manufacturers' Association and to the officers and employees of the Deuver City Tramway Company for the many courtesies extended to us and our guests; to the Denver & Northwestern Railway Company, the Deuver & Inter-Mountain Railway Company, the Denver & Interurban Railway Company and the Denver & South Platte Railway Company for free transportation over their lines; to the Denver Country Club for the privilege of its club house and grounds; to President R. N. Wallis and Secretary H. E. Weeks, to the executive committee and to the committee on standard classification of accounts for their faithful and efficient work, and to the authors of the valuable papers read before the association." The report was accepted and placed on file.

Mr. Wilson presented the report of the committee on nominations, as follows:

President, H. S. Swift, secretary and auditor, Toledo Railways & Light Company. First vice-president, A. L. Linn, Jr., general auditor, New York State Railways. Second vice-president, A. S. Michener, comptroller, Stone & Webster Management Association. Third vice-president, N. E. Stubbs, auditor, United Railways & Electric Company of Baltimore. Secretary-treasurer, H. E. Weeks, secretary and treasurer, Tri-City Railway. Executive committee, Robert N. Wallis, treasurer, Fitchburgh & Leominster Street Railway; W. J. Thorp, auditor, Little Rock Railway & Electric Company; R. Morrison, Jr., secretary, Michigan United Railways; D. S. Mitchell, auditor, Pittsburgh Railways.

The secretary was instructed to cast one ballot for these officers.

After acknowledgment of their election by the new officers the meeting adjourned sine die.

FIRST DAY OF STATE CONVENTION

The first day's sessions of the Colorado Electric Light, Power & Railway Association were held yesterday at the Hotel Auditorium, Denver. Beginning thus on the closing day of the national street railway conventions, reciprocal courtesies were extended between the national and state organizations. J. F. Dostal, Denver Gas & Electric Company, president of the state association, was in the chair. None of the set papers of the convention applied particularly to street railway operation. The association devotes much of its attention to the question box, and in this there are departments on "Boilers and Engines" and "Cars, Railways, Motors, etc." The latter department was not reached yesterday, but the former was taken up in the morning and discussed at some length.

President Dostal stated in his address that practically every railway and lighting company in the State is a member of the association. Frank W. Frueauf, president of the National Electric Light Association, gave an outline of the work of that association as taken up by the present administration. J. R. Cravath, Electrical World, Chicago, gave a talk on "Recent Progress in Illuminating Engineering" at the afternoon session.

The Big Pool at Glenwood Springs is 750 feet long, from 65 feet to 110 feet wide and from 4 feet to 6 feet deep.

The State Capitol in Denver is built of native Colorado granite and cost \$2,500,000.

COMPLIMENTARY SUPPER TO DENVER CITY TRAMWAY TRAINMEN

A most impressive demonstration of the high standard of loyalty and earnestness of the employees of the Denver City Tramway Company was shown at the complimentary supper given to the Tramway Band and Minstrel Troupe on Tuesday evening after the vaudeville performance. This year when the entertainment committee made its plans for the vaudeville performance, which has come to be an annual feature of the conventions, some fear was expressed that, owing to the long trip to Denver, any of the star performers of previous years would not be in attendance to take their usual places in the program. It was suggested to Mr. Whipple, chairman of the entertainment committee, that the Denver City Tramway Company Band and Minstrel Troupe would provide an attractive feature. Mr. Whipple took the histrionic ability of the street car men on faith and molded the program around their act as the central feature. The wisdom of this move was apparent on Tuesday night, when the street car men distinguished themselves by performing with unusual ability to the great satisfaction and amusement of all those present. It was indeed a surprise to see such a finished performance from men who are not usually considered to have any other ability than to ring up fares or turn a controller handle. As a small token of appreciation of the excellent work of the members of the Denver City Tramway Company Band and Minstrel Troupe Mr. Whipple arranged for a Dutch supper at the Kaiserhof after the performance. The selection of this hostelry for the supper was particularly appropriate because Mr. Openheim, the proprietor, was formerly an employee of the Denver City Tramway Company.

After the vaudeville performance was over and the burnt cork removed from the countenances of the amateur actors the entire company, numbering 68 in all, adjourned to the Kaiserhof and partook of a generous Dutch supper with all the trimmings. Mr. Whipple as chairman of the entertainment committee acted as host of the evening. With him, representing the Manufacturers' Association, were Charles J. Peirce, vice president; James H. McGraw, vice president, and George Keegan, secretary and treasurer of the Manufacturers' Association. After the substantial repast had been served and cigars lighted a number of toasts were proposed.

P. E. Beuhler, a clerk in the auditor's office of the Denver City Tramway Company, who was formerly a motorman on the road, responded to the toast, "The Boys." He spoke feelingly of the loyalty of all of the employees of the company and its officers. There was no dissatisfaction over wages or hours of labor because the officers of the company had always manifested a willingness to meet the men walf way in adjusting any fair and reasonable complaints; and the men in turn showed their appreciation of the interest taken in their welfare by working for and with the company.

J. J. Kreidler, a motorman, spoke for the Minstrel Troupe. After recounting the reasons for formation of this organization of employees he paid a high tribute to the officers of the Denver City Tramway Company for their liberality, fairness and interest taken in the welfare of the men. Like many other employees of the Denver City Tramway system, he had come west some 10 years ago in search of a place to work where his wife might regain her health and strength. He had been working for the Cincinnati Traction Company and had seen his wife wasting away, with no hope for her recovery. One day he found a copy of the *Street Railway Journal* in the car-house, and in reading it through he happened upon a description of the street railway system in Denver. This gave him an idea and he immediately broke up his home in Cincinnati and came to Denver with his family looking for a job. The Tramway Company gave

him the chance he was looking for and he had been here ever since. His wife had improved in health from that day and he was now happy in the enjoyment of his home, blessed with a family of healthy and happy children. 'All this, he said, he owed to the inspiration given him by the *Street Railway Journal*, and he took this opportunity of expressing his heartfelt thanks and gratitude to James H. McGraw, president of the McGraw Publishing Company, who had made the *Street Railway Journal* and its successor, the *Electric Railway Journal*, one of the greatest elements of good in the street railway business.

Mr. Booth, a conductor, spoke for the Tramway Band and pointed out how organizations of this kind among the men promote a spirit of good fellowship and welded the men into a unit with the single idea of giving their best efforts to the work they were doing.

Mr. Peirce congratulated the men on their esprit du corps and their loyalty to the company and pointed out to them that they were an essential part of the machine. Their officers might be capable and efficient, but without the men a street railway system could not be run.

Mr. McGraw expressed his appreciation of the high compliment paid him by Mr. Kreidler and narrated some of the early history of the founding of the *Street Railway Journal*. He expressed a desire to make the *Electric Railway Journal* a powerful influence for the betterment of the service and said he hoped to continue the good work which he believed the paper had already done in the field.

Mr. Keegan made a few remarks in which he pointed out the opportunities of today for men who take an interest in their work to rise above the routine duties of subordinate employees and assume positions of responsibility in the organizations of street railways.

The supper party dispersed with general expressions of mutual good-will and the singing of "Auld Lang Syne" at a late hour.

DENVER & SOUTH PLATTE RAILWAY

The Denver & South Platte Railway Company is a new interurban line connecting with the Broadway line of the Denver City Tramway at Englewood, 7 miles from the central loop in the business district of Denver. The new road is now in operation between Englewood and Littleton, 5 miles. Littleton is the county seat of Arapahoe county. At this point the road crosses the Platte river. An extension is projected up the river from Littleton to Roxborough Park, which is located at the mouth of the Platte canyon in the edge of the Rocky mountains. Within this park is a natural formation similar to the Garden of the Gods, near Colorado Springs. It is expected that the new park will develop into a popular tourist resort. Along the route of the present and proposed lines are coal, lime rock, silica and cement deposits.

The new road has few curves and these with a maximum of 3 deg. The maximum grade is 3 per cent. while the average grade of the entire line is less than 1½ per cent. There are but two bridges to be built on the line. At Littleton the road passes under two steam railroads through substantial reinforced concrete arches. The tracks are laid with 70-lb. rails built to 3-ft. 6-in. gage to conform to the tracks of the Denver City Tramway. Power for the operation of the line is purchased.

A theater party was given by the entertainment committee last evening at the Broadway Theater. The entire house was reserved for convention people, and it was more than filled. The attraction was "Vasta Herne," a four-act modern American drama, with Mrs. Leslie Carter in the title role. Ross F. Hayes of New York and W. K. Beard of Philadelphia were the members of the entertainment committee in immediate charge.

“SEEING SEATTLE” TROLLEY TRIPS

The Seattle Electric Company is especially well situated for operating sight-seeing cars. The city and the neighboring country offer many interesting scenic features, and the city is visited throughout the entire year by large numbers of tourists so necessary in making this type of service profitable. An accompanying illustration shows one of the “Seeing Seattle” cars as operated by the Seattle Electric Company. Two trips a day are made: one at 9:30 a. m. and the other at 1:30 p. m. The trips are each about 26 miles long covering the city and suburbs and occupying three hours time. A fare of 50 cents is charged.

The “Seeing Seattle” car starts at Pioneer Place in the center of the business district and runs over Second Avenue through the commercial district and on the original Ballard line along the water front. Here are many interesting views of the deep sea docks of the transcontinental railways and large lumber and shingle mills. From the water front the car proceeds to Green Lake where a complete trip around this beautiful body of water is taken. En route on this part of the trip Woodland Park is visited. This park is the largest of the city’s improved pleasure grounds and comprises nearly 200 acres. The greater part of its area has been left in the natural state. After leaving Woodland Park the sightseer is taken over Westlake Boulevard, along the shore of Lake Union and through the residence district to Capitol Hill. From this hill a splendid view of Puget Sound on one side and of Lake Washington on the other, with the city between, may be had. On the return route the sightseeing car is taken to Madrona Park, located on the shore of Lake Washington. The return route from there is through the central residence and business portion of the city to the start-

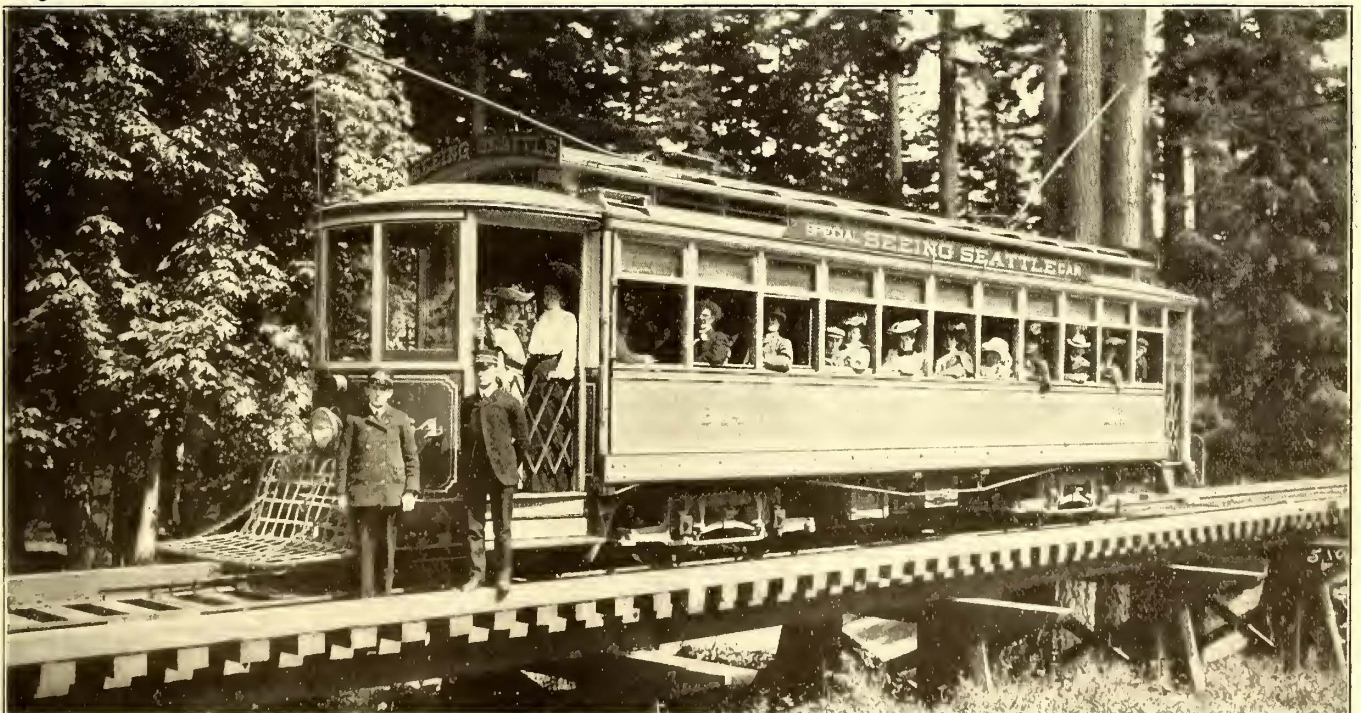
THE LAST HORSE CAR IN DENVER

New York has been made famous in the joke papers as the only city of any size in the United States which can still boast of horse cars. The reputation is emphatically denounced as being undeserved. Denver had a horse car, on exhibition



Convention Visitors and Old Horse Car

yesterday morning in front of the Auditorium, which antedates any in service in New York. It is the original pay-as-you-enter car, all passengers except the horse being compelled to pay toll to the owner, general manager, purchasing agent, superintendent of transportation and driver of the



Sight-Seeing Car of the Seattle Electric Company

ing place in Pioneer Square. On each of these trips the lecturer explains the interesting scenic features as the car passes along.

Mr. R. D. Wynn has been elected vice-president and general manager of the Central Engineering & Construction Company, Chicago, Ill. Mr. Wynn was formerly vice-president and general manager of the Waukegon, Rockford & Elgin Traction Company, Waukegon, Ill.

Cherrellyn line. The car is pulled up hill by a motor of one horse power and the driver is careful to conserve his propulsion energy when running down grade by shutting off and coasting while the motor is unhitched and rides on one platform.

The Alaska-Yukon-Pacific Exposition at Seattle cost \$10,000,000 and the exhibits are valued at another \$5,000,000. There are 15 large buildings and many smaller structures.

THE SELECTION, TRAINING AND DISCIPLINE OF CONDUCTORS AND MOTORMEN*

By Charles B. Wells, Denver City Tramway Company

The selection and training of conductors and motormen has become one of the most important factors in successful street car operation—so much so, in fact, that educators are being attracted to the problem; and at the present time schools are established for the purpose of preparing young men to enter the street railway service, and to assist the already over-wrought manager in securing enough honest and intelligent men to meet the demands of his city's ever-growing population.

It has been well said that "a company is known by the men it keeps." To the masses of daily street car patrons you managers and operating men are unknown. Your desires and ambitions to achieve greater efficiency in service and to provide adequate transportation facilities, are a sealed volume to them. Only apparent results are considered. If your men are lacking in courtesy or intelligence; if they are ill-dressed and poorly disciplined; if traffic is delayed by the failure of cars or from other cause, and your "rush-hour" service appears to the generality of strap-hangers insufficient; you are lashed to the pillory of public censure, and there judged, misjudged and reviled by the very people for whose safety, comfort and convenience you are giving the best years of your life, and the best that is in you.

To further add to your discomfiture, some unfriendly newspapers take up the hue and cry—probably revamping a series of past unfortunate accidents and printing in glowing colors an incident or two from your past—to make up good measure and show your general unfitness to cope with the situation.

If you would overcome public prejudice, your chief hope must lie in your conductors and motormen—the agents who represent you in dealing with the company's patrons. It is therefore of the utmost importance that such men be carefully selected, and that the most approved methods be employed in fitting them for this service. They must be fairly educated, of good appearance, and possess a knowledge of human nature which will enable them to enforce the company's rules, and yet do so without giving offense. The subtle art of diplomacy, when exercised by a street car conductor or motorman, is an invaluable asset for him as well as for the company he represents. It shortens his hours of labor; it lightens his burdens; and it wins friends many times even without his knowledge. Much depends, therefore, upon the selection of material.

To attempt the establishment of an uniform weight, height or even an age limit adaptable to every locality, would seem to be impracticable. In densely-populated districts where the demand for men continually exceeds the supply—as, for instance, New York and near-by cities—the employment agent, daily harassed by the clamor of the operating department, opens his door each morning in the face of a rabble representing all conditions and all nationalities. Many can barely make themselves understood. Here they stand—Hungarians, Roumanians, Jews, men bearing the stamp of the rowdy and the ill-bred—a motley assortment of impossibilities with perhaps here and there one who may stand the test. Then the elimination process begins. Facing a continual shortage of perhaps 300 men, think you this company can be restricted to the limitations which we of the West impose?

The ideal conductor or motorman should possess a good figure and a kindly face. He must be above the use of loud, vulgar or profane language, and he must not be ad-

dicted to excessive drinking nor objectionable tobacco chewing. The filthy use of tobacco, in my judgment, totally unfit a man to succeed on either end of a car. In weight he should not be under 150 lb. nor more than 200 lb. Heavy men cannot long stand the strain of remaining on their feet. His age, at the time of employment, should be between 25 and 38 years. My observations have convinced me that at least eight out of every ten men between the ages of 21 and 25 are not well enough seasoned to fit them for the responsibilities of a conductor or a motorman. As the weeding-out process goes on, few of them are found who meet the requirements or who are willing to submit to necessary discipline. Men of families, as a rule, are much more desirable than those unmarried. The former are of much more regular habits, and accept their positions with a view of providing homes for their families and becoming permanent; while a single man, unless he is bound by ties of mother or sister, feels no responsibility, and is free to rove from place to place as often as he accumulates a little money. Our experience has proven the truth of this assertion; and therefore married men are always given preference in Denver.

The climatic conditions of Denver, the attractiveness of its street car service and the generous rates of wages paid, render comparatively easy the securing of good men. Before a man is accepted for employment by the Denver City Tramway Company his references are carefully investigated and all available information about him is secured. I am satisfied that this method could not be employed in eastern cities, for the reason that many desirable men are lost to the company on account of their being forced to await the result of a search for their past records. Only men between the heights of 5 ft. 7 in. and 6 ft., and those not less than 150 lb. nor more than 200 lb. in weight, are eligible for the service. They are required to pass a rigid physical examination conducted by the company's surgeon. If successful, they are admitted to membership in the Tramway Mutual Aid Association, and no man who cannot obtain such membership may enter the car service. On account of the fact that Colorado's climate is well known to possess wonderful curative properties, Denver has become the Mecca of health-seekers; and in order to safeguard the company against an influx of men who would be physically unable to endure the rigors of the car service, it is necessary that our test be more rigid than would perhaps be required in many other cities. In addition to the requirements already mentioned, successful applicants must be between the ages of 25 and 38 years.

Country-bred men often make good conductors and motormen, but it is, as a rule, much more difficult for them to become familiar with the details of street car operation than for the city-bred man, who has the advantage of a better knowledge of human nature. One item in favor of the farm-bred man, however, is the fact that he considers his position a decided step in advance; and, unless he falls into civil hands or is led away by the glamor of the city, he makes his best endeavor to hold the position given him, and desires to acquit himself with credit. Much may be said in favor of both the city and the country-bred man; but the problem hinges upon the man himself—whether he has sufficient character to carry him through the difficulties of his position and keep him honest in dealing with the company he serves.

Training Employees

The question of training employees is a weighty one, and at present is far from being solved. We all know what it means to have cars manned by squads of green conductors and motormen, during seasons of heavy traffic. One of the most approved methods of training, and the one adopted in Denver, consist in giving the novice a thorough course of instruction before he begins actual practice upon a car. A schoolroom is provided, and is placed in charge of a com-

*Communication presented during discussion of report of Committee on Training of Transportation Employees at meeting of the American Street & Interurban Railway Transportation & Traffic Association, Denver, Oct. 7, 1909.

petent instructor. Here beginners are shown the uses and abuses of all machinery which may come under their charge, and the preservation of the overhead line and its parts is dwelt upon. The student is thoroughly drilled upon his future duties and his obligations toward the railway patrons; the necessity for the avoidance of accident, and the importance of securing accurate data, when an accident occurs; the result which may attend his failure to report an accident; and many other pertinent matters in reference to the duties which lie before him. When he is ready for actual practice, he possesses a valuable fund of information, which is, as yet, theoretical. Whether he will be enabled to put it to practical use, depends largely upon his mental powers of assimilation. I am inclined to the opinion that on many students much of our preliminary instruction is wasted, on account of the fact that, while it all seems very plain and easy of understanding, yet by reason of its great volume, it appears to the raw recruit much like a chapter in Sanscrit, and he is confused by the multitude of new ideas with which his brain has suddenly been charged. From my own observation I believe that our efforts would be productive of better results were we to reserve our school room instruction until after the student has been given an opportunity to familiarize himself more thoroughly with the company's rules and regulations, and has been pronounced by his conductor or motorman instructor as capable of handling a car. As a result of the practical experience, his mind is now more receptive; he asks intelligent questions based upon actual problems which may have confronted him, and derives more benefit from the schooling given him. Under such conditions he will without doubt be better fitted to make a satisfactory "trial trip," and able to pass a more creditable final examination. Now he is ready to be listed and numbered, and is launched upon a sea of activity. If he proves to be of the right stuff, it remains with us to hold him by the bonds of friendliness and mutual interest, and make him a permanent factor in the company's growth.

It is a fact well known that many of our strongest business enterprises have been built up by employees who had more than a mere salaried interest in their welfare, and I believe that transportation companies will come in time to recognize the value of greater co-operation among their armies of workers, and will perfect a plan by means of which their interests may be more strongly cemented.

Discipline

No attempt will be made in this paper to discuss numerous methods of discipline, but we shall touch briefly upon two of them.

