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NEW YORK—OCTOBER 13, 1910.—ATLANTIC CITY

PROGRAM FOR TO-DAY

- 9.30 a.m. Chalfonte Hotel, Meeting of the Accountants' Association.
- 9.30 a.m. Greek Temple, Convention Pier, Meeting of Transportation
& Traffic Association.
- 9.30 a.m. Atlantic City Country Club—ASIRMA Golf Tournament—
18-Hole Competition—Tournament Round may be played
any time during the day (prizes).
- 2.00 p.m. Greek Temple, Convention Pier, Meeting of the American
Association (Executive Session).
- 3.00 p.m. Marlborough-Blenheim, Japanese Tea for Ladies.
- 9.00 p.m. Lobby, Convention Pier, Promenade Concert and Ball.

City Rules

The action of the Transportation & Traffic Association
this morning on city rules was to ratify three of the changes
recommended in the code by the rules committee this year,
and in four cases not to adopt them. It was noticeable that
in each one of the latter instances the majority opinion as
expressed at the meeting was exactly contrary to the ma-
jority opinion as expressed in the replies received by the
committee earlier in the year. In no case, however, was the
total number of votes so large, either at the meeting or in
the letter canvass, as to carry very much meaning. The
largest number of votes given in the convention hall was

50, and the largest number of replies received by the com-
mittee as to any one question was 75—numbers which con-
stitute only 14 and 21 per cent respectively of the entire
number of 350 members of the association. This result
emphasizes the point made by Mr. Hegarty, as one of the
members of the committee, that unless greater interest was
shown by member companies in expressing their wishes in
the matter of the rules the committee would have no means
of learning the consensus of opinion of the members. Under
the circumstances the designation of the code adopted at the
meeting yesterday morning as the Official Code for 1910
was the wisest thing to do, but the conditions disclosed sug-
gest the advisability of the adoption, in future, of some meth-
od, like a letter ballot, of learning the ideas of the majority
of members in the association.

A Word for Lighter Equipments

One of the most interesting portions of the report of the
committee on equipment presented Wednesday before the Engi-
neering Association is that which deals with the weights of the
electrical parts. The history of electric railway equipments
has been a curious one, beginning with converted horse cars
and 7.5 hp motors. Weights of rolling stock have steadily in-
creased up to the huge and powerful interurban cars of to-day,
admirably suited for high-speed work, but altogether too heavy
for street service under ordinary conditions. In the same way
the call for high speed and consequently very great variation of
speed where terminals were to be considered has brought in
the use of heavy, intricate and costly motor equipments, capital
for their own special purposes, but troublesome under many
and perhaps most conditions. The change has come about
partly in response to real needs and partly as a result of what
comes very near to being pure fashion. It obviously is not
true that every street railway must be equipped with 60-pas-
senger cars adapted for a speed of 40 m.p.h. and fitted for the
highest possible acceleration attainable without positive danger
to the passengers. There are roads requiring this heavy equip-
ment, but for each one of these there are a dozen roads which
do not need it and there is now a most encouraging tendency
toward more reasonable equipments.

The committee report, in considering the two and four-motor
equipments, deals particularly with the saving in weight, which
appears to be, in the case of ordinary requirements, not less
than 25 per cent in favor of the two-motor outfit. This of itself
is a matter well worth considering at a time when inventive
genius is being taxed to reduce the weight of every article
which goes into a car. But there is no doubt also, from the
experience of the past decade, that when used within their
proper sphere of action the two-motor equipments are more
efficient than the four-motor, cost less per car to keep up and
finally involve a smaller investment and depreciation charge. In-
cidentally, of course, the lighter equipment gives suitable op-

portunity for lightening the trucks, which still further increases its advantage. The obvious moral is that for conditions of speed and acceleration that do not require four motors the simpler equipment possesses advantages so considerable as to make its use highly desirable.

Fear has occasionally been expressed lest lightening the equipment, and particularly lessening the weight of the whole rolling stock, might tend to make cars ride less easily and perform less smoothly. On the other hand, as the committee indicates, the lighter equipment sometimes does better than the heavier in these respects and certainly is likely to produce less damage to the track, which is no inconsiderable advantage. On the face of the returns, therefore, it seems altogether desirable to retreat from the extreme position of the last few years and work toward rolling stock and motor equipment cheaper to buy and operate by reason of its less weight and equally well suited for the purpose of its use in most situations. There will always be necessity for heavy interurban cars where great speeds are to be attempted, but the introduction of these extreme types on most roads is, we believe, a mistake which should be corrected for the advantage of all parties concerned.