About three years ago, we, in Denver, determined to adopt the Brown merit system. We read all the available literature upon this subject, and corresponded with numerous street railway companies who were known to have given it a trial. Strange as it may seem, some of the replies to our questioning were far from reassuring; but notwithstanding these, we believed that if any company could succeed in perfecting a satisfactory method, we could do the same. In order that we might be just to all concerned, we prepared voluminous schedules of misdemeanors, and set opposite each the number of demerits to be charged. We also appended a long list of meritorious acts for which credits were to be given. We purposely made the penalties as light as possible, hoping thereby to show the conductors and motormen that the company's justice was always tempered by kindness and a consideration for the difficulties of their positions. We abandoned suspension, and made strenuous efforts to ferret out all actions of our men that were worthy of special commendation. It was known that each merit nullified one demerit, but if the balance on the debit side reached 100, such fact would be deemed by the company as sufficient ground for dismissal. It seemed only fair to the men that they should receive notification when demerits

were charged against them, and also when merits were given. For this purpose we used a printed blank upon which were shown the date and time of the occurrence, the car number and name of line, the name of conductor or motorman, the number of rule or section violated; and a brief summary of the misdemeanor itself, together with the number of demerits charged; and the men were given an opportunity to explain or deny any report made against them. The same blank was used in sending out commendatory notices. Instead of drawing our men into closer relations with the company, we found that the demerit slips created an irritation among them, which continued to grow, and which could not be overcome by numerous merit notices of good behavior. Some of the hitherto good men became decidedly unfriendly, and expressed great disapproval of the system among themselves. Our discipline suffered. Instead of continually striving to obtain merits for good monthly records, many of the men seemed to care little for the number of demerits charged against them; and, as the number grew near the danger point, became reckless—stating openly that it was only a matter of time when they must inevitably be dismissed from the service. The feeling continued to grow, in spite of every effort made by us to turn the tide. In addition to the disappointing results in our attempt to win the confidence of the conductors and motormen, we found that the labor of keeping records was increased by nearly one-half. And so, after two years of conscientious effort to promote closer relationship and a better understanding between company and men, we reluctantly abandoned a system of discipline marked by dismal failure, so far at least as we were concerned.

At the present time our records are kept with the same vigilance as formerly, but the demerit marks are absent. We refer to it as "the silent system," and use our discretion as to making any part of it public, even to the men most concerned. Discipline notices are sent out with much less frequency. We adhere strongly to the principle that a "heart to heart" talk in the privacy of the superintendent's office is productive of more good to an offender than a bushel of demerit notices; but at the same time we are not slow to publicly acknowledge an act of merit. We resort to occasional suspension, but suspension does not mean total absence from duty. It means that an offender who has a regular run must pay his penalty upon the extra list, and see an extra man marked up in his stead. To an extra man it implies a position at the foot of the extra list each day until his sentence is served.

Under this method our discipline has improved. Our relations, for the most part, are pleasant and harmonious. A friendly spirit, seemingly impossible under the "merit" system, now prevails, and the results have been more than satisfactory.

DINNER FOR PACIFIC COAST RAILWAY MEN

The Albany Hotel was the scene of a jolly dinner party last night. The hosts were the supply men of the Pacific Coast and Northwestern States, and they had as their guests nearly the entire delegation of railway men from their territory who are attending the convention. The party consisted of about fifty, and of these thirty-five were railway men. F. F. Bodler, of San Francisco, filled the chair very acceptably, and there were songs by Will Judge, a well-known Denver baritone singer. A number of speeches were made and an atmosphere of the most cordial good-fellowship prevailed.

The States of California, New York, Oregon, Utah, Pennsylvania, Nebraska, Missouri, Michigan, Idaho, Montana, Massachusetts, Kentucky, Nevada, Wisconsin, Kansas, Minnesota, Ohio, North Dakota and Colorado have separate buildings and exhibits at the Alaska-Yukon-Pacific Exposition at Seattle.

THE CORPORATION TAX

A Letter Presented to A. L. Linn Jr., General Auditor, New York State Railways

Out of the prolonged discussion of the tariff question, during which manufacturing and commercial interests were given the fullest opportunity for criticism and objection, the new corporation tax law was finally and suddenly evolved, almost without protest, and certainly without adequate consideration or discussion. This convention affords an opportunity to call attention to the measure, which seriously affects the companies represented by the American Street & Interurban Railway Association. It is the purpose of this communication to discuss the impracticability of the law so far as it affects the present methods and practice of accounting by common carriers, and not to discuss the questions of policy, public finance and economics involved, the merits of the law itself, or its constitutionality or far-reaching effects.

Some of the difficulties which will be encountered by corporations in keeping their accounts in the form prescribed by the Corporation Tax Law were ably set forth in a letter to each member of Congress, signed by twelve prominent firms of public accountants in New York City, a copy of which, together with the subsequent correspondence, is hereto attached. This correspondence calls attention to certain accounting errors in the form of the bill, claiming that some of its provisions are "impossible of application" and that others "violate all the accepted principles of sound accounting."

Complication of accounting methods should be avoided by making one classification of accounts and one fiscal year the basis of all reports required by the Federal or by State governments for corporation tax or other purposes. When separate classifications are prescribed for different purposes, the resultant complications are serious.

The Interstate Commerce Act, for example, provides that "The Commission may, in its discretion, prescribe the forms of any and all accounts, records and memoranda * * * and it shall be unlawful for such carriers to keep any other accounts, records or memoranda than those prescribed or approved by the Commission. * * * In case of failure or refusal on the part of any such carrier * * * to keep such accounts, records and memoranda on the books and in the manner prescribed by the Commission * * * such carrier * * * shall forfeit to the United States the sum of five hundred dollars for each such offense, and for each and every day of the continuance of such offense." Under this act the Commission has promulgated a classification of accounts for interstate electric railways.

The Public Service Commission Law of the State of New York provides that the Commission for each district "may prescribe the manner in which such accounts shall be kept, * * * the forms of accounts, records and memoranda to be kept by such corporations, including the accounts, records and memoranda of the movement of traffic, as well as of receipts and expenditures of moneys. The system of accounts established by the Commission and the forms of accounts, records and memoranda prescribed by it as provided above shall conform as near as may be to those from time to time established and prescribed by the Interstate Commerce Commission under the provisions of the Act of Congress entitled 'An Act to Regulate Commerce.' * * * Where the Commission has prescribed the forms of accounts, records and memoranda to be kept by such corporations, it shall be unlawful for them to keep any other accounts, records or memoranda than those so prescribed or those prescribed by or under the authority of the United States."

In either case, the Government has subjected the accounting corporations to the discretion of a commission whose views may change at any time; and this situation is now

still further complicated by the fixed provisions of the new Corporation Tax Law, which necessitates a different classification of accounts. Why should a different classification be prescribed for purposes of taxation?

The law states that the tax is to be "equivalent to one per centum upon the entire net income over and above five thousand dollars received by it from all sources during such year, exclusive of amounts received by it as dividends upon stock of other corporations, joint stock companies or associations, or insurance companies, subject to the tax hereby imposed."

How is the "net income" to be determined under this law? A reading of the law discloses that "net income" is assumed to be the cash income for the period, less the amount of cash disbursed on account of expenses, interest, taxes, etc. This is not the true way to determine "net income." I would respectfully call your attention to the fact that the definitions of net income as set forth in all classifications of accounts so far promulgated by the Federal or by State governments have recognized the principle of accounting that the net income of a corporation for a given period can be arrived at only by making an allowance for accrued liabilities, and in some instances these classifications require that corporations shall recognize and provide for an estimated monthly accrual on account of depreciation, obsolescence and inadequacy.

To cite a few instances of inconsistency, the classifications of accounts promulgated by the Public Service Commissions of the State of New York prescribe the following regarding material and supplies, accounts receivable, and interest and dividends receivable.

Material and Supplies: That this account be charged with "the cost of all material and supplies acquired by the corporation, regardless of whether the same are intended to be consumed in construction or in operation or later to be sold." The Corporation Tax Law, on the other hand, provides that "all the ordinary and necessary expenses actually paid within the year out of income in the maintenance and operation of its business and property" shall be deducted in ascertaining the net income of the corporation. It is customary for railroads to take advantage of market conditions and purchase large quantities of material for future use, and it is not always possible accurately to determine whether material and supplies paid for within the accounting period will be charged to expenses or improvements.

Accounts Receivable: "Charge to this account all amounts owing to the corporation upon accounts with solvent concerns (other than banks) * * *" and credit the proper applicable earning accounts. The Corporation Tax Law provides "gross amount of income * * * received within the year from all sources," which would eliminate amounts due for service rendered or material sold for which the accounting corporation had not been reimbursed during the accounting period.

Interest and Dividends Receivable: "Whenever the income account is stated the appropriate sub-account therein shall be credited, and this account shall be charged with all accrued but not yet collected interest upon all commercial paper and accounts considered collectible held by or for the benefit of the corporation; also all dividends declared or guaranteed by solvent concerns but not yet collected, the right to which is in the corporation." The Corporation Tax Law provides "gross amount of income * * * received within the year from all sources." This would eliminate amounts accrued on account of interest and dividends but not yet collected.

A great many more inconsistencies might be cited, such as those resulting from prepaid insurance, prepaid taxes, prepaid rents, taxes accrued, interest accrued, casualties and insurance reserve, etc.

Gross income, operating expenses, depreciation, and net income, as interpreted by the Corporation Tax Law, are not

in accord with the classifications of accounts promulgated by the Federal and State governments.

The accounting problems discussed will confront, to quote the language of the law, "every corporation, joint stock company, or association organized for profit and having a capital stock represented by shares * * * under the laws of the United States or of any state or territory of the United States * * * or under acts of Congress applicable to Alaska or the District of Columbia."

I would respectfully recommend to this convention that a committee of the association be appointed with a view to co-operating with associations and organizations representing this and other lines of business in carrying out a campaign of publicity to bring the defects of this law directly before the people.

Accounting Errors in Corporation Tax Bill

Following is a copy of a letter which has been sent to each member of Congress in reference to the proposed corporation tax:

New York City, July 8, 1909.

Dear Sir:

On reading the text of the proposed corporation tax law, as reported in the Commercial and Financial Chronicle of July 3, 1909, we have formed the opinion that some of its provisions are absolutely impossible of application, and others violate all the accepted principles of sound accounting.

Under the third clause it is provided "that there shall be deducted from the amount of the net income of each of such corporations, * * * ascertained as provided in the foregoing paragraphs of this section the sum of \$5,000.00, and said tax shall be computed upon the remainder of said net income of such corporation * * * for the year ending Dec. 31, 1909, and for each year thereafter, and on or before the 1st day of March, 1910, and the 1st day of March of each year thereafter, a true and accurate return under oath or affirmation of its president," etc., etc.

In connection with this clause we would call attention to the fact that as you are no doubt aware, the fiscal year of a number of corporations is not and for business reasons cannot be the calendar year, and consequently, having in mind that in such cases an inventory was not taken at the beginning of the calendar year 1909, it is and will be quite impossible for any business, corporation or institution, whose fiscal year does not terminate with the calendar year, to make a true return of its profits as required by the proposed law.

Under clause 1 the tax is to be charged upon the "entire net income," and the net income is to be "ascertained by deducting from the gross amount of the income * * * from all sources,"

- (1) "Expenses actually paid"
- (2) "Losses actually sustained"
- (3) "Interest actually paid"

in each case "within the year." The words "actually paid" convey, and it is to be presumed are intended to convey actual disbursements out of the treasury

The proper deductions should be:

(1) Expenses actually incurred, because the payment is not necessarily made in the year in which the expense is incurred;

(2) Losses actually ascertained, because losses may be incurred and the amount not be ascertained until a subsequent period;

(3) Interest actually accrued, because interest is never paid until the end of the period during which it accrues, and the interest accrued is the proper charge against income.

In clause 1 the bill refers to "net income received"; in clause 2 it refers to "gross income" without the addition of word "received"; in clause 3, paragraph 3, it refers to "gross income received." There is here a complete confusion between income and income received, which can only lead to endless complication.

Two methods may be adopted for taxation purposes, either

(1) To tax the difference between actual cash receipts on revenue account and actual cash payments on revenue account, which difference will seldom if ever represent the profits of a manufacturing concern; or

(2) To tax profits made up in the ordinary commercial way, namely, to ascertain the gross income earned whether received or not, and to deduct therefrom

(1) Expenses actually incurred during the year whether paid or not;

(2) Losses actually ascertained and written off during the year whenever incurred;

- (3) Interest accrued during the year whether paid or not;
- (4) A reasonable allowance for depreciation of property; and
- (5) Taxes.

As accountants actively engaged in the audit and examination of a number of varied businesses and enterprises, we unhesitatingly say that the law as framed is absolutely impossible of application, and would suggest that in the said clauses 1, 2 and 3 of paragraph 2, the words "actually paid" and "actually sustained" be changed to read "actually incurred" and "actually ascertained," and that the third clause be changed to read so that the return will be based on the last completed fiscal year prior to December 31, in cases where the fiscal year of a corporation is not the calendar year.

Yours very truly,

Deloitte, Plender, Griffiths Co., 49 Wall Street.
Price, Waterhouse & Co., 54 William Street.
Haskins & Sells, 30 Broad Street.
Lybrand, Ross Bros. & Montgomery, 165 Broadway.
Wilkinson, Reckitt, Williams & Co., 52 Broadway.
Niles & Niles, 111 Broadway.
Gunn Richards & Co., 43 Wall Street.
Edward P. Moxey & Co., 165 Broadway.
Geo. H. Church, 55 Wall Street.
Barrow, Wade, Guthrie & Co., 25 Broad Street.
Loomis, Conant & Co., 30 Broad Street.
Marwick, Mitchell & Co., 79 Wall Street.

The Corporation Tax Correspondence

The joint letter sent to Attorney-General George W. Wickersham by several firms of public accountants in New York City, which was published in the July issue of The Journal of Accountancy, was answered as follows by the attorney-general:

I am in receipt of the letter signed by your firm and a number of others with respect to the proposed corporation tax law, in which you advise me that you have formed the opinion that some of its provisions are absolutely impossible of application and others violate all the accepted principles of sound accounting.

You first call my attention to the fact that the "fiscal year of a number of corporations is not and for business reasons cannot be the calendar year, and consequently, having in mind that in such cases an inventory was not taken at the beginning of the calendar year, 1909, it is and will be quite impossible for any business, corporation or institution, whose fiscal year does not terminate with the calendar year, to make a true return of its profits as required by the proposed law."

I beg to call your attention, in the first place, to the fact that the proposed law does not impose a tax upon "profits" but upon "the entire net income over and above \$5000 received by" the corporation, joint stock company, or association, or insurance company subject to the law, from "all sources during such year." It has been the uniform practice of the government in framing revenue bills to require the tax to be paid as of a fixed date, and, so far as I have been able to ascertain, in every instance the tax is imposed for the calendar year ending Dec. 31. Such was the income tax law of 1894. It may be inconvenient, but it is certainly not impossible for any corporation which keeps just and true books of account to make up a return such as that required by the proposed law, particularly as the return requires statements of actual receipts and payments, and not, as you recommend in your communications, of expenses "incurred," interest "accrued," and losses "ascertained."

2. You next object that the proposed law authorizes the deduction of "expenses actually paid," and you contend that this should be changed to read "expenses actually incurred." The bill was purposely framed to deal with receipts and disbursements made within the year for which the tax was to be imposed, and the words "actually paid" were employed advisedly. The same may be said with respect to losses actually sustained and interest actually paid. The theory of the framers of the bill in this respect differs from that which you advocate.

3. You then object that in clause 1 the bill refers to "net income received"; in clause 2 it refers to "gross income" without the addition of the word "received"; and in clause 3, paragraph 3, it refers to "gross income received," and you comment: "There is here a complete confusion between income and income received, which can only lead to endless complication."

I cannot agree that there is any confusion whatever in this respect. "Gross income" in clause 2 obviously and necessarily means "gross income received." The tax is im-

posed by clause 1 upon the entire net income above \$5000 received from all sources during the year. By clause 2 "such net income" is to be ascertained by deducting from the gross amount of the income from all sources the specified items; and if anybody could question whether that meant "gross income received," his doubt would be removed by the provisions in paragraph 3 of clause 3.

Your further statement that "as accountants actively engaged in the audit and examination of a number of varied businesses and enterprises, we unhesitatingly say that the law as framed is absolutely impossible of application," causes me very great surprise. My personal acquaintance with you and a number of other signers of the letter leads me to the belief that you have underestimated your capacity. Certainly the statement of objections made in your letter is entirely insufficient to support the conclusions which you express.

To this communication the accountants replied as follows:

Our only object in addressing you was to be of assistance in a matter of practical accounting which enters into the proposed law, as to which we believe that our experience specially qualifies us to speak. We have purposely refrained from any reference to the policy involved in the law, with which we as accountants are not concerned.

The views expressed in your letter of the 12th instant would seem to indicate that you have not fully appreciated the difficulties which will be met with in carrying into effect the provisions of the proposed law as amplified and explained in your letter; and we therefore feel that in justice to ourselves we must refer at greater length to some matters which were only briefly touched upon in our letter of July 8.

We are glad to have your clear expression as to the intention of the law to deal with receipts and disbursements only (presumably on income account) and not with income earned (or profits) and expenditures incurred. Under these circumstances it would seem better to use the term "receipts on income account" and "disbursements on income account" rather than "income" and "expense" as the latter terms are more commonly defined and used in relation to income earned and expenses incurred. In any case if in clause 2 "gross income" means, as you state it is intended to mean, "gross income received" it would certainly be better to say so and thus remove any possible ambiguity.

We note that you refer to the precedent of the income tax law of 1894. We believe that this law was declared unconstitutional before there had been time to experience the difficulties and uncertainties which any attempt to enforce it, if drawn on the lines of the present bill, would have involved. In this connection we may perhaps point to the precedent of the English income tax law which has stood the test of over half a century. In this case the tax is on profits which in this country are frequently termed "net income"; and the accounts of corporations prepared in the regular course of business for their respective fiscal years are and always have been accepted as the basis of taxation, subject to minor provisions as to rates of depreciation, interest deductions, etc.

Our main criticism of the bill in its present form is that in the large majority of cases it will be impossible of application for the year 1909, as explained in our previous letter, and very expensive and difficult if not altogether impossible in subsequent years.

Railroads perhaps require the simplest form of accounting obtaining among business corporations. These accounts are kept in a form prescribed by the Interstate Commerce Commission and severe penalties can be inflicted for any departure from those forms. They must be kept on a basis not of receipts and disbursements but of earnings, whether collected in cash or not, and of expenses, whether paid or not, which in both cases accrued during the fiscal year closing on June 30; the outstanding income and expense item uncollected and unpaid running into very large figures and frequently varying considerably in amount between one year and another. While it would be possible to prepare also an account of receipts and disbursements, this would involve a great deal of extra work in the compilation of special data and would raise most difficult questions as to the proper distribution between capital and income of large payments for stores, the ultimate use of which is not and cannot be known at the time of payment.

Turning now from this, which is perhaps the most simple case, to that of a large manufacturing concern producing all kinds of finished products out of purchases of ore and other raw materials, an accurate or even approximate statement of cash receipts and disbursements on income account is a practical impossibility at any time. Cash receipts arising from sales of products can be ascertained without much difficulty beyond requiring considerable extra

work. But no system of accounting can give even approximately "the ordinary and necessary expenses actually paid within the year out of income in the maintenance and operation of its business and properties." Such expenses presumably must include the cost of the goods sold. Into this cost and following it through all the intricate accounting which has been found to be necessary are raw materials actually used in manufacture, labor expended and innumerable items of expense which are taken into costs as they accrue quite irrespective of the date of payment. Very large inventories are carried of materials and supplies which are purchased at one period, paid for at another, and used at all sorts of times, in all sorts of quantities, and for all sorts of purposes, mainly for manufacture into products for sale but to a large extent for additions to or extensions of the plant. Such as are used for the latter purpose are not, as we understand the proposed law, a proper deduction from gross income, and yet long before they are used all identity between the materials themselves and the disbursements made for them has been lost. There is in our opinion no method in which any such statement as that called for in the proposed law can be prepared short of an entirely independent and separate set of books, designed to follow each bill paid through to the ultimate destination of the materials or services covered thereby, thus duplicating the present cost of the accounting department, and serving no useful purpose whatever. Even if such method were adopted it is very doubtful if it would produce the results required with even approximate accuracy.

Without unduly burdening this letter it is impossible to go into further details here; but the facts must in the opinion of any one familiar with the operations and accounts of a complicated modern manufacturing concern fully justify the conclusions which we expressed in our letter of July 8, and which we now emphatically endorse. Whether the proposed method is physically impossible, or merely as you state "inconvenient," it will, we think, be generally conceded that it is in the general interest of the effective administration of laws relating to taxes that they should involve as little inconvenience as possible upon those required to make returns thereunder. The basis for arriving at the amount liable to taxation suggested in our former letter would have the advantage of simplicity, and if the tax is to be a permanent institution, its efficient operation would be greatly facilitated by conformity with regular accounting methods.

We have felt it our duty to protest strongly against the wording of the proposed bill upon the grounds set forth, but our object is to help and not to hinder. If you think any good purpose would be served by our appearing before you and discussing this matter fully with a view to arriving at a satisfactory solution, which we are satisfied can be done, we shall be pleased to hold ourselves at your disposal for this purpose.

Regretting our inability to in any way modify the conclusions already expressed,

We are, dear sir,

Yours very truly,

Deloitte, Plender, Griffiths & Co.
Price, Waterhouse & Co.
Haskins & Sells.
Lybrand, Ross Bros. & Montgomery.
Marwick, Mitchell & Co.
Niles & Niles.
Gunn, Richards & Co.
Edward P. Moxey & Co.
Barrow, Wade, Guthrie & Co.
Loomis, Conant & Co.
Suffern & Son.

The correspondence was closed by the following letter from Mr. Wickersham:

I have a letter dated the 21st inst. signed by yourself and a number of other firms of accountants in response to my letter of July 12, replying to your former letter of July 8. In your last letter you set forth in somewhat more detail the following proposition:

But no system of accounting can give even approximately the ordinary and necessary expenses actually paid within the year out of income in the maintenance and operation of its business and properties.

I think the bare statement of that proposition would be received with very great incredulity by most minds. Certainly, I am quite unable to assent to it. However, it is now too late to attempt to recast the corporation tax amendment bill on the basis of such proposition.

Colorado is the land of sunshine. It has averaged 357 sunny days each year for the last 20 years.

LIGHTNING PROTECTION*

By J. V. E. Titus, Second Vice-President Electric Service Supplies Company

The term "lightning" is now used in a general way to describe surges of potential of a value high enough to approach the danger point. With this viewpoint lightning may be subdivided into two great branches, viz., internal, disturbances caused by switching, short circuits, grounds, etc.; and external, or more properly speaking, cloud lightning.

The most common phenomenon of external lightning, as manifested as the induced static or "bound" charge, and that, by the way, is practically all that has to be contended with in low voltage circuits, such as railway lines. To illustrate, consider any overhead line insulated from ground; suppose a positively charged thunder cloud passes over it. The ground below the cloud assumes an electro-static charge opposite to that of the cloud above, as does also the line, and furthermore, the charge assumed by the line is higher than that of the ground since it projects above it. A flash between cloud and cloud, or between cloud and ground, equalizes the potential existing between them, and requires a change of potential distribution on the line.

This equalization of potential between cloud and ground leaves a free charge on the line which manifests itself now as an abrupt impulse or wave traveling along the line with the approximate velocity of light, 186,000 miles per second. These waves have frequencies corresponding to the discharge frequency of the cloud, and amount to thousands of cycles per second. Reaching an end of the line they suffer reflexion either from resistance or otherwise, and give rise to complex phenomena.

On a line not connected to ground, some provision must be made to supply leakage for waves like these, otherwise the potential will rise until the insulation is punctured.

High e.m.f.'s are caused in a system by means of electromagnetic induction, since the cloud discharge is a current and sets up an opposing e.m.f. in any parallel conductor.

The phenomenon known as direct stroke perhaps occurs very infrequently on a system. In case the discharge does strike the line, it is quite possible that small damage to apparatus will result, owing to the choking effect of the line on such an abrupt discharge. The e.m.f. will on this account build up very suddenly and probably jump to the pole and ground itself that way. Shattered insulators and splintered poles are the result. Supposing, however, that the discharge does take place near some apparatus, or that sufficient passes along the line to enter the station; in such cases protection will sometimes only be obtained at the loss of the arresters, which then certainly will have paid for themselves many times over.

The early lightning arresters therefore were crude affairs, and but few of the early ideas have survived. Originally, efficiency in discharging the circuit was the prime requisite and the other essential to a successful lightning arrester, namely, durability, has come by a process of development.

A majority of the users of lightning arresters today do not realize that just about one-half of the efficiency and just about one-half of the durability depends upon the manufacturer and the lightning arrester itself, and the other half depends upon the user, in the way he installs it, and the care he takes of it after it is installed.

Today the most progressive roads make it a practice to inspect lightning arresters at least three times per year, preferably in the spring just before the first lightning storms occur, and while the earth is still moist with the winter rains; another inspection is made in mid-summer when the earth is dry, and at the time when the most severe

storms usually occur. This inspection is probably the most important, as it enables one to find out whether the ground connection is as good as it should be after the surface of the earth has become thoroughly dry. The last inspection is made in the fall, after the storms are over for the season. At that time such arresters as have been damaged may be taken down and repaired or replaced.

Particularly at the spring inspection should the connections to rail be investigated. Frequently the connecting wires become frozen in the earth and the vibration of the rails breaks off the wires. Arresters having no visual means of operation are better tested by employing tell-tale papers—the size of the puncture serving in a measure to check up the condition of the arrester and the ground. By employing this plan of a series of inspections, the cost is kept down to a minimum, and the efficiency of the installation is properly maintained.

Installation of Arresters

In installing lightning arresters, and particularly in the method of providing ground connections, there is a woeful lack of standard practice. Until the last year or two the ground connection has usually been made by burying a copper plate or coil in the earth, with which the ground side of the arrester is connected by means of a copper wire. As an original installation this makes an ideal connection, but such grounding has probably caused as many lightning arrester troubles as any other one element.

In most soils copper rapidly corrodes, and usually the resultant salts form a coating around the conductor that is practically an insulator, thereby introducing in the discharge path a high impedance. This not only impairs the discharging efficiency of the installation, but with some types of lightning arresters prevents the flow of sufficient current following the discharge to operate the circuit opening device.

The argument has been advanced that such resistance in a ground path is of but small importance because such a ground connection being of large cross section, offers a multitude of tiny paths or outlets over which the discharge will escape to earth. The fallacy of this argument is apparent when one considers the impedance that is offered a sudden rush of lightning by even a normal amount of resistance. It is quite as important that the ground path be of low ohmic resistance as that the lightning arrester itself should be. Any ground connection must discharge freely or the desired protection against very sudden rushes of lightning will not be secured.

The use of galvanized-iron pipe for ground connections has been recommended for the last year or two with the very best results. In soils that will permit, the pipe may be driven to a sufficient depth to reach permanent moisture. This method of connecting lightning arresters by means of iron pipe insures the greatest possible durability at a reasonable first cost. Its chief advantage lies in the fact that iron pipe corrodes very slowly in practically all soils, and the resultant salts are fairly good conductors. Even after the pipe has completely wasted away the usual oxide provides a good conductor, unless of course it becomes broken. An effort should always be made to secure genuine iron pipe, and in its absence, the best grade of galvanized steel pipe.

Some operating officials question the advisability of grounding arresters on railway circuits to the rail, as well as to the ground-point. There are several reasons for a rail connection in grounding lightning arresters. The ideal condition is that at the instant of discharge the line, rail and earth shall be at the same static potential. It is to accomplish this result that the discharge occurs. To secure this end it is absolutely necessary that rail and ground shall be of the same static potential at all times. Great care is usually taken to have these conditions, but on many systems, particularly large interurban properties where rock ballast

*Abstract of paper presented as Appendix E, report of Committee on Power Distribution, American Street and Interurban Railway Engineering Association. Read at Denver, Colo., Oct. 4, 5, 6, 7 and 8, 1909.

is used, the rail may be of other potential than the earth at many points.

Unless the rails and the ground are of the same potential there is every possibility of a discharge from the rail puncturing the windings of the motors of a car that is passing, and going to earth via the car, the trolley wire and the arrester on the adjacent pole. There has been advanced most unmistakable evidence that many car motors are burned out in exactly this way.

Principles of Design

In choosing a system of lightning protection compromises have to be made. The air gap must be adjusted for some point between normal voltage of the system and what we may call the danger voltage at which the insulation of the system is imperiled. The first consideration, therefore, is that an arrester must have an air gap small enough to come between these limits.

A reason why the simple air gap is unsatisfactory as a lightning arrester is that on a grounded circuit every discharge will necessarily produce a dead short circuit between line and ground. This means not only a loss of energy, but severe and dangerous strains on the apparatus supplying the current. Something must be found that will limit the flow of dynamic current to such a degree that these severe strains and the resulting dangers are avoided, but in limiting this flow of dynamic current we must be careful not to limit or seriously impede the discharge of abnormal voltages.

To solve this problem, resistance, in series with the air-gap, at once suggests itself. The requisites then of a satisfactory lightning arrester appear to be:

(1.) A medium, such as an air-gap, which breaks down on a voltage low enough to insure protection to apparatus.

(2.) A resistance of a value sufficient to prevent grounding and the consequent strains on apparatus, but not so high as to impede to any appreciable extent the free passage of the more heavy discharges.

(3.) Some positive automatic means of interrupting the relatively small flow of normal current following the discharge.

Users are heard even today expressing the opinion that a lightning arrester is good for but one discharge. If that were true, then a fuse in series with an air-gap would be the ideal arrester, because it would be entirely efficient for its one discharge, and would be inexpensive. Results, however, have proven quite differently with the more modern types of lightning arresters now on the market.

A large part of the failures of the older forms of lightning arresters, employing a low series resistance and some form of circuit-opening device, was due to an increase of resistance of the resistance rod itself. These rods were usually made of some combination of carbon or graphite with kaolin. Due to the action of the discharge in some cases, and to an apparent aging process in others, these rods kept on increasing their resistance while in service.

There are resistance rods on the market today, however, that entirely overcome this trouble, as after four years' service absolutely no increase of resistance is shown. These rods are composed of a combination of a special grade of carborundum, kaolin and a high percentage of metallic conducting material, properly fluxed at an extremely high degree of heat in the firing kilns.

Modern arresters are so designed that the discharge has practically a straight path to earth. They overcome many of the troubles of the older forms, due to an insufficient surface distance on the arrester base, between parts of opposite potential.

Many arrester failures are due to the use of iron boxes. An iron box offers an inductive effect to a discharge, and this effect becomes very marked as the frequency of the oscillations increases. Often the discharge jumps around the insulating bushings surrounding the leading-in wires, the

normal current follows, and establishes a serious short circuit. Wooden or asbestos lumber boxes are greatly to be preferred; the former are cheaper than iron and quite durable, while the latter have their fireproof qualities to recommend them. For car service asbestos lumber boxes should always be used, as any lightning arrester, unless properly fireproofed, may burn out and hazard valuable apparatus.

Service Results

If arresters are properly designed to meet service conditions; if they are properly installed and frequently inspected to see not only that the arresters themselves are in good condition, but that the ground connections are likewise, users may reasonably expect several years' service from an equipment of the present-day lightning arrester.

If tell-tale papers be put in the gaps of lightning arresters it will be a matter of considerable surprise to note the number of discharges taken. If this practice is continued for a period of two or three years, it will enable railway operators to determine where discharges most frequently occur, and at these points, arresters may be installed more frequently and better results thereby secured.

As a sample of what has been accomplished by careful inspection, one of the large interurban roads in the center of the lightning belt of Indiana has shown a total loss of lightning arresters of less than two per cent of the entire equipment per year for three years. This company inspects its arresters frequently, and the saving of lightning arresters due to this inspection, together with the increased protective efficiency of their arrester equipment, has more than paid for the inspection.

Another company, located in practically the same territory, operating at 1200 volts d.c. since 1906, has lost or had partially damaged in the past three years, a total of but 6 arresters out of 225 originally installed, and during that time has lost absolutely nothing in the way of equipment. On this property frequent and careful inspections are the rule.

The foregoing statements refer throughout to lightning protection of direct current circuits. A large part is equally pertinent in relation to alternating current circuits. The design of alternating current lightning arresters has presented very different but quite as difficult problems as direct current railway circuits.

The characteristics of alternating current are taken advantage of very nicely in practically all modern types of a.c. lightning arresters. The use of several air-gaps in series, where the current flow is limited to certain values by various means, results in the failure of the arc in the gaps, when the current wave passes through zero. In some forms of a.c. arresters this action is supplemented by shunting some of the gaps with a series of resistance, in others a circuit-breaker cuts off the flow of normal current, if for any reason the air-gaps fail to respond promptly.

There is no more fitting conclusion than to remark that the price of satisfactory lightning protection is proper installation and inspection. The manufacturers today may be said to have done very well with this problem, as is evidenced by highly satisfactory general results. But these satisfactory results are secured only when the operating companies co-operate by giving the arrester installation the proper care.

Denver is a particularly bright and attractive city, in which electric illumination at night rivals the brilliant sunshine of the day. The famous "Welcome" sign at the Union Station typifies a characteristic hospitality. One interesting example of decorative street lighting is the combination of arc and incandescent lamps in handsome fixtures on the trolley span-suspension poles on Sixteenth and other streets.

SOME NOTES ON CALIFORNIA HIGH-TENSION TRANSMISSION LINES*

By S. L. Foster, Chief Electrician, United Railroads of San Francisco, San Francisco, Cal.

In California are to be found some of the longest transmissions, the highest voltages, and at the same time some of the best and some of the worst electrical conditions. Much that is of vital interest here is only of historical interest, or perhaps incredible to engineers east of the Rocky Mountains. Much that interests those of the East is valueless here. We have no sleet or snow loads, no sleet nor snow driving or accumulations, no tornadoes, and practically no tree or lightning interferences such as are met with in the East.

For high-tension station outlets we simply build ordinary terra cotta sewer pipes, bell ends inside, into the walls, set a circular perforated disk of plate glass in each bell end, and lead the wire through the center. The hole aids station ventilation. There is no snow to fear, and the upward tip of pipe toward the inside of the station obviates danger from rain. In later 60,000-volt work a 24-in. square of glass with a central 3-in. hole for the conductor is used, and the terra cotta pipe feature is omitted, as birds sometimes build nests in them. Lightning arresters are usually conspicuous by their absence, as are also the effects of lightning.

As compensation for these advantages, however, we have in some parts of the country eagles, wild swans, pelicans or blue herons with over 6 ft. spread of wings, that occasionally short-circuit even 72-in. spaced wires. We also have from four to six months of rainless weather during the summer when the dust becomes prevalent. In addition, along the coast and bays we have spells of heavy fogs at night.

The combination of dust, fog and night wind applies a conducting smear over the insulators, the pins, the cross-arms and the poles of our high-tension lines, that results in most unexpected and extraordinary phenomena to disturb the electrician's equanimity. One effect appears in the fact that in a few, though important, localities a voltage test factor of safety of six in the insulator is inadequate to secure continuous operation. Another is the fact that the brush discharge from insulator to wood pin generates nitric acid from the nitrogen of the air and the hydrogen and oxygen of the fog or air. This nitric acid attacks and "digests" the threads of the wood pin top until it becomes a powder, and the thread ceases to serve as a support.

As the surface of the pin, where unprotected by the insulator, is covered with the moist paste of salt, dust and fog drops, it is a better conductor than the protected part of the pin, and is not attacked at first. On the drier and more highly resisting part of the wood pin, up under the insulator, the heat generated by the leakage current appears first, but as the moisture is dried out of the other surfaces the evidences of heat appear, and pins, cross-arms and pole tops suffer.

Brown striation marks on pin, arms and pole, charred "worm holes" in pins, wood pins burned off altogether, leaving insulators adrift in the air, cross-arms charred or entirely burned off around the iron pin or at the gain in the pole, are some of the strange symptoms of the disease. The "static" or "brush discharge" or "Corona," as it is variously called, cracks and snaps between insulator and pin by day and scintillates by night.

All these interesting manifestations occur on a 13,000-volt, 25-cycle, three-phase line, 24-in. spacing, equipped with porcelain two-part insulators tested by the author to 50,000 volts, and advertised by the maker as "test voltage 70,000." Of course, these eccentricities do not occur every day nor

continue all the day when they do occur. In fact, they cause very few interferences with our city 13,000-volt service, but to one accustomed to the prosaic behavior of the insulator on the 500-volt d.c. work they are mighty interesting doings and keep us guessing sometimes.

The cause of the burn-offs at the pole is a natural query, and various theories have been advanced.

At first, the two 3/4-in. galvanized-iron machine bolts holding the cross-arm to the pole were passed through the pole, as was the classical practice derived from the Eastern lag-bolt custom. After much trouble from fires in cross-arm gains during foggy weather, it was felt that it would be an improvement to do away with these through bolts and substitute a U-bolt that would go around the pole.

In the early 60,000-volt, 150-mile transmission construction the single three-wire circuit was constructed at the points of an equilateral triangle, apex up, using a single cross-arm and setting one wooden pin into the top of the pole. In the fog district even a spacing of 42 in. between conductors and insulators, tested to 120,000 volts, failed to be infallible on the 60,000-volt line, and fires started around the "kingpin," and even further down on the pole. The theory was advanced to explain these phenomena that there were certain paths of varying conductivity in or between the fibers of the wood pole, and that in this star-connected line with grounded neutral the potential tended to force current along these conducting paths, and as the moisture was evaporated the persisting current caused heating and the fire.

To break up this action by breaking the uninterrupted course of these paths the pin was removed from the center of the pole and mounted on a short one-pin cross-arm bolted around the top of the pole. The wood pins had been "digested" seriously in the "fog belt" by the "brush discharge," and were replaced by hollow galvanized iron pins provided with lead threaded tops. These wood pins referred to were made of eucalyptus or Australian blue gum, which is stronger than the locust or oak usually furnished in pins, and is equal to hickory. The wood is specially seasoned and treated for this purpose. Sawed into stocks 3 in. square, the wood is boiled in water for 24 hours, thereby being deprived of its sap. These pieces of wood are then arranged for efficient drying, and so exposed for three months. After being turned to shape, the finished pins are boiled in linseed oil at a temperature of 100 deg. C. for several hours, the oil penetrating about 1/16 in. and serving as a protection against moisture. When new in the laboratory these pins readily withstand a 60,000-volt test from end to end. Thus there seems to be no ground for a claim that thorough work was not done on the wood pins.

The form of construction just described represents about the last steps in constructing combustible or perishable high-tension overhead work. The next step is to the steel tower, the steel cross-arm and the suspender insulator.

The 13,000-volt line referred to was built in 1902, after observing the difficulties of an 11,000-volt, 60-cycle, three-phase line, that with 24-in. spacing and wood pins, could not succeed during the foggy weather with triple-petticoat glass insulators, which have been used successfully on a 44,000-volt line in Utah.

The new San Francisco line has about 4000 insulators, 20 miles total length of pole line, 82 miles total length of conductor—No. 0000, No. 000, No. 00 copper, some No. 0000 solid, some stranded (no advantage found so far in use of stranded wire), equilateral triangle arrangement, apex up, no transposition, no cross-arm braces, no line lightning arresters.

The poles are 50, 60 and 70 ft. long, square, sawed, planed, tapered and of red-wood cut from the hearts of young trees—16 in. by 16 in. at butt, 10 in. by 10 in. at top—set 6 ft. deep in concrete—stepped with galvanized-iron step irons. In the suburbs some 40's and 35's were used. The cross-arms are 4 in. by 6 in. clear Oregon pine, bolted to gained poles originally by 2 3/4-in. through bolts, but on latest work and

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in case of burned off cross-arms by $\frac{3}{4}$ -in. U-shaped galvanized bolts passing around the pole.

In this climate all ironwork on poles, such as lag screws, bolts, braces, steps, etc., is galvanized by the hot-dip process to prolong life and to prevent streaking with rust.

On straight line work composite pins were used, consisting of $\frac{5}{8}$ -in. galvanized wrought iron carriage bolt, threaded wood top and truncated conical porcelain base.

The nitric acid formed by the brush discharge has "digested" many of these threaded oak tops, and as opportunity offers or necessity requires, they are replaced by threaded lead tops. When from "digestion" or burning of wood top of pin it seems necessary to take some action, a threaded lead top is substituted for the threaded wood top without washing, wiping or changing the insulator. No recurrence of similar symptoms on identical poles have been recorded, either where cross-arms have been burned or wood pin tops digested.

Another company profiting by our experience did not attempt to use the wood tops, but retained the rest of the parts of this composite pin, cementing the bolt into the insulator with litharge and glycerine.

The brush discharge occurs during very heavy fogs between the lower insulator petticoat and iron pin, just the same as when the wood top was used, but so far (four years) with no serious results.

For corner work a $1\frac{3}{8}$ -in. galvanized iron pin is used cemented into the insulator with a mixture of litharge and glycerine. These ingredients are mixed on a glass plate with a putty knife to a stiff paste. The pinhole of the upturned insulator is filled to the proper height and the pin pressed into place, being held central in the hole by wooden wedges until the compound sets. Pins thus cemented are usually allowed to stand for 24 hours before being used, though this setting depends on the weather. In rainy weather 24 hours is not long enough. In dry weather haste must be used lest the cement set before the pin can be inserted.

Insulators

The insulators generally used are a two-petticoat brown porcelain, umbrella-top insulator. When building this 13,000-volt line it was specified that the insulators should pass a 50,000-volt brine test. All that were accepted (about 80 per cent of the shipment) passed this test, which consisted of inverting the insulator in a metal pan of brine connected to one pole and putting a wire in the brine-filled inner petticoat connected to the other pole of the testing set. Today the manufacturers advertise these insulators as "Test Voltage 70,000." With two of these in series, each having 13 in. of creepage distance between conductor and pin, it was felt that the construction was safe from leakage, but we were disappointed.

The 20 per cent that were punctured in the testing made the makers feel so badly that they now insist on the insulators being tested at the factory before shipment.

The "static" or "brush discharge," or "Corona" that is active in certain localities during six months, or during our summer months when sea fogs are prevalent, "digests" some of the wood tops of our composite pins. It has led in a few cases to burned-off pole tops, where the cross-arm was fastened to the pole by bolts passing through both.

Some engineers in testing insulators use the spray test. In the "fog belt" out here we would like to have a spray on all our insulators all the time. In the winter, when we have long spells of continued rain, we have no insulator trouble at all. During the summer the fog and dust form a conducting paste that at some points leads to all the peculiar exhibitions previously detailed. As soon as the first rain of winter has washed off this paste the troubles vanish for six months. So far, no evidence has been reported of the lead-pin tops or cementing being affected by this "static."

When the fog is persistent and the action gets serious, we

stop it readily enough by washing the insulators with ordinary water inside and out, but without removing them.

In the beginning there were four types of porcelain insulators in use, all having passed the 50,000-volt test, but since the number has been reduced to one, there has been but one out of 1000 poles burned-off pole in six years resulted in an interruption to the service, and this one occurred on a pole standing 15 ft. from a chemical factory. There was more than one burn-off, but the others occurred, fortunately, either on a duplicate line or near the regular shutting-down time.

When the fog is absent it is marvelous how little porcelain is required to insulate one wire from its neighbor. During our recent strikes, or due to malicious boys, two adjacent insulators have often been seen with the outer petticoat in both cases entirely gone, and yet there was no evidence of trouble, and they were left undisturbed till shutting down time.

The best defense against this fog and dust action is a generous insulation factor of safety in the insulator (say, make a test voltage six times working voltage), which should always be of porcelain, as being less hygroscopic than glass and tougher. If this fails, the last resort is the cloth and the water pail at night. Of course, falling tree limbs, the busy small boy with his piece of wire, or the malevolent striker with his chain have burned off our line a few times, but so far without injury to persons or property. Much of this would be prevented by having had the three wires of the line arranged with the apex of the triangle down.

One power company in San Francisco goes farther, and besides arranging the three wires on an inverted equilateral triangle plan, extends light galvanized iron channel irons along the line of the ends of the cross-arms and 3 ft. beyond. A guard wire is stretched along the tops of these upward projecting points.

Some of the lines arranged on the apex-down plan offer an attractive roost for eagles and hawks. When the bird stretches his wings for his final hop into space he short-circuits the two wires, and incidentally kills himself.

Precautions During Work

When making repairs, even if assured by the station men that the current has been cut off, the linemen always hang an iron chain over the three wires to prevent the current coming on again without warning. No lineman has ever been injured on our 13,000-volt lines.

The other methods of completing the line contained nothing different from standard practice. The last six years' experience has taught us how to construct and how to maintain our high-tension lines so as to escape the interesting effects of fog and dust.

The results of our experience, summed up, are as follows:

1. There should be a larger factor of safety in the test voltage of insulators to be used in the foggy localities than elsewhere, say six.
2. To keep the insulators up to a safe margin these insulators should be wiped or washed once a year in the most aggravatingly foggy locations.
3. The through bolts for attaching the cross-arms should be replaced by the U-bolt around the pole.
4. The all-wood pin or the wood-tipped iron pin should be replaced by the all-iron pin with the threaded lead top.
5. No pin should be located in a hole bored in the top of the pole, but should be installed on a short arm bolted to the pole by a U-bolt.
6. All iron parts should be galvanized.
7. An insulator with a few "still air spaces" is preferable to one with many such spaces, no matter what the comparative "test voltage" may be.
8. If the wood pins are used, very many will surely burn off during the foggy conditions. If iron pins are used, a few cross-arms may burn off. In any case the main dependence must be upon the insulator.

REPORT OF COMMITTEE ON STANDARDS*

W. H. Evans, Chairman; H. H. Adams, L. L. Smith, G. H. Kelsay, James Heywood, E. O. Ackerman, B. Penoyer, M. J. Kehoe, J. Z. Murphy

At a meeting of the executive committee of the American Street & Interurban Railway Engineering Association held at Atlantic City, Oct. 12, 1908, the question of the standing committees and their relation to each other was very carefully considered, and as a result the executive committee submitted certain recommendations for the consideration of the association which were subsequently adopted by the convention at its first session, Oct. 13, 1908.