Specifications for Insulation

The report of the committee on power distribution deals fundamentally with the matter of specifications for cables. It has been only very gradually that experience enough has been gained with cables to make it possible to work out the proper specifications. It is perhaps even yet doubtful whether the specifications for so-called rubber-covered cables can be standardized in any satisfactory way. The suggestions for the high-tension paper cables made by the committee seem sound and conservative. There is this to be said for the paper cable, that when carefully manufactured and installed with rigorous attention to the character of the joints it stands up remarkably well. Thorough inspection of the sheath is the most necessary precaution in dealing with this kind of conductor. Deficiency in thickness is very properly penalized in the specifications. Variations in thickness should, we think, be dealt with even more severely. These fortunately do not occur often in serious degree, but now and then they appear and are liable to lead to trouble. The committee's guarantee for paper cables certainly sounds rigorous enough, but we are inclined to think it will be extremely hard in the future, as it has been in the past, to pin down the manufacturer to the responsibility after any considerable time has elapsed since the installation.

As to the rubber compound question the committee has made the best of a rather troublesome situation. To be perfectly frank, rubber compounds at the present time are difficult to subject to an effective specification. The best of them are very good indeed and the worst of them singularly bad, while it is very doubtful whether any physical, chemical or electrical tests not applied by one with a large practical knowledge of rubber manufacture can lead to anything like definite results. The thing to be feared in rubber cable is not complete and sudden breakdown due to a definite injury, as is commonly the case with paper cables, but slow deterioration under the influence of time and heat. Rubber itself varies considerably in quality and the treatment to which it is subjected produces still greater variations. These variations account for the phrase in the second clause of the new specification which provides that the inspector shall not be privileged to learn what mineral ingredients form a part of the rubber compound. In a sense these are trade secrets, but if there is going to be any physical and chemical specification it is certainly instructive to know what 70 per cent of the material paid for is made of, not with a view of

prying into the manufacturer's business, but to find out the relations of this 70 per cent to the after history of the cable.

Electrical tests are satisfactory enough initially, but bear little direct relation to subsequent electrical conditions. After all, in the matter of rubber-covered cables, as in many other matters, the character of the manufacturing company for honesty and reliability goes further than any formal tests. One can specify a percentage of rubber and ascertain it. He can specify the thickness of the installation and the way in which it shall be put on, and can make initial tests of the completed cable, but the experienced rubber manufacturer can, if so disposed, evade any specification sufficiently simple to be practically applied, so that in a last resort reliability of the product is a question of honesty. Considering the present temptations to scamp rubber compounds the generally good results obtained from first-class commercial cable speak well for the sense of responsibility on the part of the manufacturers.

Advertising the Service

This is an age of advertising, and our convention issue this year is devoted largely to an exposition of the methods used by a large number of electric railways in advertising what they have to sell to the traveling public—that is, transportation. The summary in our convention issue shows that the electric railways as a whole have not overlooked the possibilities of advertising their service, but it is also true that some companies are not making the most of their opportunities in this direction. Perhaps this backwardness is due to forced economies in every department, or it may be due to indifferent success in the past which has discouraged further efforts. It is easy to discern the effect of successful advertising, but it is sometimes very difficult to locate the cause of failure of an advertising campaign which does not bring results. Undoubtedly the right kind of advertising pays handsomely, provided always that the service given is up to the standard claimed for it in the advertisements.

Advertising is not salesmanship, and it constitutes only one phase of the promotion of traffic. The purpose of advertising is merely to create interest in the thing advertised, or, in other words, the desire to buy. The next step is to offer the opportunity to buy. As applied to electric railways this means comfortable and attractive stations and adequate accommodations on the cars. Personal solicitation plays an important part in the creation of traffic. The time to sell is when the attention of the buyer has been secured through advertising. A circular letter is a helpful introduction for the solicitor, but personal salesmanship is the most satisfactory medium for closing a contract for a large excursion or special-car party.

Finally, the service given and the fares charged must be so attractive that a new patron secured through advertising becomes a regular traveler by the electric road, because the pleasant recollection of the first journey remains with him. Periodical advertising of a different kind from that required to create new traffic serves to keep fresh this recollection. Some managers believe that the features of the service they offer—frequent and comfortable cars, fast schedules and convenient terminals—are sufficient advertisement of the road. They may serve to hold regular patrons, but they create little new traffic. The occasional traveler and the stranger in a strange land bring in the extra revenue above operating expenses out of which dividends are paid, and it is to them that advertising should appeal. The ways of reaching them through paper and ink are legion.

Conventionalities

Who took "Billikin" for a ride in a wheel chair?

The members of the two convention ball teams were a stiff lot yesterday.

J. A. Lemon, of McCord & Company, made a flying trip from New York to look the convention over.

S. M. Curwen, of the J. G. Brill Company, arrived on Tuesday afternoon. He at once began circulating among his friends, and has been circulating ever since.