The report submitted referred to the work of this committee as follows:

"The committee on standards to consist of nine members, four of whom are to be chairmen of the other standing committees, 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.

"All recommendations for adoption of proposed standards made by any of the general committees shall be subject to the approval of the committee on standards and are to be presented by them to the association.

"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."

This action by the executive committee and the association is heartily indorsed by the members of this committee and no doubt will result in a more satisfactory manner of arriving at standards. It is very necessary, however, that the other committees make definite recommendations as to standards in their annual reports, as it is upon these reports that the work of the committee on standards will in the future largely depend. Owing to the fact that no definite recommendations as to standards were made in the reports of the committees last year, this committee has been somewhat handicapped in this respect and has not profited by the above rule to the extent that subsequent committees will.

At a meeting of the executive committee, held in New York City, on Nov. 16, 1908, the following subjects were suggested for the consideration of this committee this year:

(a) Gears and pinions; (b) standard dimensions with particular reference to standard taper for pinions; and (c) standard gear ratios.

Also that data be collected for the purpose, if possible, of submitting specifications for material for: (d) Iron for brake rigging; (e) axles; and (f) rubber-covered wire. Considerable work on all of the above subjects has been done by the different committees, and this no doubt will take form in their reports, making definite recommendations for standards to be adopted by the association.

Standards of the Association

It is gratifying to your committee to report that no recommendations are submitted nor suggestion made for changes or alterations in the standards and recommended practices that have been adopted by the association at the 1907 and 1908 conventions, held at Atlantic City. These standards have met with general approval and there is an increasing tendency to adopt them as standard practices with a large number of the electric railway companies throughout the country; and with the more general use of the standards, greater benefits will be realized and economics effected.

Also many of the manufacturing and commercial concerns have adopted these as their standard practice and are urging their use. In a number of cases they have reproduced the standards in their advertisements and catalogues, with the result that considerably greater publicity has been given them. Your committee considers this a very decided advan-

tage in the introduction of the standards of the association and takes this opportunity to express its appreciation of the effort of those that have taken the matter up in this manner.

(a) Gears and Pinions

Consideration has been given this subject with the view of adopting standards for gears and pinions in addition to those that have already been adopted. It has developed, however, that, owing to the great variety of motor equipments that are in use and the different classes of service in which each of these is being employed, it is very difficult to agree at this time on additional standards for gears and pinions that will be acceptable generally.

It is suggested that a careful study of the table adopted in 1907 will very materially assist in the standardization of the gears for the different motors and in connection with the standard axles will greatly assist in the interchange of gears for different motors on the same axle. The character of the pinion is naturally dependent on the gear used. This matter was taken up with the representatives of the motor manufacturing companies, with the result that it developed that the time is not now opportune for suggesting additional standards for gears and pinions. Your committee, therefore, has no recommendation to make on this subject at this time.

(b) Standard Taper for Pinions

A consideration of this subject disclosed the fact that it was not possible to adopt a standard taper for pinions that would conform to any general extent to that now used by the equipments already in service. It is, therefore, desirable that the standard recommended shall conform as nearly as possible to that used by the greatest number of equipments already in service. It is also thought that the difference in the taper of the pinions now in service can be harmonized without a great amount of difficulty and the advantage, especially to the companies that operate motors manufactured by the different makers will be very considerable.

Your committee would, therefore, recommend that the standard taper for pinions be made in the proportion of $1\frac{1}{4}$ in. in diameter to 1 ft. in length.

(c) Standard Gear Ratios

This subject was taken up by the committee in connection with the first subject, (a) Gears and Pinions, and was considered in much the same light as that subject, with which it is so closely allied. While it is evident that considerable improvement is possible along this line, it is, in the opinion of your committee, questionable whether it is altogether advisable at this time to insist on a very rigid standard in this particular. Conditions vary so widely as regards service requirements and limited space in which to locate motors that it hardly seems practicable to adopt standard gear ratios. In the opinion of one manufacturer, the situation is as follows: "Even were it possible I think it would handicap other features of design to such an extent that on the whole it would be a detriment rather than an advantage." While it is the opinion of the committee that considerable can be accomplished by the individual member companies with their own equipment, we do not consider that the matter has had sufficient general investigation to warrant the association in adopting standards along this line at this time. Your committee, therefore, has no recommendations to offer at present on the subject of gear ratios.

(d) Iron for Brake Riggings

Your committee is of the opinion that the important duty of brake riggings and other wrought-iron forgings on electric railway equipments demands a thoroughly reliable grade of material, which should be fully specified to the manufacturer. Care should be taken in the inspection of the material received. Your committee does not consider it advisable to

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prepare special specifications for forgings for brake riggings alone, but rather for a general character of No. 1 wrought iron, which will not only serve for the above purposes, but also for general blacksmith work.

The committee recommended the adoption of the specifications submitted as the standard of the association.

In connection with these specifications and as a further safeguard in the purchase of round bar iron of proper diameters, not only on account of strength, but also to insure the cutting of a satisfactory standard screw thread when desired, a set of limit gages for round iron together with tables of sizes of limit gages for round iron are proposed.

(e) Axles

In considering the subject of specifications for material for axles your committee has confined its investigations to the steel axle. With the general introduction of larger and heavier cars and motors of greater capacity, and the exacting conditions under which these are operated, it has developed that the conditions affecting the motor axle are such as to require the greatest care in the selection of the material from which it is formed.

While we may profit very materially by the experience of organizations similar to ours that have developed the axle problem since the beginning of operations of railroads in this country, it is no doubt true that the requirements of the motor axle under all conditions call for a material fully equal to, if not much better than, that used under any similar circumstances.

Your committee recommends the following specifications for axles:

Standard Specification for Steel Axles

(1.) **Material:** All axles must be made of steel manufactured by the open-hearth process and the material required shall have the following composition:

(2.) Chemical Requirements:

	Basic Open Hearth.	Acid Open Hearth.
Carbon	0.40 to 0.55 per cent	0.35 to 0.50 per cent
Manganese, not to exceed	0.70 per cent	0.70 per cent
Phosphorus, not to exceed	0.05 per cent	0.05 per cent
Sulphur, not to exceed	0.05 per cent	0.05 per cent

In no case must the total of carbon and manganese exceed 1.15 per cent.

(3.) **Physical Requirements:** Tensile strength, not less than 80,000 lb. per sq. in. Elongation in 2 in., not less than 20 per cent. Reduction in area, not less than 25 per cent.

The standard turned test specimen, $\frac{1}{2}$ in. in diameter and 2-in. gage length, shall be used to determine the physical properties. Drillings or turnings from the tensile specimen shall be used to determine the chemical properties.

The railway company must be notified in advance when axles will be ready for inspection and no shipment shall be made before tests shall have been completed and the inspector shall have advised that the axles are satisfactory.

(5.) **Stamping and Marking:** Each axle must have the heat number and manufacturer's name or initials plainly stamped on one end with stamps not less than $\frac{3}{8}$ in. high and have order number plainly marked with white lead.

(6.) **Inspection:** All axles must be free from seams, pipes, cracks or other defects and must conform to the sizes ordered, as per drawings which accompany these specifications.

Axles must be rough-turned all over with a flat-nosed tool, cut to exact length, have ends smoothly finished and centered with good 60-deg. centers.

Axles that fail to meet any of the above requirements or that prove defective on machining will be rejected and returned at the expense of the manufacturer and must be replaced by them free of cost to the railway company.

(f) Rubber Covered Wire

The subject of rubber-covered wire has been investigated by the committee on power distribution, and James Heywood, chairman of that committee, reported at the meeting

of the committee on standards that his committee would make a definite recommendation in its report to the convention this year and ask that the same be adopted as the recommended practice of the association.

The committee on power distribution is of the opinion that the standard specifications adopted by the Railway Signal Association would be suitable and advisable as a standard compound for rubber insulated wire to be adopted by this association.

This committee therefore has no recommendations to offer on this subject at this time.

Definite Recommendations as to Standards

In order to facilitate the work of the committee on standards for the year 1910 as well as in subsequent years, it is considered very necessary that the reports of the various committees to the convention make definite and distinct statements of what they would recommend be adopted by the association either as standards, recommended practice or suggestions for specifications and also make recommendations for what action they desire to be taken by the convention. This will materially assist the committee on standards as well as avoid the possibility of considerable confusion in the work to be taken up by the different standing committees of the association.

Adoption of Standards

The subject of the adoption of future standards by the association has been given very careful consideration by this committee during the past year with a view to making the standards more effective. In the opinion of the committee considerable additional force and effect would be gained for the standards and recommended practices by submitting them to a vote by all the member companies entitled to a vote for final decision by letter ballot.

The committee on standards offers the following amendment to the constitution and by-laws of the American Street & Interurban Railway Engineering Association subject to the approval of the executive committee:

Recommendations for Standards

Sec. 1. Any proposition recommending the adoption of standard construction or practice shall be in writing and be accompanied by drawings, if the latter are necessary for a clear understanding of the subject. Such proposition shall then be submitted to the association for discussion, after which a vote will be taken to decide whether the proposition shall be submitted for decision by letter ballot to all the members entitled to vote. If decided in the affirmative the secretary, within three months from the time the vote of the association is taken on such measure, shall send by mail to each member a blank ballot and a copy of the proposed recommendation with a report of the discussion thereon approved by the executive committee; such ballot to be filled in, signed and mailed to the secretary, who will count all the ballots received within 30 days from the date they were sent to the members and he shall then announce the vote in such manner as the executive committee may prescribe. Any recommendations securing two-thirds of the votes cast shall be thereby adopted by the association.

Sec. 2. Each active member shall be entitled to one vote on all questions, and in addition thereto shall on all measures pertaining to the adoption of standards have one more vote for each full 1,000,000 car-miles made by the cars of that company during the fiscal year next previous to the convention at which such standards are recommended to be submitted to letter ballot for adoption by the association.

The General Use of the Standards

The committee on standards desires to call attention to the fact that the standards and recommended practices which were adopted at the 1907 and 1908 conventions at Atlantic City have become standard practice with a large number of companies, and it also desires to emphasize the importance of the adoption of these standards by other companies. It has been demonstrated that many of these standards can be readily applied to the older types of trucks and motors with decided advantage. Particular attention, how-

ever, should be directed toward the use of these standards in ordering new equipment.

Your committee is of the opinion that some agitation on this subject by the association at this time would be advisable and would result in advantage to the member companies and also promote the cause of a system of standards and recommended practices.

Reprint of Standards in Annual Reports

Your committee would recommend that as a further means of bringing the standards of the association into general use and that the information may be readily obtainable, a reprint of all the standards, recommended practices and specifications that have been adopted up to the time of each convention, together with proper notations as to the time adopted with any additions or alterations made, be embodied with each annual report of the American Street & Interurban Railway Engineering Association as an appendix.

CHICAGO'S TRANSFER CRUSADE*

By Joseph V. Sullivan, General Supervisor, Chicago Railways Company

With a record of more than 1000 arrests in one year for misuse of transfers, officials of the Chicago Railways Company believe that their experience may be of interest to other street railway operators, especially in the larger cities. In the first place, let it be understood that while Chicago has been one of the most fruitful fields for persons with an inclination to make improper use of transfer slips, yet the facilities for correcting this evil are now as helpful as any large city could expect. This is principally true because we have a valid ordinance under which offenders of this class may be punished, and we get assistance from the police and the courts in enforcing it. Through our campaign with posters and the newspapers the terms of the ordinance have been made known throughout the city, and if anyone is now making illegal use of our transfers it is not because he is ignorant of the law but because he thinks he is more clever than others and is willing to "take a chance."

Let me quote the section of our city laws under which we have made all these arrests:

It shall be unlawful for any person to sell, barter or exchange for any consideration whatsoever any street railway transfer ticket or other instrument issued by any person or corporation operating any street railway within the city giving, or purporting to give, to the holder of such transfer ticket or other instrument the right to transfer, without the payment of additional fare, from one car to another car on the same line or route, or from one line or route to the car or cars operated upon another line or route; or for any person to give away any such transfer ticket or other instrument as aforesaid to another for the purpose of enabling, or with intent to enable, the latter to use or offer the same for passage upon any street railway car or cars; or for any person not lawfully entitled thereto who shall receive any such transfer ticket or other instrument as aforesaid to use, or attempt to use, or offer the same for passage upon any street railway car or cars: Provided, however, that this section shall not relate to nor in any manner affect the issuing and giving of transfer tickets or other instruments as aforesaid by the agents or employees of any street railway to passengers thereof lawfully entitled thereto. Any person violating any of the provisions hereof shall be fined not less than \$5 nor more than \$100 for each offense.

The provisions of this ordinance are plain, and we had progressed some months in our crusade before any judge would agree with the defendants that it was unconstitutional. Then the Illinois Supreme Court, following a ruling in a similar case in California, decided that this was a valid ordinance. Since that time we have had no further interruptions in our work, and while successfully prosecuting an

average of almost 100 offenders each month, we have had no setbacks in the way of suits for false arrest.

The Chicago Railways Company operates practically all the surface lines on the north and west sides of Chicago, 306 miles in all. These tracks are spread over a large area, approximately a square, where the north and south and the east and west lines are about equally divided. We are compelled to issue and receive transfers at every intersecting point or wherever our lines approach within 200 ft. of other lines of the same company. The same provisions of the city ordinance extend to points where our lines connect with three other surface railway operating companies. This combination gives, perhaps, the largest number of transfer points of any city in the world. Not only that, but we issue transfers upon transfers without number, so long as the passenger is riding in the one general direction, and it is possible for a person to make proper use of transfers and travel the better part of a day, with many stopovers for the transaction of his business. If any conductor fails to make the required limiting punch mark on the slip, the privileges may be further extended, and it is not an unusual happening for a passenger to put in half of the day going in one general direction and double back on his trail to get home in the evening. These are the burdens from which we can find no relief.

In our last fiscal year we carried 373,000,000 passengers, of whom 153,000,000 rode on transfers and almost 3,000,000 were free riders. This showed a percentage of 41.03 transfer passengers out of the total. The percentage of revenue and free passengers using transfers was 69.57. Of course, there were thousands of other transfers issued to passengers who did not use them, and it was the careless disposition of these by our patrons which made work for our squad of secret service men.

Transfer Traffic

At the time we started our crusade the sale of transfers at junction points and in stores was quite general. At one point there were a dozen newsboys who solicited transfers from passengers and sold them to others. Testimony given in court showed that at this crossing alone each of the boys derived a revenue of from \$1 to \$3 per day through this source. There were other corners where the unlawful sale of transfer slips was almost as extensive. But the greatest injury to the company's business was done at points where hundreds of transfers were not sold, but were thrown down, picked up or traded daily. At one place where three important lines connected, it is estimated that several hundred transfers were presented daily by persons who had not received them from a conductor. Since the start of our prosecutions we have arrested 85 offenders at this crossing, and as a result the loads originating here are now made up almost entirely of cash instead of transfer passengers.

This nuisance had grown to such a size in the late summer of 1908 that the company decided to make a determined effort to eradicate it. Three of our investigators were sworn in as special officers and we secured a detail of two plain clothes policemen from the city to make up our transfer squad. These men first cleaned up the junction where the dozen newsboys were making a living out of the sale of transfers, and it required many raids in the morning and evening rush hours before the last offender was driven away.

Gradually we followed up each car route until we had touched at every crossing where there was evidence of the misuse of transfers. After six months of such scouting we narrowed the crusade down to a score of places where the evil had grown so strong that the daily arrest of five or six men or boys did not seem to make a proper impression on the others. At the present time there are not more than a dozen junctions, where the frequent attention of the transfer squad is necessary, and even at these points the person who picks up or trades transfers knows that he is taking a

*Abstract of paper read before the American Street & Interurban Railway Transportation and Traffic Association, at Denver, Colo., Oct. 4, 5, 6, 7 and 8, 1909.

long chance if he hands his slip to a conductor for transportation on our cars.

It was surprising to find what a class of men we got in our net. There were hundreds of laboring men and clerks by the score, but it was not a rare happening to pick out a business man of high standing who should have considered it too small a thing to beat the street car company out of a nickel. After a dozen or more of these men had been advertised in the daily papers with a humiliating account of their actions, there were few, if any, of the "silk stocking" grafters in the monthly list of "results." The patrol wagon was called into frequent service in our work, and its appearance helped to scare off many who otherwise might have failed to be impressed by the crusade at that point.

We have never asked for the maximum fine under the transfer ordinance; in fact, it has become customary to waive this charge and change to a prosecution under a disorderly conduct ordinance. This makes the usual fine about \$2 and costs, about \$8 in all, which proves sufficiently expensive to the victims to deter them from a second offense. We have had cases, however, where the misuse of a single transfer has cost the defendant \$16, and in one instance an Italian, known as the transfer king, was held to the grand jury on evidence that he was the leader of a crowd of boys who were selling transfers.

Not the least pleasing development of the campaign was the manner in which we won over many of our opponents by kind treatment of prisoners. We have not insisted on severe punishment in any case where the defendant was shown to be in hard circumstances financially, and, in fact, dozens of men and boys were turned loose with a warning when it appeared that there were extenuating circumstances. There were only a few cases where we found it necessary to arrest women or girls as frequent offenders.

Our work was looked down on when first undertaken and was decidedly unpopular and somewhat scorned by public officials and the courts, but the crusade was continued in as dignified and humane a manner as possible, and soon officials and the public generally saw that it was not a case of persecution or boys' play. They began to realize that it was a matter of considerable magnitude in a financial way and educationally, and those engaged on the job received more encouraging words, looks and friendly aid all along the line.

The public had sufficient notice of our plans: In the first place a warning notice, quoting a section of the ordinance, was printed on the reverse side of the transfer slips. Then a similar warning was posted in all our cars, and finally a notice printed in English, German and Polish—11 in. by 21 in. in size—was distributed among the principal factories and stores in the vicinity of our lines. In this last publicity work we had the assistance of the leading industrial concerns. One thousand of these signs are now displayed in places employing from 100 to 10,000 helpers, and the warning printed thereon is backed by each concern's endorsement.

We believe that this part of our plans has brought almost as good results as our raids by the police, because we have been informed that men have been discharged by their employers for failure to heed the warning given in printed notices and their fellow employees doubtless have profited by their lesson. The newspapers also have sided with us, and their editorials have played an important part in educating the people to the fact that it is illegal to give away, barter or make other improper use of transfers.

As we progressed in our crusade our trainmen also began to take an exceptional interest in the work. They enjoyed witnessing the misfortune of some of the prisoners whom they had often suspected of presenting transfers unlawfully received, and it was not long before our office got daily information from conductors and motormen as to the location of bad transfer points and the identity of individ-

uals who had been defrauding the company for months. This was quite a help to us in our plans. Another strong factor in the work was the constant vigilance of our investigators.

We have been engaged for about one year in this work and we believe that the sale of transfers at street corners and in stores practically has been stopped. We know that at corners where it was not unusual to see hundreds of transfers thrown in the street to be picked up by anyone so desiring, there is now a small scattering of such slips and they are rarely taken up for use. We know also that the cars taking a load at such places now get about 75 per cent more cash passengers than formerly in the rush hours. It is impossible to estimate in dollars the increase in earnings due to our educational work along these lines, but we believe it to be considerable. The work of educating our patrons has been costly, but when we see how the misuse of transfers has been materially reduced in one year we feel that the investment has netted good returns.

AT THE DENVER COUNTRY CLUB

The ladies had the time of their convention lives at the Denver Country Club on Thursday afternoon. Two hundred and twenty-five of them were taken in the "Seeing Denver" and other cars out to the club, where they were received by a committee consisting of Mrs. W. G. Evans, Mrs. John Evans, Mrs. James Brown, Mrs. Fred Moffat, Mrs. George Sanger, Mrs. Sam Perry, Mrs. Charles Whitehead, Miss Archibald and Miss Brown.

The club is most attractive and located in an extremely picturesque spot, affording a charming view of the hills. Excellent arrangements had been made by Mrs. Evans and her committee for the comfort, pleasure and entertainment of their guests.

A clock-golf tournament has held, the prizes being, first, a silver picture frame, won by Mrs. James W. Rollins; second, a cluney lace centerpiece, won by Mrs. Warren L. Boyer; and third, a silver picture frame, won by Mrs. W. H. Glenn. For those who did not wish to participate in the clock-golf tournament tables were set both inside and outside of the clubhouse for bridge-whist. About sixty of the ladies participated in the bridge-whist game. The prizes were, first, a silver picture frame, won by Mrs. Russell; second, a handsome silver dish, won by Mrs. Henry Clay Evans; and third, a silver picture frame, won by Mrs. A. L. Price.

During the afternoon, the wind becoming decidedly chilly, a large roaring log fire was built in the office of the clubhouse and the ladies gathered around to exchange anecdotes and experiences. At 4 o'clock refreshments were served, consisting of sandwiches, ices, ice-cream, cake, tea, coffee and chocolate.

The ladies who served at the table were Mrs. John Evans, Mrs. Fred Moffat, Mrs. Hunt and Mrs. Charles S. Clark.

The weather was rather threatening during the latter part of the afternoon, but the rain held off until all of the automobiles had left for the city, the party returning about 5:30.

It was the unanimous opinion of all the ladies present that the afternoon had been a most successful one and all of them expressed their appreciation of the efforts made by Mrs. Evans and her committee to make them feel at home and to provide them with pleasant recollections of their visit to Denver.

The gentlemen who assisted were Messrs. Charles R. Elliott, Ross Hayes, Fred Elmquist, Nathaniel C. Garland, William Wampler, W. L. Conwell and James M. Wakeman.

The Denver & Rio Grande Railroad crosses the Continental Divide at Marshall Pass, which has an elevation of 10,856 ft. above sea level.

INTERURBAN STATISTICS*

By S. C. Rogers, Treasurer, Mahoning & Shenango Railway & Light Company

Investigation of this subject reveals the fact that while statistics of interurban operation are compiled concerning almost every detail, there are hardly two interurban properties in which the statistics can be compared without first taking into consideration the method employed on each property in obtaining and in tabulating such statistics, together with a comprehensive idea as to the conditions governing their operation.

The subject is still more complicated by the efforts of the Inter-state Commerce and the several State railroad and public service commissions in attempting to outline rules and regulations concerning these matters for the guidance of the individual companies coming under their jurisdiction, and the work of this association is in the mind of the writer very clearly similar to that of a balance wheel to harmonize all these factors and finally produce a uniform standard of comparative statistics of operation of interurban railways with uniform rules for their compilation.

Recognizing the necessity of uniformity in this regard our affiliated association, the American Street & Interurban Railway Transportation & Traffic Association, has recently sought to obtain statistical information bearing on revenues and expenses as applied to freight and express traffic. It recognizes, however, that such information will not be complete because many of the companies make no attempt whatever to separate their operating expenses as between freight and passenger service and where efforts are made to segregate the expenses chargeable to freight service alone, the equity and reliability of the arbitrary bases of divisions are sometimes open to question.

This paper cannot better convey an idea of the exact situation than by giving herein extracts from correspondence in answer to four specific questions addressed to over 100 companies engaged in interurban operation throughout this country and Canada in the investigation of this subject.

1. What statistics are compiled covering the detail of revenue, traffic and operation of your interurban lines, both passenger and freight?

(a) Daily report of earnings made up within 24 hours from the reports of agents and conductors, used by operators and traffic officials as an index of business conditions.

Monthly statement of earnings, expenses and net earnings, cumulative as well as comparative, furnished to general manager and board of directors.

Statistical statement of earnings and expenses reduced to a per car-mile on passenger and a per ton-mile on freight business, furnished to operating department, where they are plotted graphically. This forms a basis of all increases or decreases in service.

Comparative statement of tonnage and revenue, showing the actual net tonnage hauled and revenue received from freight in and out of each station, furnished to general manager and traffic department, showing the results of traffic department efforts. Similar statement of passenger business out of all stations monthly, furnished to general manager and traffic department.

(b) Daily report showing the earnings, apportioned as between city, suburban and interurban companies, worked out on the basis of traffic agreement between companies.

Monthly report of service earnings and passengers of each of the three systems without regard to any separation or apportionment for the purpose of traffic agreement between the two companies or for any other purpose.

The first-named report might be named "Financial Report of Passenger Earnings," as it shows the earnings of each company or system operating under specific traffic agreements, one with the other, and the second report, the "Transportation Report of Passenger Earnings," showing the actual earnings of each division without regard to such agreements.

*Abstract of paper read before the American Street & Interurban Railway Accountants' Association, Denver, Colo., Oct. 4, 5, 6, 7 and 8, 1909.

(c) Monthly comparative report of tons moved one mile; empty cars hauled one mile; trains hauled one mile; loaded cars hauled one mile; and empty cars hauled one mile.

Average cost per train per mile for each item of operating expense; per 100 ton-miles for each item of operating expense; per ton and passenger for station service; per passenger per mile for operating expense; and per estimated loaded car-miles for operating expense.

Average number of tons moved per train per day; estimated loaded cars moved per train-mile; tons moved per loaded car-mile; and tons moved per car-mile, loaded and empty.

Percentage of engine mileage to train mileage.

(d) Daily, weekly and monthly reports show the details of operation and the classification of receipts and expenditures in comparative form, and percentage is figured in relation to track mileage, car mileage and car hours.

(e) Average mileage of road operated.

Passenger car-miles—revenue, motor and trailer, each separately. Special car-miles—revenue. Total revenue car-miles.

Car-miles—non-revenue, service and business, each separately.

Train-miles—revenue and non-revenue, separately.

Operating revenue, operating expense and net operating revenue per mile of road.

Operating revenue, operating expense per car-mile and net operating revenue per car-mile.

(f) Daily statement of passenger earnings.

Monthly comparative statement of passenger traffic with the previous year, showing the number of passengers handled, fare, transfer, free and total.

Passenger car-mileage, showing revenue, non-revenue and total.

Car passenger earnings and car earnings from chartered cars.

Average earnings per passenger and per passenger car-mile.

Statement showing movement of freight in tons of the different commodities on a receipt basis at all stations, including transfer points with steam roads; also a statement showing revenue produced by each line.

Monthly comparative statement of earnings and operating expenses, both cumulative and comparative.

(g) Daily report of receipts (being a detailed cash statement covering conductors' cash-fare collections), agents' ticket sales, agents' freight collections, scrap sales and sundry receipts from operation, compiled from treasurer's report of cash and daily traffic report.

Daily report of earnings, compiled from daily traffic report for cash and ticket earnings, from treasurer's report of miscellaneous earnings and from waybill tissues for freight earnings.

Daily traffic report, compiled from conductors' turn-ins and used as a basis for statistics covering earnings, mileage, number of passengers, car-hours, etc.

Monthly comparative statements of ticket sales by station and freight forwarded and received by stations.

Monthly statement of revenue and operating expenses.

(h) Revenue and expense per car-mile and car-hour for each.

Item of classification of operating expenses.

Average fare per revenue passenger, average freight receipts per ton, and average express receipts per ton.

Per passenger results for the following: Operating revenue, cost of power, platform expenses, other car service expenses, other expenses, total operating expenses, and net operating revenue.

Car-mile results for the following: Operating revenue, way and structures, equipment, traffic expenses, superintendence of transportation, cost of power, platform expenses, other car service expenses, general and miscellaneous expenses, total operating expenses and net operating revenue. Car-hour results for all except other car service expenses.

Daily averages for the following: Passenger revenue, freight revenue, other operating revenue, total operating revenue, operating expenses and net operating revenue.

Per cent of the following: Operating expenses to operating revenue; taxes and licenses to operating revenue; operating expenses and taxes and licenses to operating revenue; and fixed charges to operating revenue.

Revenue passengers, transfer passengers, advertising passes, complimentary free passes, employee free tickets, total passengers carried, average passengers per day, and average passengers per car.

Freight tonnage and express tonnage.

Car mileage of motor cars, work cars, passenger trailer cars and freight trailer cars, each separately, and total car mileage, average mileage, average mileage per day, and average mileage per car.

Cars operated, average cars per day, car hours, average car-hours per day.

Power, kw-hours per car-mile, revenue per mile of track, operating expenses per mile of track, and operating expenses and taxes per mile of track.

2. Method or system employed in obtaining such statistics in each case.

(a) Statistics are worked up from the following: (1) Weather and temperature report; (2) conductors' reports; (3) audit stub of conductors' cash receipts; (4) recapitulation of time table; (5) daily report of cars operated and car-hours run; and (6) statement of tickets collected, statement of tickets issued, passengers carried and earnings of the three systems.

(b) Our accounting systems are so arranged and inter-related that our reports to officers and heads of departments contain all statistics which we have so far been called upon to compile.

(c) Cash fare receipts, tickets and conductors' reports—The transportation department has a table covering each day, showing the actual number of car-miles that should be run, and by deducting therefrom the number of trips lost or the extra trips made, which conductors are required to report, we are enabled daily to compute the actual car-mileage run.

(d) The basis for the compilation of mileage, hours, etc., is sometimes difficult to decide. The Interstate Commerce Commission has decided that passenger car-hours of electric railways include not only actual time while in revenue service, but also the time consumed in running from car house to point where regular service is begun, and delay for lay-over on special occasions, such as ball games, circuses, block-ades, etc. It includes the entire time during which the crew is on duty. The commission will, no doubt, later issue instructions regarding the basis for compiling mileage with particular regard to trailers, dead mileage, etc. Such companies as are subject to the jurisdiction of the Interstate Commerce Commission will necessarily be governed in the future by the rules laid down.

3. The practical use to which each form of statistics is put.

(a) Both "Financial Report of Passenger Earnings" and "Transportation Report of Passenger Earnings" furnished to the president, general manager and superintendent of transportation, for their information, one copy of each statement being retained by the comptroller and one copy by the ticket auditor, under whose direct supervision the work is done. Incidentally the comptroller incorporates into his monthly report a detailed analysis of the statistics and results of each line, submitting them to the president, general manager and the superintendent of transportation.

(b) Each departmental head is sent that part of the detailed monthly report which directly relates to his department, and his explanation is requested of such variations. His inquiry into the situation then brings a satisfactory explanation, or brings to light some unusual occurrence.

(c) A daily record from the conductor shows the mileage, time, routes and destination, which is very valuable for court record, and also to find where the peak of our riding is. Comparison of earnings from year to year and from route to route enables us to make the unit as small as possible and to get at the exact cause of increase or decrease in business.

(d) The practical use of statistics as compiled is that of making comparison both with passenger statistics of the steam road, and with the electric lines, thus serving as a guide both to the operating and traffic departments.

(e) The statements are used by the operating and executive officials for comparative purposes and to show the differences in the cost of operation as well as the results of operation of the different divisions. It is a question whether the information is of sufficient value to pay for the work, but the fact that nearly all lines require statistical information, and the Interstate Commerce Commission as well as the railroad commissions of the various States require statistical information, would indicate that they are considered of sufficient value to warrant their cost.

(f) It enables the management to make comparisons and to keep track of all revenue, expenses, etc., and to regulate the service according to passengers carried, expenses and earnings per passenger.

(g) The principal use of these statistics is to determine what expense seems to be abnormal and what traffic needs stimulation.

4. If no traffic statistics are compiled as to passengers carried on your interurban lines from and to each individual station, is your system of recording fares collected such as to make this possible, and would this information be valuable?

(a) It has been considered of more importance with us to know the amount of business out of each station rather than the amount of business into the station, as this information enables us to place the matter before our traffic department for investigation of further needs of that particular locality to suggest improvements in the service, or other inducements to be offered which will increase the travel. Our system of recording fares was especially designed for this purpose, and could, with very little change, be made to show business to each station. In addition to a monthly statement, which shows business from all stations, we furnish our traffic department and operating officials a statement of business done between the largest towns, and on this line passenger business is largely in and out of the larger towns.

(b) No traffic statistics are compiled as to passengers carried on our interurban lines to and from each station, but the earnings of each line are apportioned between divisional fare points. Outside of the main terminal station conductors are the ticket sellers. It is the opinion of this correspondent that the actual number of passengers in and out of each station, fare-point and stopping place should be compiled rather than an apportionment of earnings, but that in either case the information is not of sufficient practical value to justify the labor and expense involved.

(c) We compile traffic statistics, our lines being divided into fare zones, and conductor's day-card is so arranged for reporting passengers carried through each fare zone. We have at certain periods worked up data relative to the number of passengers to and from each individual station for special purposes.

(d) Statistics are compiled showing the amount of business in each division and each agency station. Passenger statistics are worked up from agents' monthly ticket reports, conductors' reports of cash fares, and interline ticket reports received from foreign lines. All except the conductors' reports are worked out on blank sheets of journal paper. Conductors' reports of cash fares issued are abstracted on triangular form and totals for the month carried forward to journal paper, the combined totals so obtained being total passengers carried as taken from the recapitulation of the conductor's book for the month.

(e) It is impossible to give the exact number of passengers carried to and from each individual station for the reason that our line runs on the highway more than half the way and makes local stops.

(f) We do not compile any statistics of passengers carried on our interurban lines between individual stations. Our system would enable us to do this in a great many instances, and we are enabled partially to arrive at it through the record of ticket sales to each station, but we do not think its value to us would outweigh the additional labor and expense in keeping it fully.

(g) About 70 per cent of our business is either upon commutation or card tickets, and it is possible to compile the number of passengers carried from station to station, and the revenue thus derived. It is of interest, both to the operating and traffic officials, to obtain this information, as it is of great importance in coming to a determination as to the necessity of complying with requests to open new stations, or as to the possibility of closing those which we may already have, and it is also extremely useful in making comparisons with steam line revenues from and to the same stations.

(h) Other than ticket sales reported by agents, no attempt is made by this company to compile statistics local to any particular station, and except in special cases I can see no necessity for such information.

(i) We do not compile statements of passengers carried between individual stations, and although it would be possible for us to prepare a statement of this character, the cost would be large. We do not think the information would be of sufficient value to warrant the labor and expense.

(j) In the passenger department we keep a traffic sheet which shows detail of ticket collections and cash fares, giving selling point and destination and value of each. This requires one sheet per month for each station and is a complete record of all tickets or cash fares from such station to all other points on the road. This sheet shows the number of passengers carried from and to each individual station.

(k) We have found no method whereby we can arrive at the number of passengers carried between individual

stations. We feel, however, that this information would be of service to us.

(l) While our fares are classified as to the different prices, the register does not show to or from any station. No such statistics are compiled, as we have never considered them of sufficient importance.

(m) This is very important information to have if it can be obtained without too great complication and expense. On our line we are basing our fares on a two-mile zone, but have never worked out details fully.

(n) We do not keep any account of passengers carried from and to individual stations on our line. We have over 100 stops on our western divisions alone, so that this information would be quite difficult to obtain and of doubtful value. About 55 per cent of our interurban passenger earnings are ticket sales, the balance—45 per cent—represents cash collected by conductors.

(o) Our own experience has been that the expense of ascertaining travel from and to each individual station and stop is not justified by the value of the information thus received. We did this for one week on our entire system, and in addition to requiring extra conductors at the time, our auditor was compelled to work a number of extra clerks for several weeks in order to tabulate the information. However, such information would be of value where it is desired to ascertain whether or not a particular run is profitable.

(p) It is not possible, without making special provision, for us to compute the number of passengers carried from and to each individual station, nor do we, under our conditions, consider that the information would be of much practical value to us.

(q) The only regular traffic statistics we compile consider value only, regardless of destination or direction, although we are able to deduce some information as to how our traffic originates. Occasionally we take stubs of tickets and plot the results, from which we can tell accurately the business done from the several points, although we are unable to tell direction passenger was traveling. We would be glad to have these statistics compiled regularly, but do not believe they would be worth to us what the cost would be.

(r) Until quite recently our interurban lines have been operated on the fare zone method of collection, which would require considerable labor to compile statistics regularly as to the amount of or direction of travel at any particular point. We have, however from time to time, compiled statistics for a few days or a week at a time. Such information we consider quite valuable, but not sufficiently so to warrant the expense necessary for regular compilation.

(s) Our interurban lines do not permit quick service between termini. They consist of several local lines joined together and afford an opportunity for interurban traffic. We have not, therefore, considered it practical to make a distinction between interurban traffic and local traffic, and have not considered this information of sufficient value to make any attempt to obtain it, and, I doubt, under our conditions, if it would be practical to do so, although I appreciate it would have many advantages.

(t) We compile no statistics as to number of passengers carried from and to individual stations, although we could get this information from our tickets and cash fare receipts if we felt that the large amount of labor involved would be justified. At one time we worked this information up for one week, but never attempted it afterward.

Practice in Computing Car-Miles and Car-Hours

As an examination of the correspondence, especially of the forms submitted, which were in large number, indicated that the basis of computing car-miles and car-hours, the two principal units of comparison, were many and varied, the following extracts of letters are submitted as illustrating this fact and containing certain suggestions for more uniform practice:

(a) If we have a motor car pulling two express trail cars we obtain the mileage of the train and multiply by three. The same method is used in obtaining car-hours. We have frequently taken data pertaining to train-miles and train-hours showing the average number of trains daily and the average train-hours per day. It is intended to modify this data by showing locomotive or pulling-car mileage separate from the individual car-mileage. We have a number of electric locomotives that are beginning to haul cars. I believe that ton-mileage would serve a better purpose, even though different companies handle different classes of shipments bearing different rates, etc.

(b) We have discontinued using car-hours as a basis for statistical data, but follow the usual practice in figuring mileage, the mileage of the locomotive being added to the

mileage of each car to determine the revenue car-miles. We use for handling our freight business on one division a steam locomotive, on another division an electric locomotive, and on other divisions motor cars with and without trailers. We include the mileage of both motor-car and trailers in our mileage statistics.

(c) We consider that each car operated for one hour, whether motor-car or trailer car, whether operated singly or in trains, represents one car-mile, making a part of the total car-hours and total car-miles of the system in computing earnings and expenses per car-hour or per car-mile. In view of that fact that the weight of the car operated, directly and materially affects the maintenance of the track, line, cars and the power consumed, a unit should be used entitled "car-mile tons," or some other approved term, the tons referring to the weight of the cars operated. Consideration should be given to "trail car-miles," but they should not be on the same basis as "motor car-miles."

In the operation of cars in trains, consisting of a motor car pulling one, two or three trail cars, the wages of motor-men per car-mile would be affected and the cost per car-mile would show very different results when comparing the operation of motor cars operated singly with the operation of motor cars and trail cars operated in trains. The speed at which the cars are operated, the conditions of operation with respect to the number of stops, the type of track and condition, as well as the difference in types and weights of cars operated, are all factors that affect results, as shown by the car-mile unit, and, therefore, should be taken into consideration.

(d) We consider the mileage of passenger cars from the division terminal to the point of going into service, as revenue passenger car-miles, for the reason that with hardly an exception the car immediately enters service when leaving the terminal. Should a passenger car become disabled or wrecked the mileage of that car from the point of disablement to the division terminal would be considered non-revenue passenger mileage. On certain of our lines cars are operated in trains of from two to six. This mileage is compiled on the basis of that made by each car, the train-mileage not being considered. We have practically no non-electrical equipped passenger cars in service.

The compilation of freight car-mileage is handled in the same manner as that of the passenger car mileage. Each freight conductor on his daily time report shows initials, car number, loaded or empty, and from point to point handled by him during the day. Conductors of work trains are required to turn in a regular work train report showing every car, loaded or empty, handled by them during the day and between points.

In our car accounting bureau we keep a record of each passenger, freight or work car owned by the company. This record is posted daily and totaled at the end of the month statements being furnished to the electrical and mechanical departments as to the mileage made. From these statements these departments base the efficiency of gears, pinions, motors, controllers, etc., installed on each car, a record being kept of the installation or transfer of all such equipment on each car by the different departments.

(e) All of our statistics of passenger car mileage are based upon actual mileage of each car in a train, whether motor or trailer. "Ton-mileage freight" includes the gross tonnage of the train, motors as well as trailers, and is worked up from the car and tonnage report.

(f) In the case of our company we have always considered mileage of motor cars only in computing passenger or freight revenue and expenses per mile, regardless of whether one trailer or several were hauled. Freight traffic, therefore, seems to resolve itself into a question of tonnage rather than mileage, in order that accurate results may be secured. While we consider mileage as car-mileage it is in reality train-mileage, and when considered as such the number of trailers hauled on particular trips do not have to be considered. The trailer mileage cannot be entirely ignored, however, and in our case an item of "total trailer mileage" is included in our statement of operating statistics. In the case of car-hours we follow the same general plan.

Statistics Must be of Practical Use

Statistics are valuable only when put to some practical use. What is essential that the presidents, general managers and individual superintendents should know in order that the property may be operated to produce the maximum revenue with the minimum of expense consistent with proper maintenance, is the question that should be given mature consideration by every accounting officer, and this is particularly true of interurban operation. Condition of

operation must govern in determining the statistics to be compiled in each case.

I have sometimes felt, and presume that many have had the same experience, that our efforts to furnish daily, weekly and monthly elaborate statistics figured to the fourth decimal point have not attracted the attention and provoked action on the part of operating officials that their importance would warrant and that maybe the same information at special periods, rather than regularly, would get better attention for the reason that the regular reports become more or less a matter of routine and often pass to the file as a matter of course.

A busy man does not wish a mass of figures. Find out what the management wants to know and present such information on one side of a single sheet of paper in such a manner that it can readily be grasped in a moment of time.

There is one form of statistics that has proved of very great value to the management of a particular property, and which I do not think, as a rule, is furnished, and that is the detail of labor costs separate from material. To know what percentage of the cost of the different items of classification represents labor and what material, is of interest and value to the management as it shows immediately by comparison with previous months wherein labor has increased and material decreased, or vice versa, inviting more careful scrutiny of the large item of labor costs which, in the majority of instances, represent between 50 and 60 per cent of the total operating expenses, and it is in the labor item where economies generally are affected. This is done by making a division as between labor and material on each account, and when a voucher is entered under its proper general heading it is at the same time entered in what is known as an "Abstract of Expenses," which consists of a loose-leaf in binder form, each leaf representing a classification of account and ruled for columns as between material, labor and total. These individual leaves carry full information concerning every charge made from month to month and any statistics may be compiled concerning the costs of operation without reference to voucher files or otherwise. It involves very little additional labor and has resulted in more practical benefit in the operation of this particular property than anything ever attempted in the statistical line.

Another item of statistics that indicates at a glance the actual conditions of a property is to show by percentage the relation of total fixed charges to the gross revenue.

As to the value of so-called traffic statistics, one can readily see how an interurban line, say 50 miles in length, might be operating its cars for the full distance and be earning an adequate revenue per car-mile, at the same time carrying the bulk of its passengers over one section of the line, due to the lack of knowledge as to the density of traffic, while a system of collection of fares, designed to furnish information as to the number of passengers from and to each station, would serve to reveal this fact. It might also serve to indicate that certain stations on the line might be discontinued as stopping points for limited service, confining the services at these stations to local cars, thus improving the service for through passengers and increasing the earnings per car-hour. This is a class of information, however, in the majority of instances, which might be obtained periodically rather than daily or monthly. I believe, however, that a system of collection of fares should be laid out for the purpose of obtaining such information when needed.

Taking the car-mile and the car-hour as the two units of comparison, I find, for instance, in the case where in interurban practice it is customary to operate cars in trains, that some companies takes the mileage and car-hours of the electric locomotive, or motor car plus the mileage, and car-hours of each trailer, while others take the train as a unit. Some companies include the mileage from the car-

house to the point at which the car starts on its schedule run and commences to earn a revenue, applying this as a unit for comparison of both revenue and operating expenses. Others take only the revenue car-miles or the mileage of the cars operating on its regular schedule. Some companies figure the mileage from the transportation department reports of car schedules, while others figure from the conductor's trip card as to operation of each individual car each day.

We have a very complex situation, when considered in the light of comparative statistics between companies; we have no unit of comparison that can be applied with equal force and value between companies. Our present units, "car-miles" and "car-hours," mean little or nothing unless all the many factors governing the individual operation of each company are considered.

The operation of interurban railways offers many intricate problems peculiar to itself and to this particular industry. We furnish service somewhat similar to that of the steam roads, but only to the extent that we carry passengers and freight. The difficulty of the collection of fares, due to the many stops and often local conditions, necessitating the use of the same car in certain portions of the road as a local street railway car, and for carrying passengers long distances at high speed and the many different conditions that apply in franchises and ordinances of different localities and peculiar traffic agreements between companies, make the compilation of statistics, of comparative value, a most complex one.

I think, however, that the time is ripe for this association to appoint a committee to act with and in connection with the committee on standard classification of accounts to take up this matter of defining as a standard of this association the character of the car-miles and car-hours, the method upon which they should be computed, and the fixing of a standard unit of comparison which will be comparative as between companies; this committee to represent the association before the Interstate Commerce Commission or other Federal or State commissions, to secure uniformity of ruling on this subject.

AWARD OF BRILL PRIZES

It will be remembered that on Sept. 28, 1908, The J. G. Brill Company offered three prizes to the students of the technical schools of the United States to be graduated in 1909 for the best three theses on the subject of "Design of an Electric Car for City Service." The first prize consisted of \$250, the second of \$150 and the third of \$100. In April, the company announced that in addition, it would give to the winner of the first prize, a gold medal issued in memory of John A. Brill, the former vice-president of the company. The successful winners in the contest have just been announced. They are as follows:

First prize of \$250 and the John A. Brill Memorial Medal to Charles T. Ripley, University of Illinois; residence, 414 Maple Avenue, Oak Park, Ill.