R. C. Cram, assistant engineer of the Connecticut Company, is attending the convention for the eighth consecutive year.

The installation weather was rather moist for exhibitors, but the weather man is evidently doing his best to retrieve his good name.

William T. Dougan, engineer maintenance of way, Metropolitan Street Railway, is at the convention. "Bill" has promised to be good. There is a reason.

Carl P. Dennett, the local manager at Boston of the Griffin Wheel Company, is attending the convention for the first time. He has confided to his friends that he likes the experience.

J. J. Sullivan, president of the American Railways Company, came down from Philadelphia yesterday. Mr. Sullivan is a citizen of Atlantic City, as he spends about six months of the year here.

Mrs. J. R. Ellicott, wife of the president of the Manufacturers' Association, bears her official responsibilities with lightness and grace. She is a decided acquisition to the social side of the convention.

Ralph Sanger is present at the convention after a sojourn in Europe of four months. He reports the universal adoption and use of the "H. B." life guard, over 40,000 being in service in Europe and foreign countries.

One of the uncomfortable thoughts about these conventions is that there is no way to adequately express the appreciation which everyone feels for the work done by the officers and the committeemen of all the associations.

At the mysterious hour of 6.30 a.m. the lone, silent but majestic figure of Charles Banghart, superintendent of the New York & Queens County Railway, was observed in a buzz-wagon hastening through the deserted streets of this fair city.

The mechanical bird shown in the booth of the Dearborn Drug & Chemical Works is said to be of a chemically unknown type, and is reported to be the personal property of George R. Carr, one of the company's representatives.

Daniel M. Brady, president of the Brady Brass Company and ex-president of the Manufacturers' Association, is at the convention. Mr. Brady says he is too busy building a new plant to make an exhibit this year.

At the booth of the Massachusetts Chemical Company delegates have a chance of winning \$500 by smoking a cigar handed out by Mr. Furbush. There is a number under the band. Get the lucky number and the money is yours.

His Excellency R. Nakakoji, vice-minister of the Department of Communication of Japan accompanied by two secretaries, will inspect the exhibits at the convention on Friday. His excellency will be accompanied by E. H. Mays, of the E. G. Long Company.

Wednesday, being Columbus Day and a holiday in New York City, gave many busy men an opportunity of visiting the convention at Atlantic City. Among others taking advantage of this opportunity was Charles C. Cluff, manager of sales, New York office, Carnegie Steel Company.

J. Alexander Brown, ex-secretary of several railway supply manufacturers' organizations, vice-president of the Pocket List of Railway Officials, government delegate to the recent International Railway Congress at Berne, is in our midst. He speaks with a foreign accent that is decidedly noticeable.

Whether it is the apparatus exhibited, the official family, or both, of the Railway Improvement Company, we notice that the booth is always crowded with delegates. Frank Hedley, president, R. L. MacDuffie, vice-president, James S. Doyle, treasurer, and Andrtw J. Pizzini, general manager, are all present at the convention.

John G. Buehler, Mrs. Buehler and John Kress, Jr., arrived from New York by automobile on Wednesday morning. It is rumored that the trip was successful, although they were on the lookout for "Bill" McGowan once or twice. It will be remembered that "Bill" towed Buehler into Atlantic City two years ago.

No face at the convention is more familiar or meets with a more hearty welcome than that of F. A. Estep, of the R. D. Nuttall Company, of Pittsburgh. This is the eighteenth convention that Mr. Estep has attended, and therefore the only delegates who do not know him are the younger men attending their first convention.

George Keegan gave a lifelike imitation of the five foolish virgins just before the baseball game Tuesday. He stole two A. & W. marker lamps and a gallon of Galena signal oil, and by so doing enabled the Yama Yamas to emerge from the dressing room with their hats on straight. The green light was reflected for hours by Hank Fassett's uniform.

Thomas W. Casey, of the Pay-As-You-Enter Car Corporation, has just returned from Europe, after attending the Brussels Exposition and visiting a number of European railways in the interest of the P-A-Y-E cars. He reports a great deal of interest in this type of car in Europe. Of a number of new cars now being built by the Paris Tramways 10 cars will be the P-A-Y-E type.

The meeting hall provided on the pier for the Engineering Association was severely criticised after the meeting on Tuesday afternoon. In the midst of an interesting discussion on the report of the committee on power generation the meeting had to adjourn because no lights had been provided and the room became so dark that the stenographer could not see to take notes. The acoustic properties of the room were very poor and it was difficult to hear most of the speakers.

A prominent supply man is authority for the statement that you can buy anything on the Boardwalk except suspenders. He tried it Monday evening when he came to dress for the reception on the Pier. He found a full complement of glad rags minus the one most important piece of his wearing apparel. A belt failed to hold up his essentially masculine attire, and he was compelled to disappoint several ladies with whom he had engaged dances.