Second prize of \$150 to Victor D. Dressner, Polytechnic Institute of Brooklyn; residence, 2460 Seventh Avenue, New York City.

Third prize of \$100 to Robert T. Pollock, Worcester Polytechnic Institute, Ashland, Mass.

The Griffin Wheel Company, Chicago, Ill., is showing samples of single and double plate spoke center, chilled cast iron wheels which are adapted for all classes of street and interurban railway service.

The Exposition Monument at the Alaska-Yukon-Pacific Exposition in Seattle is a Corinthian column 80 ft. high entirely covered with gold from Alaska.

PAYROLLS AND TIMEKEEPING*

By N. E. Stubbs, Auditor, United Railways & Electric Company, Baltimore

In considering the question of timekeeping and the handling of payrolls the first thought would be the very important part which timekeeping and payrolls bear to any large industry, particularly the railroad field, where we have no factory cost tables to guide us and where the workers are of many grades, scattered all over a city and its suburbs, necessitating the employment of competent timekeepers. Where the nickel is generally the maximum standard of receipt of a railroad, with the patron paying that nickel ever clamoring for more in return and the company anxious to increase its business by comfortable and attractive service, it is most essential that operation, of which labor is such a large factor, should be kept ever to the point of strict but sensible economy as well as accuracy and every attention given to perfecting methods which would throw a safeguard around this important outlay. Those of us whose work carries with it the compilation of statistics of comparative costs, percentages and other interesting data, are shown conclusively what an important bearing labor has on the operating expenses of any road, and my company, having these facts in mind, has never deemed it advisable to restrict the paymaster in making any reasonable expenditure for the company's protection.

Officials, Departmental Heads and Clerks

The salaries of our officials and heads of departments generally are paid by voucher and check at the end of each month; and the salaries of the large clerical force are paid monthly by the envelope system, a receipt being given on a voucher, made out for each employee.

In cases of resignations, new employees, increases of salary and other changes, letters to the paymaster and auditor must be sent by the heads of the departments as authority. If the changes are very marked they must bear the approval of the president.

The motormen and conductors, track, overhead, power stations and other employees, numbering about 4,000, are paid each 10 days by the envelope system, i. e., on the 15th, 16th and 17th for pay ended the 10th of the month; 25th, 26th and 27th for pay ended the 20th of the month; 5th, 6th and 7th for pay ended the last day of the month, and each man signs in the payroll book opposite his name.

Motormen and Conductors

The dispatchers' time sheets, certified to by the line superintendent, are checked against the schedule operated and the conductor's manifest, so as to insure their correctness as to name, time, etc., and, after being passed by the checker, are entered in the payroll books daily.

At the end of the 10-day pay period the time is extended and rate of pay and amount due each employee are placed opposite his name. These amounts are then checked against the dispatcher's time books and any differences investigated and adjusted.

The foundation of the motormen and conductors' wages is a schedule, which is approved by the general manager. This schedule shows the time the crew takes a car, the leaving time of the various trips of the run operated and the time the crew leaves the car.

The superintendent of the line makes out his run list, showing the run number, car numbers, trips, motormen and conductors, time out, time in, total and remarks. Each run on the schedule calls for a certain number of hours and minutes. If there are no delays the employee is paid ac-

cordingly and his name is entered upon the daily time sheet, on which is written the run number, the name and the time, i. e., "regular per schedule," "extra tripper" (not on schedule), "delays," "special" and "totals."

In case of fires, etc., the crews are paid from the time they leave the barn until they return, the extra time over and above the time provided for on the schedule being entered in the "delay" column on the time sheets and the cause for same noted. When attending court in accident cases they are paid through the claim department for the time consumed.

Investigations are arranged as far as possible to avoid an employee losing time. There are times, however, in special cases where employees are used as witnesses in an investigation, for which they are paid for the time lost.

Track Department

On the maintenance work two timekeepers visit each day the majority of the gangs (always including the most important) and the time of the men, the rate of pay of each, together with the character of work done, is noted in a daily time book, a separate book being kept for each of the four divisions into which the system is divided.

Each of these four divisions is under the supervision of a division foreman, and each afternoon the timekeepers check up with these foremen (who also keep a record of the time made by all men in their respective divisions) and also obtain from them the time of such gangs working on outlying sections as the timekeepers may have been unable to reach during the day.

The following day the timekeepers, each one of whom covers two divisions, post from these four daily timebooks to two 10-day payroll books and on the 11th, 21st and last day of each month these 10-day books are extended, totaled, approved by the chief engineer and turned over to the paymaster's department.

After the timekeepers have completed their posting to the 10-day books the daily time books are turned over to a bookkeeper, who extends the time (in dollars and cents) made by the different gangs on each particular piece or kind of work and distributes the correct amounts to the various sub-accounts of the department. This information is then recorded daily on a specially ruled sheet, each amount under its proper classification, and at the end of each 10-day period is totaled and sent to the auditor.

In order that the department may receive the proper credit for all work done for outside parties or other departments, or for work other than actual maintenance, a record is also kept by this same bookkeeper of the daily amounts so spent and department charges, or cross entries, charging the proper accounts and crediting maintenance, are made up at the end of each month.

On construction work, where handled by our own men, the same procedure is followed except that a different timekeeper is detailed on this work and the checking with the division foreman is eliminated as the jurisdiction of these foremen is confined exclusively to maintenance. On this character of work the distribution is sent to the auditor once a month, although the payroll is made up in 10-day periods and the men paid exactly the same as on maintenance.

On work done on force account, on percentage basis, one man is detailed to look after the timekeeping for the company. The information as to the number of men working and the time made by each is made up in duplicate, and after being signed as correct by the timekeepers or both the railway company and the contractor, one slip is turned over to the contractor and one kept as an office record to check the contractor's bill when presented.

When contracts govern work and the charges are to be made by measurement of excavation, track laying, ballasting, etc., the work is checked by the company's engineer and the bills of the contractors are approved on this basis.

*Abstract of paper read before the American Street & Interurban Railway Accountants' Association, Denver, Colo., Oct. 4, 5, 6, 7 and 8, 1909.

Overhead Line Department

Each foreman at the end of the day turns in a time sheet for himself and for each of his men; from these sheets the timekeeper prepares a time sheet daily. This is approved by the departmental head and forwarded to the paymaster as soon as made out. In addition the timekeeper makes a transcript of the time in a book and turns it into the paymaster's department at the end of the 10-day period for checking as to rates and computations. The payroll is then made up in the paymaster's office and the distribution made from the foremen's daily sheets by the timekeeper in the line department office is sent to the auditor at the end of the 10-day period.

Power Stations

A time clock is installed and each man rings "in" and "out," time cards being used for this purpose. These cards are changed by the timekeeper, whose office is located directly opposite the clock (thus enabling him to keep track in a general way of men going in and out), and are used by him in making up his time book for the 10-day periods, after which he turns them into the paymaster's department, first being approved by the superintendent of motive power. The timekeeper at the same time turns into the auditor's office the distribution of time shown thereon for the operating department to the various accounts.

Station men engaged in work other than distinctly operating, as well as the construction crew engaged on reconstruction or construction work, turn in at the end of each day, in addition to these cards, work cards upon which are noted the jobs and the time spent on each job. These cards are inspected by the foreman in charge of the men and are then used by the timekeeper in distributing the time to the proper accounts.

In the case of special jobs, where it is desired to keep an accurate record of time required to do this work, a special job number is given and all time upon that particular work is charged to that number.

Car Shops

The various departments of the main repair shops are equipped with Dey time registers and the workmen register the time of arrival and departure against which is checked the time shown upon the foremen's time sheet. This latter sheet is made up each day and turned into the office of the superintendent of shops at the completion of the day's work.

At the various car houses not equipped with time clocks the shop foreman forwards each day to the shops office a time slip for each individual employee showing a distribution of the time of each employee and the total number of hours worked. He also enters in his time book the number of hours and forwards this time book every ten days to the office of the shops department. This time book is used as a check against the time slips forwarded each day.

From the data furnished by the time card and time sheet the daily time report is made up, approved by the superintendent of shops and forwarded to the paymaster each day.

For the information of the superintendent of shops a monthly summary sheet is prepared showing the number of hours of work made by the various departments or car houses at the end of each ten-day period.

To carry out work other than maintenance of equipment or work for other departments, special job-work requisitions are issued, and are furnished to the foreman of each department concerned. Upon completion of a piece of work a department charge, in the nature of a bill, is rendered against the department or account for which the work was required. The department doing the work receives the credit according to the distribution of accounts.

Payroll Department

This department is in charge of a paymaster, who re-

ports to the cashier and has as his assistants five entry clerks and one checker. At the end of each pay period the paymaster makes up his report, showing the number of employees, hours and wages for each department and furnishes a comparison with the same period of the previous year. He also prepares a comparison of the wages of motormen and conductors, showing service mileage, hours and amount and comparison with the same period of the previous year. A comparative statement of employees—power-house organization—is also made up. These are forwarded to the president and general manager for their information. A recapitulation of the payroll is forwarded to the auditor, who draws a voucher, forwards it to the treasurer and a check is drawn to the order of the cashier, who with guards goes to the bank for the money for the paymaster, who verifies the amount received with his payrolls. Each employee's name on the payrolls is numbered and the envelope system is used in paying off. Before the money is placed in the envelope it is verified by a checker, who is held responsible for the correctness of the amount placed therein.

The paymaster is in charge of the pay car, which is scheduled to be at the various barns at certain times, and has as his assistant the entry clerk whose books he is using that day. The pay car was built especially for the purpose and has safes and wire guards for the protection of the money. The crew of the car is stationed upon the platforms and regulates the entrance and exit of the employees. All in charge of the car are armed and every precaution is taken to safeguard the money. All employees must sign the payroll when paid, and signatures are witnessed by the paymaster and his assistant.

At the end of each three months all unpaid wages are returned to the cashier by the paymaster, and the amount is credited to unclaimed wages. This report is certified to by the paymaster and two checkers and is receipted for by the cashier and audited by the auditor. The amount of each envelope returned to the cashier is tabulated in a sub-ledger by the paymaster. If claim is made and found correct it is paid by the cashier through petty expense, and so noted by the paymaster on his sub-ledger, and at the end of each month the balance is checked against the balance on the general ledger of the company.

General

Of the three large roads which I visited recently I found that none paid off by the envelope system or did they obtain any written receipt from the employee. One of these roads has a roll of over 15,000 names and to place the money in envelopes and obtain a receipt on a payroll book was claimed to be out of the question when the paymaster could pay out the money directly from his cash box almost as rapidly as the men could file past him and have their names and amounts checked on the roll by his assistant. However, these roads did furnish time cards to the majority of their men, which were filled in, signed by each employee and handed in when he received his pay. Any difference of 50 cents or more was adjusted on the next payroll. The lower class of labor had brass checks or cards for identification.

One road used the Dey time clock for its motormen and conductors and the time of going on and coming off a car was punched by a recorder on the conductor's manifest, which was used to make up his time. On another road the motormen and conductors paid themselves each day from the passenger receipts of their cars, noting the same on their manifests.

It would seem that each road should have in its timekeeping and payroll department competent and loyal men, and such system of comparisons and checks as would keep the management in touch with the entire labor situation in every department.

REPORT OF THE COMMITTEE ON POWER DISTRIBUTION*

By James Heywood, Chairman; W. J. Harvie. G. W. Palmer, Jr., S. L. Foster, W. G. Matthews, and E. J. Dunne

The committee decided to work as closely as possible to the outline submitted by last year's committee, giving special attention to those subjects which were designated by the executive committee. It has been thought advisable to submit with this report a number of specifications for material used in power distribution.

High Tension Feeders

Underground high tension cables have passed the experimental stage, and are giving satisfactory service in a large number of installations. The majority of the later installations have been made with paper insulation. The highest voltage of which the committee has knowledge is 25,000, and this is rather the exception than the rule. From 11,000 to 13,200 seems to be the most popular range of voltage.

In Appendix A [Not republished.—Eds.] will be found a specification for use in purchasing high tension underground cables. In view of the high cost of cable of this kind, the committee recommends that in general cables be made large enough to accommodate future needs; in fact, in usual installations it is well to install as large a cable as can be pulled through the ducts. This applies to entire underground installations.

Rubber and cambric are sometimes used for high tension underground cables, and if it is desired to use rubber, the committee recommends that the specifications in Appendix B [Not republished.—Eds.] be used to determine the quality of rubber compound.

High tension cables should be protected outside the lead where they pass through manholes, the common practice being to cover the lead with woven asbestos saturated with a solution of silicate of soda. The silicate of soda solution should be omitted in manholes that are full of water. This method of protection is recommended by the committee.

Where overhead high tension transmission circuits are used, the committee recommends steel supports in the form of towers where the line is isolated, and when along the tracks to be supported from extensions to the structure that supports the trolley wires. All steel towers should be galvanized, and subjected to the test for galvanizing given in last year's report, to obtain the most economical results.

Some special conditions demand the use of wood poles instead of steel towers, for instance on streets where the line must be carried along the sidewalk, and in climates where wood is not subject to decay.

As illustrative of special conditions, Appendix C gives a discussion by S. L. Foster, of this committee, showing some results with moderately high tension transmission lines in California. [Appendix C presented elsewhere.—Eds.]

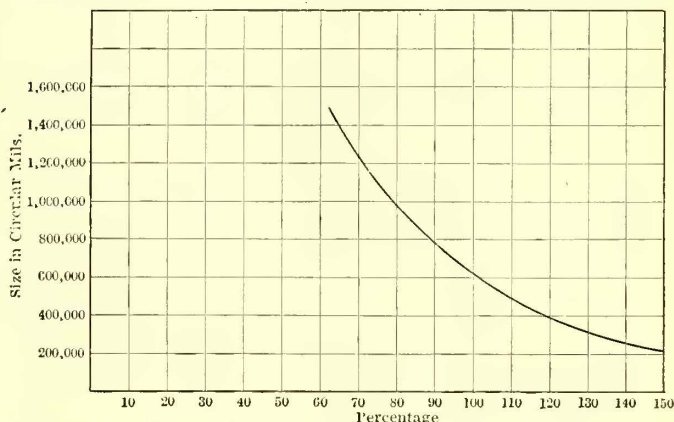
With the new form of suspension insulator, and with ten feet of vertical separation between conductors, the use of wood poles for even ordinary spans is out of the question when ample clearance between lowest conductor and foreign wires or even the earth is maintained. The steel tower or pole is practically invulnerable to fire and is safe from deterioration and from short circuits by climbing animals.

The suspended insulator is built up of a series of insulator units connected together by hooks and eyes. Each disc-shaped unit has a mechanical breaking strength factor of safety of from 25 to 50, even after all the flange has been broken off. In case of a broken or burned off conductor, this reserve strength in the insulator would take care of the unusual strain, and not result in a broken insulator or a split cross arm. The flexibility of the suspended type of insulator also raises the factor of safety. On one California

154-mile steel tower line now being operated at 75,000 volts and intended to be operated later at 110,000 volts, five units in series are used, each tested at 65,000 volts, giving an ultimate factor of safety of three. On another 150-mile steel tower line in the same state with 60,000 volts at present and 100,000 volts as prospective, five units tested to 90,000 volts each are used, giving a factor of safety of 3.6. Another 13,200-volt transmission in the same locality contemplates a three-part insulator of a test voltage of 80,000, or a factor of 6.06. Assuming that city construction averages \$50,000 per mile, and high tension insulators cost 40 cents each, the cost of high tension insulators is a little over 1/100 of 1 per cent of the total cost of construction, exclusive of cars, buildings and power houses on a large street railway system there. Such being the case, the advance from an admittedly inadequate factor of 5.34 to one of 6.06, the sufficiency of which is yet to be demonstrated, seems not over-cautious in the light of the great importance of absolute continuity of service in heavy street railway operation demanded now.

Other qualifications of the suspended insulator are: Superior accessibility for cleaning and observation; and superior resistance to missiles.

If wood construction were to be attempted on a scale corresponding to that of the steel tower, the cost would probably exceed that of the steel tower and would last only eight or ten years, whereas the galvanized iron tower should



Power Distribution—Fig. 1.—Cost of Re-Leading Cable According to Cost of New Cable Less Scrap

last indefinitely. Also, greater durability of the conductor is assured when it is strung on suspended insulator because of less crystallization at the point of support. It has been the experience in California where after a year's operation on spans varying from 350 to 4000 feet and towers varying from 50 to 300 feet high and 60,000 volt lines that no short circuits are made in high winds. As steel towers consist of many separate pieces which are only assembled when at the point of erection, it is easier to transport a tower piecemeal to a location difficult of access than it would be to transport a wooden pole of equal height.

Low Tension Feeders

The committee recommends the use of paper insulated and lead covered cable for underground service. Specifications for this material have been prepared. There are two methods of disposing of condemned underground cables, viz., scrapping and rehabilitation.

Where re-leading is practised, a small stock of cables is maintained. When a cable fails, the faulty section is replaced from stock, the bad piece re-leaded and placed in stock. It is also possible to splice two or more pieces of cable together and re-lead them, the outside diameter at the splice remaining the same as in the continuous cable.

When it is necessary to change large quantities of cable from one location to another, as for instance when a new substation is installed, the re-leading of cable becomes a very attractive method, as shown by Fig. 1. It is more eco-

*Abstract of report read before the American Street & Interurban Railway Engineering Association, at Denver, Colo., Oct. 4, 5, 6, 7 and 8, 1909.

nomical to re-lead the large sizes, but when the size is small re-leading becomes more expensive than scrapping the old cable and purchasing new.

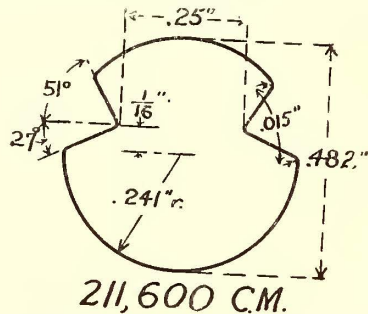
When underground cable is scrapped it can be sold as junk, or it can be separated either by stripping the lead and insulation by means of chipping knives, or it can be separated by heat. The metals in underground cables can be separated in a special furnace at a cost of labor and fuel of about \$0.002 per pound. A furnace for such service can be built for approximately \$300 exclusive of flue and stack.

Considerable work has been done by individuals and various associations of manufacturers and engineers in the drawing of specifications for rubber insulated wire and cable.

The committee has gone over the various specifications which have been prepared, and at present is of the opinion that instead of drawing a complete new set of specifications, it is better to use such portions of the specifications recently adopted by the Railway Signal Association as are applicable to the work of street railway companies, if a compound of pure rubber and mineral matter only is desired. This is done with the consent of the Railway Signal Association.

A reputable brand of wire that uses rubber and bitumen compound is unavoidably ruled out by these specifications. At the present writing no satisfactory specification has been drawn that covers this class of rubber, although it is recognized as a perfectly satisfactory product. Overhead low tension cables are in such common use that little (that is new) can be said in reference to them.

A marked improvement has been shown in the results



Power Distribution—Fig. 2

given by lightning arresters for low tension service. With a liberal distribution of lightning arresters along overhead feeders they will probably save their cost in the prevention of burned out insulators and delay to service. Some roads find it advantageous to install arresters as frequently as 10 per mile. Where overhead feeders connect to underground or submarine cables, arresters should be installed at the junctions. A paper on the subject of lightning protection has been prepared by J. V. E. Titus at the request of this committee, and is published elsewhere.

Working Conductors—Ordinary Trolley

The committee holds the opinion that for roads with frequent service a 211,600 circ. mil wire should be used, preferably of the grooved section. The American standard section of grooved wire has been sufficiently tried out to warrant its adoption as standard by this association, with the possible exception that manufacturers who draw the groove, rather than cut it, shall be permitted to increase slightly the radius of the curves shown as 0.015 in., working as closely as possible to the drawing. Fig. 2 shows the section referred to. The committee has considered several specifications for trolley wire, but has been unable as yet to decide on a practical one. The committee can only report progress on this subject.

Where excessive wear on the trolley wire is encountered and conductivity can partly be sacrificed by reason of sufficient feeder cables, wire of special alloy or of steel has been

found to give longer life and is recommended by the committee.

We recommend that for round trolley wires, a clinched ear be used. There is some difference of opinion as to the proper length of the ear, and we hope that a future committee may be able to arrive at a definite length of clinched ears and prepare a standard drawing for adoption by the Association, together with a formula for the composition of the metal in the ear.

Insulators and Hangers

In view of the delay to traffic incident to burned out line insulation, the committee considers it economical practice to change insulators that are defective, but that have not yet totally broken down. With this end in view a method for testing of faulty insulators has been devised and is giving good results. Two phosphor bronze springs are supported from a wooden cross-arm near the top of the trolley pole on a car. These springs are well insulated from the trolley pole and are made so flexible that they will not catch in the overhead work. As the car is run along the line the springs come in contact with the span wires on each side of the hanger. A wire leading down from the springs is connected through a relay to ground when it is desired to test the hanger. Leakage through the hanger actuates the relay and through a secondary circuit is recorded on a piece of moving paper. Where iron poles are used and it is desirable to test the strain insulators in the span wires, the wire leading from the springs is made alive from the trolley through the relay, hence in passing under a grounded span the relay will be actuated as before. It is necessary on a single track road to run over the line twice to get a complete test of span and hanger insulation. On a double track line it is necessary to run down one track testing the hanger insulation and up the other track, testing the strain insulators.

By means of adjustable resistance the relay can be set so that it will work at any predetermined leakage value. A view of the spring contacts used in this arrangement is shown in Fig. 3.

Line Material Tests

In view of the small amount of data obtainable in reference to the properties of overhead line material and insulation, the committee has thought it advisable to make certain tests on this class of material from which data could be compiled and rendered valuable for ordering line material. Owing to unavoidable delays, as much progress as was desired has not been made in this direction. Some work, however, has been done, and the results obtained are outlined in Appendix F. [This appendix is presented elsewhere.—Eds.]

Your committee has gathered a number of opinions on the subject of wood pole preservation, and are of the opinion that poles should be treated at and near the ground line. A paper by J. M. Nelson, of the U. S. Forest Service, published in the *Electric Railway Journal* for April 3, 1909, page 628, describes the causes of decay and the principles of its prevention.

A difference of opinion exists in reference to the use of concrete around wooden poles. Good results, however, have been obtained in San Francisco by means of concrete setting, poles having been in service fourteen years set in concrete and are still in good condition. These poles, however, were of redwood, which is not available in all parts of the country.