John S. Speer, of the Speer Carbon Company, as usual, is planning his annual moose hunt in the Maine woods. It is said that his room at the Marlborough-Blenheim resembles somewhat a National Guard armory. When he is not in his booth he is cleaning his magazine gun, with the hope of getting a shot. We would suggest that if George Fryling, Mr. Speer's brother-in-law, would stay away from his family a little more he would be able to keep Mr. Speer in the booth.

One of the busiest men at the convention is Secretary Donecker. Besides his actual work as secretary of the American and Transportation & Traffic Associations, he has general charge of the publications of all the associations and of the registration and official lists, besides being the final resort for all kinds of information about the associations. This is not a vacation for Mr. Donecker. He is accompanied to the convention by Mrs. Donecker. This is the first convention she has attended, but it is to be hoped that it is not the last.

Arthur Warren, of the New York "Tribune," who is widely and favorably known in the electrical industry, came down from New York yesterday to visit old friends at the convention.

George H. Sanford and Homer Godfrey, of the David B. Crockett Varnish Company, Bridgeport, Conn., are present at the convention in the interest of the company.

W. J. Mulholland, purchasing agent of the American Railways, arrived in town Tuesday. It is rumored that so far he has not been able to "buck the line" and get into convention hall.

The Gulick-Henderson Company, engineer, of Pittsburgh, Pa., is represented at the convention by Henry Gulick, president of the company, who is a member of the engineering Association.

Robert W. Hunt & Co., Pittsburgh, Pa., inspection engineers, are issuing a booklet containing the rail specifications of the Lorain and Pennsylvania Steel Companies, together with miscellaneous data on rails. A booklet containing the proposed rail specifications of the American Street & Interurban Railway Association will be issued as soon as they are adopted.

Edwin Hammett, superintendent of the Sheboygan (Wis.) Railway & Light Company, is present as the accredited representative of Ernest Gonzenbach, general manager, who is unable to attend the convention this year. Until a few months ago Mr. Hammett was the Pittsburgh representative of the Electric Service Supplies Company.

The Cambria Steel Company, Johnstown, Pa., has no exhibit this year, but it has on hand a large and enthusiastic delegation of representatives who are busy talking axles. In addition to J. Leonard Replogle, assistant to the president, the following local agents are in Atlantic City: C. J. Ellis, Chicago agent; William McLain, Pittsburgh agent; A. Morrison, Pittsburgh agent; H. L. Waterman, New York agent; W. S. Ottinger, Philadelphia agent; H. P. Hubbell, St. Louis agent.

PRIZE WINNERS AT LADIES' EUCHRE

The names of the ladies who won prizes at the progressive euchre given on Tuesday evening at the Marlborough-Blenheim Hotel were received too late for insertion in Wednesday morning's paper. The following is a list of the prize winners, in the order of their scores: Mrs. W. P. Weaver, Mrs. F. W. Bacon, Mrs. Thomas Bell, Mrs. T. C. Cherry, Mrs. E. M. Hedley, Mrs. A. B. Conover, Mrs. W. E. Harrington, Mrs. J. C. Glair, Mrs. C. H. Thomas, Mrs. William F. Bifting, Mrs. A. L. Whipple, Mrs. B. M. Lathrop, Miss M. D. Champion, Mrs. S. F. Hazelrigg, Mrs. T. F. Grover. The prizes were handsome lamps, china and cut glass. John I. Beggs acted as judge of the scores, but he had no occasion to settle any disputes between the contestants.

AIRSHIP "AMERICA" TO BEGIN FLIGHT TO EUROPE TO-DAY

Walter Wellman, projector of the Atlantic City-Europe airship flight, states that the dirigible airship "America" is now practically ready for its long voyage. He hopes to make a trial trip to-day if the weather is propitious. The airship is housed in a hangar located at the Inlet, about 2½ miles from the Million Dollar Pier. This place can be reached by trolley line on Atlantic Avenue, and it has been inspected by many of the conventioners.

The dirigible has a gas bag 228 ft. in length and the car is 156 ft. long. It is estimated that the trip to Europe will take about eight days, providing conditions are favorable, but the airship carries a store of provisions for a 30-day flight and emergency rations for 30 days more.

COMMITTEE ON PUBLIC RELATIONS

The committee on public relations of the American Association met and formulated its report on Tuesday, October 11. It also took up the question of work for the coming year. Various suggestions were made, and it was decided finally to appoint a subcommittee which will confer with the executive committee of the American Association after the close of the Thursday session. The subcommittee consists of E. C. Foster, New York; C. C. Smith, Milwaukee, Wis.; R. P. Stevens, Allentown, Pa.

AMATEUR VAUDEVILLE PERFORMANCE

The supply men's sixth annual amateur vaudeville and theatrical performance was given last night at the Apollo Theater before a large and enthusiastic audience. The production, which was staged by R. M. Campbell, of the entertainment committee, was an excellent one. The program follows:

Overture.

At the ASIRMA Club Smoker.....A few warm members
Convention Nonsense.....E. F. Wickwire
"He Must Feel Funny Inside."

(Through courtesy of the Ohio Brass Company.)

"THE BIRDMAN,"

A musical, nonsensical piece of fooling, written expressly for
G. L. Emmons and A. L. Atkinson by William Gill.

Scene—A room in a hotel in Atlantic City.

CAST OF CHARACTERS.

Hawleybourg McGraw Roshayes Ellicastle, Esq..G. L. Emmons
Chairman of the executive committee of the A. S. I. R. M. A.
Pete Anthony Johnson, the Birdman.....A. L. Atkinson
(Through courtesy of the General Electric Company.)

Reuben Haskins from Skowhegan.....Ernest Wright
(Through courtesy of the Pantasote Company.)

SKETCH.

James S. Devlin and Miss Mae Ellwood presenting that "Taking
Sketch,"

"THE GIRL FROM YONKERS,"

By Fred J. Beaman.

CAST OF CHARACTERS.

Augustive Butler, a wise city boy.....J. S. Devlin
Daisy Bennington, a simple country lass....Miss M. Ellwood
Place—Butler's apartment, New York City.

(Through courtesy of Westinghouse Electric & Manufacturing
Company.)

"A Little Music".....Herbert A. Clark
Also a few Personal Hits. (Be ready to dodge.)

(Through courtesy of Allis-Chalmers Company.)

ASIRMA Quartet.

A few minutes of Grand Opera,

Miss E. Virginia Root, Soprano
Miss Alice L. Mertens, Contralto
John H. Thomas, Tenor
R. J. Owens, Bass

(Through courtesy of Standard Paint Company and Whipple
Supply Company.)

In the year ended March 31, 1910, the London County Council Tramways carried 451,000,000 passengers as against 314,000,000 passengers in 1909.

WEDNESDAY MEETING OF ACCOUNTANTS' ASSOCIATION

The Wednesday morning session of the Accountants' Association was called to order by President Swift at the Hotel Chalfonte. The first speaker was W. M. Steuart, chief statistician for manufactures, United States Census Bureau, who discussed the last census of electric railways. A rising vote of thanks was extended to Mr. Steuart for his paper. The association will publish the paper in pamphlet form in order that the information presented may be available.

W. B. Brockway asked Mr. Steuart if it had been found that more companies were using the standard classification in 1907 than in 1902.

Mr. Steuart replied that more companies were using the standard system in the later year, and that in many cases where the full classification had not been adopted sufficient details had been used to permit the preparation of statistics in a satisfactory manner.

J. H. Neal, general auditor, Boston Elevated Railway, then read a paper on "Detailed Records—Their Use and Value."

Mr. Brockway, in discussing the paper, said that a good deal of his work consisted of the examination of properties. Sometimes the examination occurred years after the transactions had been reported in the records of the company, and it was frequently practically impossible to obtain any connected and intelligent information from the records as retained. The records of some one department were usually in pretty good shape; this department might be the accounting, the purchasing or some other department for which an enthusiastic electrical engineer or other official was directly responsible. The operating men who gathered the information did not digest it, and in only one of the numerous companies in regard to which Mr. Brockway had intimate knowledge had the reports and information gathered by the different departments been collected in one place. Perhaps the difficulty was due to the fact that each department stood more or less on its own feet, and struggled with its own problems without attempt to work together with a unified established plan for the whole property.

P. S. Young, Public Service Corporation of New Jersey, said that Mr. Neal had brought out the importance of simplicity in records of this character. All cost accounting appeared to be tending toward simplicity. Cost accounting seemed at first to be very complex, but as it was developed the tendency was to simplify records.

Mr. Steuart stated in answer to a question that the agents of the Census Bureau found that many important companies did not keep records from which they could secure the information desired for the census.

N. E. Stubbs, United Railways & Electric Company of Baltimore, asked Mr. Neal how he filed the statements in his office.

Mr. Neal said that each department sent in a time card. Abstracts of these cards were made on little slips, with a separate slip for each account. The same plan was followed with the material used sheets and with anything that affected the expenditures. When these were filed together they gave fine details of the accounts and summaries were made of the totals. The summaries were added on an adding machine. After the account had gone through the journal a trial balance was taken from the ledger. There was no special way of filing except that all the slips were of the same size and they were filed by accounts.

W. F. Ham, Washington Railway & Electric Company, asked how the shop employees or other employees were informed as to the assignment of their shop orders and whether they could keep account of these assignments readily.