A patented process for reclaiming wood poles which have been decayed at the butt by means of re-enforced concrete, has been brought to the attention of the committee. It is too early at this time to say what the results will be.

Repair of Poles

The principal seat of trouble in old poles is at the ground level, where the moisture lies the longest and either cor-

rodes metal poles or rots wooden poles. In selecting a method for repair, the essentials are: The work should be done with common labor; no special tools should be required if possible; the fault should be entirely eliminated—i. e., further corrosion or rotting of the pole stopped; the repairs should be permanent, i. e., no further maintenance should be required; when complete, the poles should be as strong as when new; the cost must be low. To attain this there are at present several methods in use:

One method, applicable to metal poles only, consists of filling the inside of the pole with grout in which steel rods

are fixed, in order to obtain the desired strength of the original pole, computation shows that a considerable amount of steel must be bedded in the grout, and then the cost becomes almost prohibitive. With less rods only part of the original strength is obtained. The concrete being entirely enclosed, it takes a very long time for it to set; in the meantime, if the pole is badly corroded, and as the corrosion is all the time going on and increasing on the outside, the pole is liable to bend or collapse; further, the swaying and vibration of the pole is liable to loosen the bond between the concrete and the metal, and therefore the strength to be greatly decreased. It has been found out from actual experience that in the winter time, when the metal of the pole contracts, the inside plug of concrete does not permit of such a shrinkage, and the pole splits. There are known instances in which such poles split the entire length. The pole itself continues to corrode on the outside, and in course of time some other method must be applied on the outside to eliminate the trouble.

The second method would appear to be quite effective on wooden poles, but it has not been tried a sufficient length of time to prove its efficiency. It would appear that the concrete surrounding the pole must shrink away from the wood, thus permitting water to percolate and a further rotting of the portion repaired.

The third named is quite costly, as the clamps have to be very heavy to be efficient, and even then, being held by bolts, the latter in time may become loose and corroded, and it requires constant inspection and maintenance. At best it is only temporary. It also does not stop the further corrosion of the weak spots.

The fourth method from every standpoint seems to be the most efficient. It is applied at the spot where the trouble originates, and entirely eliminates further corrosion or rotting. It is permanent in its nature. It brings the pole to its original strength, and, as a matter of fact, poles that have been tested with such sleeves have stood a greater stress than new ones. It looks well and neat in the street. And finally, its cost is the lowest. This method is especially efficient when the filling material is introduced in a molten state, e. g., molten brimstone. In making this repair, some sleeves have been filled with grout, but this method is not recommended by the committee.

Joint Occupancy of Poles

The committee brings this matter to the attention of the association with a view to having it take such action as it may deem advisable, the thought being that the foreign interests could be approached through their national associations and the subject given joint consideration.

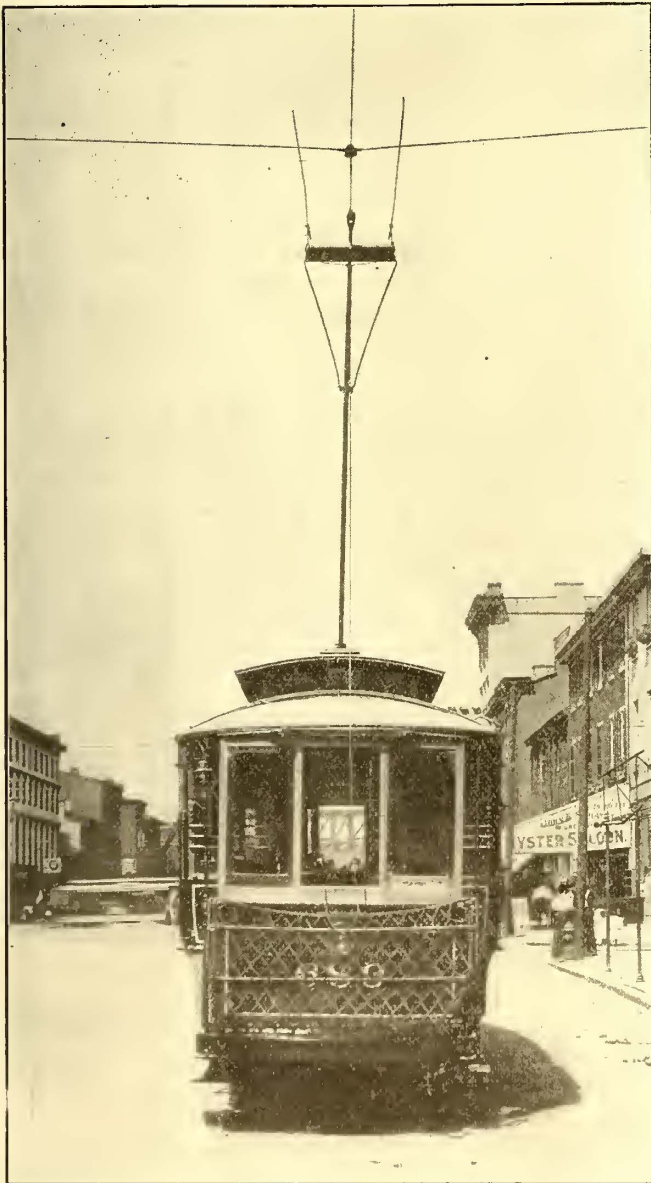
Third Rail

The committee has not observed any particularly new developments in third-rail construction, with the exception that impregnated wooden blocks have been given a trial for third-rail insulators instead of porcelain and other similar substances, with excellent results. This subject will bear further discussion and experimentation.

Catenary

In following out the instructions to your committee to amplify and bring up to date last year's report on catenary, the committee found some difficulty in locating any very new or recent developments.

Quite recently one of the technical papers published an article making a cost comparison between the construction of catenary and ordinary trolley for a two-track interurban property, and this will be taken up later, as there are some features to which your committee wants to call your attention. Your committee desires to recommend: The 211,600 circ. mil. grooved trolley wire of the American standard



Power Distribution—Fig. 3.—Attachment for Detecting Faulty Insulators

are bedded. A second method, applicable to wooden poles only, consists of driving U-shaped rod around the pole at the point where the timber has been rotted away and then filling in space with concrete. A third method, applicable either to wooden or metal poles, consists of placing metal clamps and bolting these together. A fourth method, also applicable to either metal or wooden poles, consists of using a metal sleeve either of pipe section or split, depending on the number of fixtures on the pole. This sleeve has a larger diameter than the pole, and is placed over the corroded or rotten portion of the pole, and the space between is filled in with some material.

Some of these methods have very serious objections.

section; the use of galvanized iron mechanical clips; some form of rigid suspender and a permissible spacing of 30 ft., with the suspender tightly fastened to the catenary. In the matter of messenger cable your committee wishes to make no definite recommendation other than it believes that high strength steel should be used. This cable should be galvanized so as to meet the test recommended by your committee last year. One interurban company is installing a line in which the messenger cable is 500,000 circ. mil. copper feeder. Figures indicate that this cable is strong enough for all strains to which it will probably be subjected, and its use considerably cheapens the first cost of construction.

Your committee recommends the use of porcelain insulators wherever possible for line carrying over 600 volts.

The art of building steel bridges for catenary support has been considerably improved during the last year, and the first cost of bridges for ordinary double track, interurban electric service has been somewhat reduced. This committee recommends the use of steel bridges for supports for use on private right of way. We would like to present a cost comparison which will clearly show the advance that has been made in the last year.

For comparative purposes, the costs are taken, first for a mile of double track construction for heavy interurban electric service for three types of construction, ordinary trolley, catenary with wooden pole supports and catenary with bridges.

The comparison has been confined to the type of interurban or suburban electric railway work. In these comparisons the figures cover only the support of a working conductor. All feeder or transmission line fixtures or wires are excluded from the costs shown.

Comparative Costs of Overhead Trolley (Span and Bridge) Construction Per Mile, Double Track

Ordinary span. Poles, spans, hangers and ears, \$1,085.00.
 Catenary bridge. Bridges, messenger, suspenders and clamps, \$1,760.36.

Conductor	\$1,089.60	Conductor	\$1,089.60
Insulators	48.00	Insulators	18.30
Miscellaneous	214.50	Miscellaneous	143.40
Labor and tools.....	1,323.10	Labor and tools.....	1,407.10
Total.....	\$3,760.20	Total.....	\$4,418.76

Comparative Costs of Catenary Overhead Trolley (Center Pole) Construction Per Mile, Double Track

Wood Center Pole, Bracket

Thirty-three poles, brackets, messenger, suspenders and clamps, \$726.26.

Steel Tower, Bracket

Towers, brackets, messenger, suspenders, clamps and anchor bridge, \$1,280.36.

Conductor	\$1,089.60	Conductor	\$1,089.60
Insulators	36.60	Insulators	18.30
Miscellaneous	117.57	Miscellaneous	112.00
Labor and tools.....	1,032.00	Labor and tools	1,230.07
Total	\$3,002.03	Total	\$3,730.33

Return System.—Bonds

The committee favors the use of under-the-fish-plate bonds for T-rail construction. We suggest to the next committee and the committee on way matters the re-designing of standard fish-plates with a view to giving more room for bonding. The committee recommends the use of under-the-fish-plate bonds for girder rail in paved streets for new construction, and bonds outside the plates for repair work.

All bonding should be tested after installation. Bonds should be tested at least once each year, repairs made to

defective bonds, and a complete test made after repairs are made. Most careful attending should be paid to the bonding in districts where the current density is high and where it is known that rapid deterioration exists. It is the opinion of the committee that all track bonding and bonding maintenance should be done by the track or roadway department under the inspection and supervision of the distribution engineer. All responsibility for track bonding and all other parts of the return circuit should be placed on the distribution engineer.

Special track work should be "jumped" by supplementary copper in order that it may be renewed when necessary without disturbing the continuity of the return circuit.

Conduit System.—Ducts

The committee recommends the use of single terra-cotta ducts laid in cement mortar and surrounded by a concrete envelope. In certain conditions it is impossible to use terra-cotta ducts, and iron pipes are a necessity. In cases of this kind the committee recommends covering all cables passing through iron pipe with a weatherproof braid.

The committee recommends the use of brick manholes for most work. Concrete manholes can sometimes be used to advantage, however, where other underground structures are not likely to be met with.

General

A circular letter has been received from the Association of American Steel Manufacturers on the subject of abolishing numbered gauges for wire and sheets. The committee desires to concur in this recommendation as far as wires are concerned, and submits a short abstract of the plan as outlined.

Inasmuch as confusion exists by reason of the numerous systems of wire gauges, it has seemed a good thing to abolish the numbered gauges entirely. No effort is to be made to change any of the existing standard dimensions of wire, but to insist that sizes of wire be expressed in decimal parts of an inch instead of being indicated by number, as, for instance: If a No. 10 B & S gauge wire is desired, it would be ordered as a 0.102 wire, and so on. It will be seen that it would be a very simple matter to issue orders to all interested parties to use the decimal diameter of wire instead of the numbered gauge, without changing any of the existing standards. In ordering wires of special shapes the circular mils cross-section should be used instead of the diameter.

The committee also recommends that, in ordering cables, the area be specified in circular mils rather than by the gauge number. We also recommend that, in ordering cables of sizes larger than the existing gauge numbers, the present practice of using an even number of circular mils be discontinued, and a cable ordered having a standard number of wires of a standard size. This will in many cases expedite delivery of cable, because the manufacturers can make up their strand from stock wire, instead of having to draw special size wire. For instance, instead of ordering a 1,000,000 circ. mil cable, the specifications would call for a cable of 61 wires of 0.128 diameter, which would give a completed cable of 999,424 circ. mil.

In following out the recommendations to use decimal diameters instead of gauge numbers, the committee has computed a copper-wire table, using as a basis the data contained in a supplement to Transactions, October, 1893, American Institute of Electrical Engineers, and a revision of the temperature coefficients in accordance with the standardization rules of the American Institute of Electrical Engineers, June, 1907.

Conclusion

In conclusion, the committee desires to recommend for adoption as standard of this association the American standard section of grooved trolley wire for 211,600 circ. mils cross-section, and the copper-wire table earlier mentioned.

THE ELECTRIC RAILWAY AUDITOR, HIS DUTIES AND RELATION TO THE ORGANIZATION*

By W. B. Brockway, General Auditor Birmingham Railway, Light & Power Company

At the midwinter meetings of the executive committees of the affiliated associations, suggestions were received regarding the subjects to be considered at this convention. Among them was this:

"Is the head of the accounting department of a street railway simply a recorder of figures, showing certain results and facts, or should he be generally informed on physical conditions of the road, and what should be his relationship with the heads of the operating departments?"

The question came from the operating president of one of the large street railway companies.

Owing to the contraction of system into more direct method which must exist on the smaller roads, a reply applicable to the road having annual gross revenue of \$100,000 would not be as exact when applied to the road whose revenue extends to many millions of dollars annually.

The administration of the smaller company usually requires much less information than does the larger in carrying out the operating policy of the company, a condition which relieves the accounting department of many of the duties which the same department of the larger company has to perform. The reason for this is that the heads of the operating departments of the smaller company do less through assistants, or have none at all, and are thus brought into direct contact with things as they occur. Thus they know conditions and facts by observation without the use of many formal reports. The same work, as the company gets larger, is done more and more by assistants making the use of many reports and statistics imperative because the heads of the operating departments, who direct the policy without seeing every move made, must have more information and have it arranged systematically.

However, while the work of the officers at the heads of the various departments differs with the size of the company, in essence it remains the same, except that the smaller companies have less departments, so that the work of each officer is more diversified. Nevertheless, the work of the accounting department must be done in approximately the same manner and always with the same care.

Accepting this as a general outline of the situation on an electric railway system, we may use it as a basis to consider the question which may be separated into three slightly amplified questions:

1. Is the head of the accounting department of a street railway simply a recorder of figures [a bookkeeper] showing certain results and facts?

2. Should he be generally informed on physical [and all other] conditions of the road?

3. What should be his relationship with the heads of the operating departments?

As the questions do not wholly cover the situation, the following are added:

4. What should be his authority over the accounts of the company and over the sources of information from which the accounts are made?

5. To what officer should he report and receive instructions?

6. To what extent is he responsible for the accuracy of the accounts?

1. Is the head of the accounting department a bookkeeper only?

The bookkeeper of the old partnership came close to being the auditor of to-day in this, that by his responsibilities he knew the most intimate matters so far as they were dis-

closed in the records of the firm. But there were rarely many partners and the accounting system needed to be only as much or as little as would satisfy them. He it was who kept the books because their contents were most confidential, therefore, that work was not trusted to a subordinate. Nowadays, with the numerous supervising commissions, both State and National, with the annual reports published and spread broadcast, the former secrecy has passed. Anyone with a knowledge of bookkeeping and some experience with the system used by the company can now write the record of the accounts in the books, but it is quite a different thing to keep the books.

Another thing that has caused the change is consideration of the rights of a large number of stock- and bond-holders, where previously the few partners were the only ones to be considered. This has caused an entirely different system of detail accounting, much of which is statistical, and has brought forth an accountant who is more than a bookkeeper. In addition to his knowledge of accounting he must be something of a statistician as well as a deviser of systems for the accurate and economical handling of all matters connected with the accounts and the statistics. The other qualifications he should, and in many instances must have, are numerous, and the more he has the more valuable he is to his company. The more he knows of accounting, finance, law, general business, operation, construction, manufacturing, analysis and human nature and the more tact, individuality, originality and common sense he has the better railway accountant he will be and the greater the importance will be placed upon both him and his department.

2. Shall he be generally informed on the conditions of the road?

It would seem that with a little consideration the questions would almost answer itself. For instance, it is trite to say that the more a person knows about the details of his business, the better he can perform his part of it; therefore, the more informed an auditor is about the "physical and other conditions of the road," the more intelligent his accounting methods and results will be.

In connection with the general information which an auditor should have, permit me to point out one of his troubles. Few of the heads of the operating departments have any extended knowledge of accounting. This condition frequently results in a source of confusion to both the operating heads and the auditor. He is, or should be, most willing to furnish them with every part and quantity of information he can get out of his accounts. But owing to their unfamiliarity with accounts misunderstandings of their requests will arise unless he knows something about their work and about the physical and other property of the company. When thus equipped he is able to approach the matter from their point of view.

It is not my intention to say that the auditor should be expert in the work of the other departments, but he should be "generally informed" so that he may understand what his duties require of him.

There is no doubt in my mind that the auditor will be a better auditor and a more helpful one if part of his time is spent away from the office with one of the heads of the operating departments just to see how the property moves and what is done before the reports come to his office. When he obtains this familiarity with the work of the other departments their reports to him mean activities as well as figures, and so will his own reports be more intelligent to him. In other words, he must be a better accountant and keep better accounts when he understands intimately what has transpired as shown in his accounts.

3. What should be his relationship with the heads of the operating departments?

The relationship of the auditor with all officers and employees of the company should, of course, be cordial and sympathetic. They are all working to the same end but by

*Abstract of paper read before the American Street and Interurban Railway Accountants' Association, Denver, Colo., Oct. 4, 5, 6, 7 and 8, 1909.

different means, therefore, if the best results are to be obtained for the company the relationship throughout the organization should be as nearly single-minded and mutually helpful as possible.

The most important part in the relation of the officers to one another is that taken by the president, to whom every one, either directly or indirectly reports. His tactful handling of the organization will usually keep the various departments in harmony.

Even with a well-defined system of accounts, it will always be found that the information which reaches the auditor's office will be, in a measure, colored by the relations existing between the head of the originating department and the auditor. The men absorb and reflect the feelings of their superior officers. An unguarded remark, an unconsidered bulletin, a curt letter, discloses friction and produces information cut on the same bias. On the other hand, the feelings of earnest desire to do all things needful will spread under the leadership of men in harmony with the rest of the organization.

I do not think it is the auditor only who should be conciliatory. The accounting department occupies a peculiar position, as it is the only one that touches all the activities of the other departments with equal contact. It is the duty of this department to record facts without favor. The auditor cannot order a car put into service, nor can he take one out. He cannot order more or less power. He cannot say whether the tracks shall be of one style of construction or another. But he must keep his accounts so that the effect of the order given by those upon whom these duties devolve shall be evident. He is keeping the history of the road for the benefit of those who own as well as those who operate it. Therefore the relationship between the heads of the departments is an important part of the corporate organization.

4. What is his authority over the accounts of the company and of the sources of information from which the accounts are made?

The accounting department, having equal contact with each other department, considers the information it receives from any department as of equal importance to that of any other. Delays in receiving its reports, or a lack of system in making reports from any one department, will so delay the finished work of the accounting department that its machinery or system is immediately put out of order. It follows, then, that some means must be provided to guard against the interruption. This safeguard lies in the arrangement by which that part of the work of the employees of other departments which relates to accounting or reports to the accounting department is directly subject to the orders of the auditor.

While of course the auditor does not have the right of assignment or the power of dismissal of the employees of another department, he should have some control over the method of preparing this information and the manner in which it should come to him.

This safeguard is so universally recognized that the large industrial corporations place representatives of the accounting department in each mill or locality. In those corporations whose practice I have investigated, I find that these representatives are charged to report any and all information required by the auditor, whether connected with the usual order of the accounting system or of any other nature.

While this looks as though many of the operating employees are working for two heads and subject to all the confusion that would follow from such a division of authority, the fact is that the situation presents no such complications. The regular operating and other reports must be made according to a definite system or else the results of operation and other movements would never be known in a uniform manner. Whenever any interruption occurs, if the auditor did not have the authority to reach directly to the source of the trouble, the delay would greatly aggravate the

confusion. This is so well recognized that it needs no further consideration.

As the statistician of the company the auditor may also ask for information of an unusual nature, but in this connection it is exceedingly difficult to define where the line lies between routine and other matters. To the auditor and his work very much is routine which may be exceptional in other departments. Certainly his investigations lead him to make many statements and comparisons that are unusual, but for the time being necessary, so that if a line is drawn beyond which he cannot go in obtaining information he ceases to be all an auditor should be and all that his title means.

5. To what officer should he report and receive instructions?

There was a time when this question would have been answered differently than now. But at the present time the answer is almost universal that he should report to the president or other chief executive officer. In the case of one of the largest companies in America he reports to the chairman of the board of directors, while in one, at least, of the large steam railroads the auditor is responsible to the board itself.

These plans permit the executive to be placed in immediate contact with the accounts and the statistics, instead of at arm's length through other officers. It has happened in the past that when the records are placed under the control of any minor executive or an administrative officer by requiring the auditor to report to him, instead of to the chief executive, the temptation has been to require the records to be so kept and the data taken therefrom to be presented in such manner that any actions to which criticism might attach are obscured. In other words, the opportunity to "make a record" exists.

Wood, in his "Modern Business Corporations," which is written from the standpoint of the lawyer, says, in connection with the auditor of a corporation: "He should not be a partisan of any stockholder or group of stockholders, and should be the most independent employee of the corporation."

This is the view now being taken by the most important companies, but it cannot permanently obtain if the auditor is not fully equipped by training and personality to act properly under such responsibilities. I believe the present generation of auditors is measuring up to the new requirements more completely at this time than ever before. As time progresses, this understanding of the place the auditor occupies will be more universal, until no one will question it or have any other views.

6. To what extent is he responsible for the accuracy of the accounts?

This question has frequently been discussed, and books on accounting nearly all mention some phase of it. The law recognizes its importance and has passed upon it, and now, under the revised Interstate Commerce Act, the auditor is made personally responsible for the accuracy of the accounts. Please note the word accuracy (it does not mean plausibility), which places upon the shoulders of the auditor a responsibility he must face and he must have the authority to face it successfully.

Prof. Henry C. Adams, in charge of the bureau of statistics and accounts of the Interstate Commerce Commission, presented a paper at the annual meeting of the American Association of Public Accountants in October, 1908, entitled "Railway Accounting in Its Relation to the Twentieth Section of the Act to Regulate Commerce," in which he said that his paper was not a "theoretical discussion, but rather a practical consideration" of transportation accounts, "in view of the somewhat unusual powers conferred upon the Interstate Commerce Commission." In the conclusion of his paper are these words: "Were there time, I should like to comment upon that phase in the accounting order of the commission which holds the accounting officer per-

sonally responsible for the enforcement of the accounting rules laid down. * * * " I regret his paper did not include this further consideration of his subject that I might quote it here. It would be exceedingly interesting and a valuable part of the subject we are considering.

At any rate, from this it will be seen that direct responsibility is placed upon the auditor by the Interstate Commerce Commission; therefore the auditors of roads doing an interstate business must face the responsibility, whether the method of company organization allows for it or not. As no one should have responsibility without authority, those few roads where the direct authority over the source of accounting information does not now rest with the auditor will no doubt soon change their methods.

As a summary, and speaking in generalities, I believe any consideration of the subject or any attempt to answer the questions must be qualified by the personality of the auditor and the size of the company.

I have placed the personality of the auditor first because if he is properly equipped, not with experience only, but with everything else comprehended in the word personality, he will build up, even in the smaller roads, all I have outlined as relating to the auditor of the larger companies.

The auditor to-day is very much closer to the president than in the early days of electric railroading, but with this improvement of his position none of the other officers has lost any part of their importance. All the departments are positively inter-dependent, although specialized in their duties, and the whole organization is more efficient when recognizing that "accounting to-day is more than keeping books."

WESTINGHOUSE REPRESENTATIVES

The following is a complete list of representatives of the Westinghouse companies in attendance at the convention: Westinghouse Electric & Manufacturing Company, J. C. Kyle, J. S. Trittle, L. M. Cargo, G. O. Noble, C. W. Register, H. S. Sands, E. C. Means, J. L. Davis, J. A. Brett, W. L. Conwell, C. S. Cook, Thos. Cooper, J. C. Jones, D. W. Belden, Geo. Ewing, C. H. Davis, B. S. Manuel, L. H. Kidder.

Westinghouse Air Brake Company: T. A. Hedendahl, H. A. Crocker, Horace Clark, Jos. Ellicott, T. W. Ainsworth, P. H. Donovan, C. W. Townsend, Chas. Ellicott, S. D. Hutchins, S. J. Kidder, A. L. Humphrey, W. S. Bartholomew, C. Olmstead, W. V. Turner, C. P. Cose, E. L. Adreon, R. P. Noble.

Westinghouse Bureau of Publicity: E. H. Heinrichs, J. C. McQuiston.

R. D. Nuttall Company: T. A. Estep, Milton Rupert.

Westinghouse Machine Company: E. H. Sniffin, C. C. Chappelle, Jos. Breslove, I. L. Brinsmade, A. A. Rogers, E. E. Heise, N. G. Symonds.

Emery Lubricator Company: L. D. Sweet, R. E. Adreon, T. P. Livingston, D. A. Emery.

The Atlas Railway Supply Company is exhibiting its line of track fittings which includes Atlas rail joints, tie plates and rail braces. The demand for these specialties, the company reports, is in excess of expectation. The appreciation of the utility of Atlas joints is shown by orders received from all over the world, especially for the "Special" joint, which is made to raise the pounded or cupped rail in double-track operation and where cars run in one direction, making the track, after grinding off the end of the cupped rail, as good as new. The company's one-piece joint is also proving its merits for single-track or two-way operation. This is a combined bedplate and angle bar in which the old plate or bar can be used on the inside. It may be made for any type or shape of rail, and this also applies to all of the company's products. The exhibit is in Space 168, and Pres. J. G. McMichael and D. Thompson are in charge.

Among the Exhibits

Underfeed Stoker Company of America is giving out printed matter of more than ordinary interest regarding the Jones stoker.

* * *

Crane Company of Chicago, Ill., located in Space 613, is showing a very complete and interesting line of steam traps, gate valves and heavy brass valves.

* * *

Chicago Varnish Company, in Space 370, is showing sample car sides painted and varnished by the six-day process. This system has been adopted by 80 roads since June 1, 1909.

* * *

A. L. Whipple and A. H. Sisson, representing Forsyth Bros. Company of Chicago are showing to an appreciative audience the new car specialties manufactured by this company.

* * *

One of the prominent men at the convention is E. A. de Campi of Chicago. Mr. de Campi is the special representative of the National Lead Company and is here in the interest of his company.

* * *

The car exhibited by the Cincinnati Car Company for the Logan Rapid Transit Company, Ogden, Utah, is equipped with Root scrapers. This is one of five cars built for this company, Root scrapers being specified on all of them.

* * *

Samples of Bryan-Marsh tantalum lamps designed for street railway cars may be seen in the Allis-Chalmers exhibit. J. S. Corby of the Chicago office of the Bryan-Marsh Company is prepared to furnish information about these lamps.

* * *

Henry A. Dorner, president of the Dorner Railway Equipment Company, Chicago, Ill., is spending the week at the convention. Mr. Dorner is telling his railway friends of the good quality of the rebuilt street railway cars which his company sells.

* * *

The Duntley Manufacturing Company of Chicago is exhibiting in Spaces 176-178 pneumatic cleaners and gasoline motor section cars. The cleaners have been endorsed by the Board of Fire Underwriters, and both the cleaners and cars took the grand prize at the Alaska-Yukon-Pacific Exposition at Seattle.

* * *

The Sterling Varnish Company of Pittsburgh, Pa., manufacturers of insulating varnishes and metal protective paint, is represented at the convention by W. F. Hebard, A. S. King and W. V. Whitfield. They will be found at Space 418 on the balcony of the main auditorium, where they are receiving their many friends.

* * *

The Valentine-Clark Company of Chicago is exhibiting in connection with the "C. A." Wood Preserver Company samples of butt treated poles, treated by the open-tank process at its new plant located at Minnesota Transfer, St. Paul, Minn. A neat little pamphlet entitled "On Doubling the Life of Cedar Poles" is being distributed.

* * *

The Handlan-Buck Manufacturing Company of St. Louis occupies Space 140. This company is one of the largest manufacturers and dealers in general railway supplies for electric and steam railroads in the Southwest. It is showing a complete line of standard one, two, three and four-lens markers, classification, semaphore, switch and blizzard lamps; also a large variety of the well-known Handlan wire guard lanterns. Some of these lamps are arranged for

burning oil or for electricity. Metal flags, machine tools, perfection oilers, engine bells, switch locks, engine lamps, Simplex jacks, and the Rooke recording fare box and registers are also exhibited. The company is represented by A. H. Handlan, Jr., H. O. Rockwell, Frank Stevens, A. E. Barron and R. S. Rooke.

* * *

The American Railway Guide Company, Chicago, Ill., is distributing a pamphlet which contains a time-table of all trains leaving Denver on the various railroads running into the city. The covers of the pamphlet are similar in every respect to the covers of the "Travelers' Railway Guide," which is published by this company.

* * *

The International Register Company has held a continuous reception during the week at its booth, in Spaces 134-138. Arthur H. Woodward, John Benham and William G. Kirchhoff, who are representing the company, have been busy demonstrating the fare and recording registers and showing the other devices which the company manufactures.

* * *

After the convention is over John Taylor, president of the Taylor Truck Company, will take an extended pleasure trip to the coast. He expects to visit Salt Lake City, Tacoma, Seattle and Vancouver. Then he will go down the coast to San Francisco and Los Angeles, over the Southern Pacific to El Paso, Houston and New Orleans. From New Orleans he will return by boat to New York.

* * *

L. M. Cargo, the manager of the Denver district office of the Westinghouse Electric & Manufacturing Company, is one of the busiest men during the convention. Besides the duties devolving upon him as chairman of the exhibitors' committee of the convention, he was also kept exceedingly occupied with the many demands made upon him by the other Westinghouse visitors, who were strangers in the city.

* * *

E. A. Wurster, secretary and treasurer of the Falk Company, which is among the largest manufacturers of street railway motor gears and pinions, reports a general increase in business throughout the country. His company has recently closed some very large gear and pinion contracts in the East, and its special grade of AA pinions, for meeting the requirements of extra heavy service, has already been adopted by many of the large systems.

* * *

The Burroughs Adding Machine Company is showing a complete line of adding and listing machines in Spaces 215-219, where F. A. Willard, manager of the railroad department, is meeting many of his old friends and making actual demonstrations of the application of the machines in traction accounting. The Burroughs duplex machine is particularly useful in handling material distribution accounts. This machine is the chief attraction of the exhibit.

* * *

Although the National Railroad Trolley Guard Company does not have a separate exhibit, its trolley guard is being shown at the booths of the Ohio Brass Company and the Electric Service Supplies Company. Delegates to the convention will find it instructive to give a few moments of their time to its examination. C. R. Ellicott is taking care of the interests of the company at the convention. The many friends of L. J. Mayer regret his inability to be present in Denver.

* * *

The Adams & Westlake Company is exhibiting a line of balanced-draught non-sweating signal lamps for street and interurban railway service. This company also shows railroad lanterns, arc and incandescent headlights, basket racks, car trimmings and brake handles. New specialties are an adjustable headlight holder for swinging the headlight to

illuminate the roadway on curves; also a safety floor mat which is light in weight, easily removed for cleaning and affords a perfect safeguard against passengers slipping. The company is represented by William J. Piersen, Charles B. Carson and Alfred Connor.

* * *

The following orders are announced by the American Mason Safety Tread Company: Car Karbolith and treads for Kuhlman coaches for the Milwaukee Electric Railway & Lighting Company; car Karbolith for Laconia cars building for the Boston & Northern Street Railway; for the Long Island Railroad Company and for the Metropolitan West Side Elevated Railroad. The New York, New Haven & Hartford Railroad has installed Karbolith flooring in one of its new stations.

* * *

The Wharton "H. T." switch is attracting considerable attention in the booth of William Wharton, Jr., & Company, Incorporated. This switch was adopted for use in all rehabilitation work by the Chicago Board of Supervising Engineers. It is shown in solid manganese steel construction, as well as in manganese steel hard center construction for girder and T rails. Another piece of special track work of interest in the Wharton exhibit is a solid manganese steel electric-over-steam crossing. A solid manganese steel frog to pass M. C. B. wheels is also shown. A peculiar feature of this frog is the use of separate extended easer rails, which are furnished in either manganese or rolled steel.

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The Curtain Supply Company of Chicago has recently received the order for the curtain fixtures for 350 new cars ordered by the Chicago Railways Company. They are to be of the Ring fixture type. Orders for these Ring fixtures have also been received recently for the new cars for the following traction companies: Boston & Northern Street Railway, Interborough (N. Y.) Rapid Transit Company, Detroit United Railway, Kansas City Railway & Light Company, Louisville Railway Company, Washington, Baltimore & Annapolis Electric Railway Company, Buffalo & Lackawanna Traction Company, Indianapolis Traction & Terminal Company.

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The Buda Foundry & Manufacturing Company, represented by W. S. Weston, chief engineer, and F. C. Webb, local agent, has a very complete exhibit in Spaces 50-52, 153-155. The material exhibited comprises a number of typical examples of manganese center street and interurban special work, switch stands for interurban and steam railways, a full line of ratchet, ball-bearing, cone-bearing and friction jacks, car replacers, Wilson and Paulus track drills of the latest improved patterns, track gages and levels, velocipedes and motor cars. The special work and the motor cars attracted the most attention. The street and interurban railway engineers have shown particular interest in the Buda tongue switch construction in which the tongue is provided with a manganese steel heel support and a reversible spring throw. The motor cars exhibited show the inclination to substitute power-driven cars for the old type of hand cars and velocipedes for the use of section gangs, bridge inspectors, linemen, roadmasters and division engineers.

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The Falk Company of Milwaukee, Wis., is represented at the convention by E. A. Wurster, secretary and treasurer; W. Frank Carr, chief engineer, and the company's Pacific Coast representative, Alphonso A. Wigmore of Los Angeles. The company has had a very busy year in the several branches of its business, especially in the open hearth steel casting and track special work departments, requiring the added capacity of a new extension to the plant to meet the demand. Several large shipments of special track work of solid manganese and hardened center types have been made during the season to the Huntington systems of Los Angeles,

the Central California Traction Company, the Northern Electric Company, and other roads in California. Among the recent orders secured are two single-track, double-track crossings; two double track with double-track crossings, and one double-track crossing with three tracks, in all comprising 18 electric steam crossings of the solid manganese type for Los Angeles and 12 steam-electric crossings of the hardened center steel bound type for the Northern Electric Company at Sacramento. The steel bound feature of the hardened center type of special work made by the Falk Company is proving especially attractive to the railway men throughout the country as all liability of loosening of plates is eliminated.

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A striking feature of the exhibit of the Pennsylvania Steel Company, Steelton, Pa., is the preparation of fully 114 lantern slides illustrating many scenes and processes in the production of this company's products. Thus there are shown views of ore banks, coke ovens, furnaces, pig iron ladling, scrap unloading with magnets, several open hearth processes, blooming mills, the company's foundries and machine shops, track work, bridge and bridge pieces, etc. Ten slides are devoted to views in connection with the Spanish-American Iron Company's mines in Cuba.

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The Ironsides Company, Columbus, Ohio, is showing in Booth No. 709 its various products, including gear shield, wire rope shield, fiber rope shield, felt shield, Abba roof and stack paints, boiler scale solvent shield and Tormay oilers. The durable properties of the Ironsides gear shield are shown by two pairs of serviceable gears and pinions which were taken off after six years' operation on city cars. The pinions exhibited have run for 305,876 miles. This gear shield was devised both to reduce the noise and increase the life of the gearing. The exhibit is in charge of Assistant General Manager James L. Bone, who is distributing souvenirs, including an aluminum match box.

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The Automatic Lubricator Company of Denver has equipped one car, No. 361, of the Denver City Tramway Company with its new automatic alarm signal. This car is being operated over the Fourth Avenue line on which the necessary actuating devices have been applied on the trolley wire at 22 points in advance of curves, sidings, crossings and other dangerous points. A yoke supported from the trolley wire engages with a light pivoted arm carried on the trolley pole just below the wheel. When the arm strikes one of the yokes electrical contact is made for an instant and thus actuates a relay on the car. The relay starts a bell and lights a lamp in the motorman's cab, warning him to reduce speed.

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The Emery Lubrication Company, St. Louis, Mo., is showing an air-brake lubricating device which was first used in Colorado on the Denver & Rio Grande, Denver & Interurban and the Denver city lines. The device is applied in the air-brake system in such manner that the moisture in the air dissolves the lubricant, which is then carried by the air to all frictional surfaces of the air brake and control mechanisms. In this manner the amount of lubricant conveyed to the various parts is proportionate to the amount of air passing through the system, and consequently to the duty performed by the air brake or control mechanism. The lubricant finally passes to the brake cylinder, where it effectually prevents leakage of air past the packing leather.

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The T. H. Symington Company, Baltimore, Md., is exhibiting its ball-bearing center bearing which has been so widely adopted throughout this country as an ideal, durable mechanism for relieving the friction between the car body and trucks when rounding curves. The company is also showing a complete line of journal boxes for all classes of

electric railway service. Particular attention is directed to the "Lift-off" lid journal box designed for cars with check plate collarless journals operating exclusively in city streets. This box has a very tight lid fit and is non-rattling in service. Another interesting exhibit of this company comprises the Association standard boxes equipped with both "pivot" type machined swing lids and M. C. B. type "torsion" lids.

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In addition to its well-known Barrett jacks and motor lifts, the Duff Manufacturing Company, Pittsburg, Pa., is showing a sectional hydraulic jack. The latter is said to be the only hydraulic jack made entirely out of forged steel. It will work either horizontally or vertically and weighs but one-half of ordinary jacks for the same capacity.

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The Electric Traction Supply Company, St. Louis, Mo., is showing in Spaces No. 207-213 the Fallik controller check, a new device which makes it impossible for a motorman to accelerate his car beyond a predetermined speed. The working parts of this check are few and durable, as they are made of case-hardened steel. By simply changing a star wheel in the controller check, the device can be made to fit any standard form of controller and any angle at which the controller is set.

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The Aluminum Company of America has a striking exhibit of aluminum conductors and cables for all classes of transmission work and is also showing various styles of joints and aluminum bus-bars. The company is giving away a booklet containing many important tables on aluminum conductors. The representatives who are making visitors welcome are Ernest H. Noyes, Chicago, manager, and Fred N. Baylies, manager of the St. Louis territory.

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The exhibit of The J. G. Brill Company includes a large interurban truck of recent design which has attracted much attention and favorable comment. This truck is known as the Brill M. C. B.-E. 3 and is the heaviest type used in interurban service. It is also built for lighter cars designed for high-speed operation. The truck contains the M. C. B. principles, but differs from all others of that class in that the side frames are composed of solid forgings, including the pedestals. The method of securing the transoms to the side frames by heavy wrought gusset plates folded over the side frames and the substantial connection of the end crossings with the side frame extensions enables the truck to be maintained square under the severest conditions. Double equalizing bars are employed and the design throughout is well suited to the most rigid requirements of modern high-speed service.

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The Hess-Bright Manufacturing Company has a novel exhibit in Space 126. Two GE 74, 55-hp, 500-volt railway motors are mounted on a platform of convenient height and operated "light" with 220-volt current. Both of these motors have been in regular service. One is fitted with ball bearings and the other with ordinary babbitted bearings. Practically the only heating that takes place in the ball bearings is due to conduction from the commutator and armature along the shaft, while the babbitted bearings rise 30 deg. to 40 deg. C. higher in temperature than do the ball bearings, in spite of the fact that the ball bearing motor runs at a speed of 1700 rpm, and the babbitted bearing runs at speed of only 1000 rpm, due to the difference in friction. The importance of ball bearings in preserving clean streets and saving oil is readily apparent by an inspection of the exhibit, much oil having dripped out around the babbitted bearing motor, while the ball bearing motor is clean. This ball bearing motor is one of an equipment formerly in service on the Schenectady Railway. This equipment has run without attention or wear 30,000 miles to date

on its initial charge of lubrication. At the back of the booth are photographs of a 40-ton Atlantic City interurban car, the New York City gas-electric car journals, illustrating the application of ball bearings to main car journals, and two 25-ton cars of the Schenectady Railway and Philadelphia Rapid Transit Company's lines, in which ball bearing motors are used.

THE H. B. LIFE GUARD IN NEW YORK

The following letter was recently received by Wonham, Magor & Sanger, New York, from James A. Roosevelt, general superintendent of the Third Avenue Railroad Company, New York:

"I want to tell you that since we have put H. B. life-guards on our cars, we have picked up 11 people. We have never had a single case of the life-guard failing to operate, nor have we had a single person run over by a car equipped with a life-guard. The H. B. life-guard is the best that I have ever seen in use for it really does pick up people and save lives. Another thing in its favor is that in making the pick-ups it apparently does not injure the person picked up. I really think that for city use it is absolutely essential unless the company wants to have a lot of death cases."

CARNEGIE STEEL COMPANY'S EXHIBIT

It has been only a few years since the Carnegie Steel Company exhibited any of its materials at the street railway conventions, but the age of specialties of steel has been marked by the development of several interesting examples in connection with street railway construction. It might seem to the casual observer that it would be difficult to get up a display of cold steel which would attract any attention, but the display shown by the Carnegie Steel Company is not only tastefully arranged but the articles shown have awakened much interest among the large numbers of street railway men who are attending the convention. The question of safety in transportation is well taken care of in the use of steel wheels as well as in the permanent track construction with steel ties. One pair of steel wheels which were shipped direct from the Brooklyn Rapid Transit Company shops, Brooklyn, N. Y., show the condition of the Schoen steel wheel after having been run 89,638 miles in service without any attention. These wheels are still in very good condition and can be made as good as new wheels with a very slight amount of work. Several types of new wheels are shown, adapted for single truck cars as well as for heavier cars for high-speed interurban service.

There is also shown a piece of track about 30 ft. long, built exactly the same as it would be were it out in actual service. This track is laid with steel ties and shows the various stages of construction, the section at one end showing in detail the method of laying the track in concrete. This type of construction has gained in favor, and when once placed in city streets requires little or no attention for years. This type of construction has been illustrated in former issues of this journal where tracks have been laid in Cleveland, Buffalo and other large cities.

The Duquesne joint, which has met with much success in steam railroad construction, is shown, as well as the lighter section of the same type adapted for the T-trail sections commonly used in interurban work. Another interesting part of the exhibit is steel piling of various weights, used in building coffer dams, core walls for dams and other construction purposes. A miniature representation of a dam is shown, illustrating the type of dam built some time ago in Colorado. The circumstances surrounding this particular installation are that a stream through a ranch had dried up, showing no water on the surface. The owner wanted to

reclaim the water of this stream and drove a certain amount of piling through the sand into the hard bottom the same as shown in the exhibit, shutting off the seepage, and within a few hours had water flowing over the dam, which is now being used for irrigation purposes. Another interesting feature of this exhibit is the various tests to which the Carnegie soft welding steel has been put to show that it is possible to make a grade of steel which will meet the most severe requirements. A full-sized section of a truck made from this steel for the Denver & Interurban Railway is shown.

The loss and waste to packages containing bolts and spikes is eliminated by the use of steel slack barrel hoops, a pyramid of which is shown.

While the street railway fraternity is not especially interested in mine construction, yet for the benefit of the mining people in the Denver district, a small skeleton mine is shown illustrating the uses to which steel may be put in supporting mine roofs. This exhibit also shows a portable steel track which is coming into extensive use around mines.

The Carnegie Steel Company is represented by the following men from the various agencies: N. M. Hench, J. C. C. Holding, N. D. Trist and L. P. Lincoln of the general offices and works at Pittsburg; E. S. Mills, special sales agent, Chicago; R. B. Carr, manager of sales, San Francisco; E. M. Sparhawk, manager of sales, Denver; O. M. Ash, Portland; A. H. Hawkins, Denver; K. E. Porter, Cincinnati; C. B. Friday, Chicago, and W. E. Berry, New York.

Although the Dayton Manufacturing Company has no exhibit of apparatus at the convention it is represented by F. M. Nicholl, Joseph Leidenger and Peter Leidenger, who are in attendance.

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John A. Roebling's Sons Company, Trenton, N. J., and Chicago, Ill., is showing some fine specimens of the well-known Roebling car cables. The company is ably represented by W. H. Slingloff, E. E., assisted by John McG. King, its Denver representative.

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The Avenarius Carbolineum Wood-Preserving Company of Milwaukee, Wis., and Portland, Ore., has an interesting exhibit in Space 701. The representatives of this company have some new facts regarding the preservation of wood which they are furnishing free to visitors.

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Berry Brothers, Ltd., Detroit, Mich., are exhibiting a number of panels showing different car-body colors and varnishes, interior finishes, etc. Interesting picture books for children and samples of some of the company's products are being given away for souvenirs.

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The Western Pole & Lumber Company, which has an exhibit in Booth 701 in the main Auditorium, has eight cedar yards in the State of Idaho and two white cedar yards in the State of Michigan. The company keeps a large stock of cedar poles at all of these yards, ready to ship on short notice. The company will ship its cedar products to all sections of the country, excepting that part of the United States lying south of the Ohio and east of the Mississippi rivers.

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One of the interesting exhibits at the convention is the gasoline locomotive shown by the Milwaukee Locomotive Manufacturing Company. This locomotive is driven by a 25-hp engine and is designed for use in mines and industrial plants for hauling trains of small cars. However, the company builds these locomotives in all sizes up to 300-hp for use in high-speed freight and passenger service. They may also be used as line cars by installing a tower on the frame of the locomotive.