Mr. Neal said that no work was done in the shop except on written order to the superintendent of the shop, who numbered the order and handed it to the foreman. The foreman called a man and gave him a time card and described the work wanted.

The man stamped the card in a time clock when he commenced the job and again when he completed the work and reported to the foreman. When this plan was started it was found that the foreman had great difficulty in giving out new jobs so as to avoid loss of time between the completion of one job and the commencement of another. A memorandum was sent to the foreman each week showing the amount of time lost by men owing to the fact that the completion of jobs was not anticipated and delays in commencement of new jobs obviated, and by this means more careful arrangements were made so that there is now but a few minutes intervening between jobs.

Joseph A. McGowan, Indianapolis Traction & Terminal Company, asked who had access to the files and memoranda and what record Mr. Neal had in case the memoranda were taken.

Mr. Neal said that the original record in the auditor's office was the slip that contained the total of the summaries. The time card was returned to the shop, as the auditor would not require the detailed information which it showed. All the papers in the auditor's office were bound with wire stitches.

H. L. Wilson, Boston Elevated Railway, asked how many shop numbers there were.

Mr. Neal said that there were about 60 for all departments last year, but that was easier than if the 88 operating accounts had been followed.

Henry J. Davies, secretary, Cleveland Railway, read a paper on "Accounting Features of the Cleveland Street Railway Franchise."

ANNUAL MEETING OF THE MANUFACTURERS' ASSOCIATION

The annual meeting of the American Street & Interurban Railway Manufacturers' Association was held in the Greek Temple of Young's Million Dollar Pier, at 5:30 P. M. last evening, with President Ellicott in the chair. President James F. Shaw, of the parent association, made a few remarks, briefly expressing the appreciation which all of the associations entertained toward the work done by the Manufacturers' Association. President Ellicott and Vice-President Hequembourg explained some of the difficulties under which the executive committee had been compelled to labor preparing the booths for the exhibits and in other respects, all of which was received with approval by the many association members present. The report of Secretary-Treasurer Keegan showed that the association was flourishing financially, with a balance of upward of \$7,000 on hand.

On motion of William Marshall, of the Anglo-American Varnish Company, seconded by D. M. Brady, of the Brady Brass Company, the meeting, by a rising vote, expressed its approval of the work of the executive committee and its officers during the past year.

The president appointed a nominating committee, consisting of A. H. Sisson, K. D. Hequembourg, S. H. Blewett, S. K. Colby and Edward Besuden.

The candidates reported by the nominating committee to succeed the retiring members of the executive committee were C. C. Castle, of the U. S. Metal & Manufacturing Company, to succeed himself for the unexpired year of the term of the office to which he was appointed subsequent to the last election; E. H. Baker, of the Galena Signal Oil Company, to succeed Otis H. Cutler; H. F. Martin, Pennsylvania Steel Company; W. H. Heulings, Jr., J. G. Brill Company; E. M. Williams, Sherwin-Williams Company, each to succeed himself; E. H. Bluett, of the American Car & Foundry Company, to succeed A. F. Partridge, of the A. F. Partridge Company, St. Louis.

After some complimentary remarks by D. M. Brady, who seconded a motion by H. Humphrey, of the Westinghouse Air Brake Company, that the secretary be instructed by a rising vote to cast the ballot of the meeting for the nominees, the election was confirmed, and the meeting adjourned.

MEETING OF THE TRANSPORTATION & TRAFFIC ASSOCIATION

The first action taken at the meeting of the Transportation & Traffic Association was the appointment of a committee on nominations. President Todd appointed C. Locmis Allen, N. W. Bolen and C. A. Silvester. He then called for the report of the committee on city rules. It was read by Mr. Hegarty.

CITY RULES

H. C. Page, Worcester, thought that while the changes suggested in the rules might be a little better than last year, it was inadvisable to make changes too frequently. The employees knew the rules as they existed, and it would take some time for them to get familiar with the changes. His company had adopted the old book. If it should adopt the new rules, the present books would have to be changed. He was not a standpatter, but he thought that the association should go very carefully in making these changes.

Mr. Duffy, Syracuse, was largely of the same opinion as Mr. Page. As he understood the rule on responsibility, it made the motorman only responsible for running the car according to the schedule, but did not hold anyone particularly responsible for starting the car. On his own road, the motorman and the conductor were held responsible jointly for starting open cars and long pay-as-you-enter cars. With such cars, it was sometimes easy for the conductor, with a crowd, to get confused and not see a person at or near the front end of the car getting off.

On motion of Mr. Allen, a vote was taken on changing Rule 2 as recommended. The vote was 13 yeas and 25 noes. The association then voted to refer Rule 2 back to the committee for further consideration.

Mr. Hegarty thought little progress would be made by referring rules back to the committee. Last year, the committee sent out frequent requests for suggestions and opinions, but from 355 companies the committee got only 75 replies. It was useless to expect it to formulate a set of rules to apply to every road and cover every condition.

Rule 10 on bell signals was then considered.

Mr. Duffy, Syracuse, said his objection to Rule 10 was that his company was operating a considerable number of single-end cars. These cars are compelled to wye at the end of the line, and the only way that the motorman can possibly handle them under these circumstances is by backing and it is impossible to comply with the 10-ft. rule. Many times the lines are tied up and the cars have to back for a mile. He realized that it was impossible to suit all local conditions, but he himself would be unable to use Rule 10.

Mr. Page thought that the words "10 ft." would not mean much to many motormen.

Mr. Allen, Utica, saw no objection to referring rules back to the committee. In other words, he thought any rules committee should be a continuous committee and should not think it had concluded its work in 1910 and then think there was nothing to do until 1915. The rules would probably have to be considered every year.

Mr. Hegarty thought that if that was the case the member companies ought to reply more promptly to letters and circulars sent to them by the committee.

On vote, the adoption of the suggested change in Rule 10 was lost by a vote of 7 yeas and 27 noes.

The president then said the association would take up Rule 21, "Standing on steps." The new rule was adopted unanimously by 50 votes.

The president then said that they would take up "Rule 4—new rule—"Provide change;" under Car House Rules. This rule was adopted unanimously by 43 votes.

The next change considered was Rule 101, "Position on Car." C. E. Learned, Boston, asked whether the rule applied to center-entrance cars.

W. M. Casey, Denver, said his company operated side-entrance cars and that conductors had to be at the entrance at all times when not engaged in the collection of fares. He thought that the old rule was more desirable.

T. C. Cherry, Utica, said that with 15-bench open cars the conductor often had to ride on the running board.

L. H. Palmer, New York, said that the change from the old rule had been adopted by the committee because its idea was that the rules should be general. As comparatively few cars have center side entrances the committee thought it wise to eliminate any reference to such a design. Individual companies could cover such a situation with an additional rule or amendment. The question of standing on the running board of open cars was also considered, but the committee thought that that also might be covered by a special rule and it need not be put into the general code for the adoption of all.

The suggested change in rule 101 was lost on a vote of 9 yeas and 31 noes.

The president then said that the committee would take up rule 116 on change. On vote, the change was adopted by unanimous vote of 43.

The next rule considered was rule 213, "Power off line."

H. L. Patterson, Youngstown, thought it was necessary in this rule to differentiate between day and night operation.

Mr. Page, Worcester, was in favor of the rule as it now stood in the code. Mr. Emmons and Mr. Brush agreed with Mr. Page. The latter said that he had been trying the experiment of equipping the dispatcher's office and power station with a bell system so that in case the dispatcher gave an erroneous order and realized the fact, all the power switches could be thrown. This system would not be effective if coasting was allowed.

On vote, the association voted not to accept the amendment by a vote of 37 to 0.

Mr. Emmons, Fort Wayne, asked that the city rules committee be instructed to confer with the interurban rules committee to endeavor to harmonize the two sets of rules.

Mr. Duffy, Syracuse, suggested that the committee should also take into consideration the general adoption of pay-as-you-enter, especially so far as Rule 2 on responsibility of motorman and conductor was concerned. He had found it very practicable to hold the motorman responsible to some extent for safety of people in getting off and on the car instead of placing all the responsibility on the conductor.

The association then voted that the code of city rules as amended at the meeting should be the standard code of city rules for 1910; and that this code should be referred back to the city rules committee for further consideration and that it should also be instructed to communicate and act with the interurban rules committee with a view of harmonizing the rules for city and interurban service.

TRANSFERS AND TRANSFER INFORMATION

M. R. Boylan, Newark, then read the report on "Transfers and Transfer Information." This is published elsewhere in this issue.

L. S. Hoffman then read his paper entitled "Transfer Laws and Suggested Changes." An abstract of this paper is also printed in this issue.

At the conclusion of his paper Mr. Hoffman stated that he understood that the law in Connecticut enabled prosecutions to be brought against people who abused the use of transfers.

A. N. Brady, Anderson, stated that while his own road was an interurban road and hence had little occasion to issue transfers, it was a subject which interested him greatly. He thought that the abuse should be reached first by the establishment of local prohibition under the sanction of legal punishment, and, second by a vigorous campaign of prosecution under this law. The Interstate Commerce law and the most recent railroad legislation had declared distinctly against free transportation, and the former law made it a criminal offense for any person to accept free transportation either for persons

or property. Hence, if the transfer privilege is abused and the company carries a person free whom it does not intend to carry free, the offender is attempting to do by fraud an act condemned by the spirit of modern railroad legislation. For this reason he did not see why there should be difficulty in proving the validity of any proper legal prohibition founded on the lines of the act suggested by Mr. Hoffman to prevent transfer abuses.

Mr. Hegarty, Little Rock, said that the franchises of that company required it to pay a percentage of its gross receipts to the city. This made the city interested in stopping the abuse of transfers. On the Little Rock road the conductors deposit transfers every half trip. The transfers are enclosed in an envelope and the box into which the envelope is dropped has an automatic time stamp inside the box, so that any delay in depositing the envelope will be known when the envelopes are examined after the box is opened.

Mr. Casey, Denver, said that his company had issued a pamphlet of instructions to conductors on the subject of transfers. The standard time limit allowed in Denver is 10 minutes, but on some interurban lines a longer time has to be permitted and this pamphlet educates the conductors as to the time limit. In Denver the transfers are deposited in boxes every trip and the boxes are emptied every hour.

A delegate from a Southern city said that the envelopes containing transfers on his line were deposited in a locked box, carried on the side of the car. This box is emptied at the end of the day. By means of serial numbers it is possible to determine whether the transfers were deposited promptly. Separate registers are used for cash fares and transfers. Many of the courts in the Southern States pay little attention to prosecutions brought against people for abusing transfers, looking upon the offense as too trivial to warrant serious consideration.

C. E. Learned, Boston, said that some years ago the Massachusetts Legislature added the words "give away" to the law on transfers, so as to make it a misdemeanor for a person to give away a transfer. It was found that places known as exchanges would be established in bar rooms. They consisted of a box with a slot. A passenger on a car would ask for a transfer, and if he did not use it would throw it in this box, and pick out one that he did wish to use. To make a case clear the company put a number of inspectors on the cars. The conductors were forewarned, and when they took a transfer from a passenger under suspicion, the conductor, instead of putting the transfer in his left hand, would keep it in plain view until he reached the inspector who was in the rear of the car, and show him the number of the transfer. Both of them then took a note of the number of the transfer. When a passenger who was receiving a transfer under suspicion left the car the inspector followed him and saw him give his transfer away. He would then follow the man who took it to his car, where the conductor would repeat the procedure of holding the transfer in his right hand, so that it could be identified by both the conductor and the inspector. Evidence was secured in this way against six prominent merchants. All pleaded guilty, and were fined from \$18 to \$20 each. There was a good deal of newspaper notoriety about it. The company has had very little trouble since.

Mr. Hibbard, Toronto, said there was no special law in that city on the subject, but the company has not waited for any law to be passed. Some years ago the conductors would take almost anything that a passenger would offer. About three years ago, however, the company took up the subject seriously. A transfer was prepared in which the conductor punches out the time and also the number of the car. The city was divided into sections, and these are also punched, so that it is now possible to tell the route that each passenger travels. The transfers are checked, and the conductors are graded as to the number of defective transfers which they accept, and the results are posted on

a bulletin board. Articles have been published in the daily papers saying that conductors had no power to adjust questions of fares, and urging any passenger who had a grievance, or thought that he had been given a defective transfer, not to take it up with the receiving conductor, but directly with the company. The company did not eject for defective transfers, but took the name and address of the passenger, and had him summoned to the police court. If the magistrate saw any element of fraud in the case the offender was fined.

On motion of Mr. Page, the report was accepted, and the subject was laid on the table, to be taken up again next year. The paper by George L. Radcliffe, on the use of metal tickets, was postponed until this morning. The meeting then adjourned.

CLAIM AGENTS' ASSOCIATION—CLOSING SESSION

The closing session of the Claim Agents' Association was opened with the reading of the paper entitled "Criminal Negligence of Employees; What is the Best Policy to Pursue in Such Cases?" by E. F. Schneider, general manager and claim agent of the Cleveland, Southwestern & Columbus Railway, Cleveland, Ohio.

C. B. Hardin read the paper in the absence of Mr. Schneider. The reading of this paper was followed with a written discussion by W. O. Stout, general claim agent, Minneapolis division Twin City Rapid Transit Company, Minneapolis, Minn. Several of the members also engaged in a discussion of this subject. Mr. Hooper, of the Hooper-Holmes Bureau, then addressed the association relative to the index bureau, as follows:

"I apprehend there are quite a number of you here who have not yet been able to grasp the full scope of this work that we are carrying on. This work was inaugurated in May last, and since that time we have received reports from 34 out of the 350 companies. Ten per cent practically of the street railway companies of this organization have availed themselves of the use of this bureau. During those five and a half months we have received from the various street railway companies notices of 2,874 claims, and in 175 cases we have been able to give them back information of simultaneous or previous claim records of some kind, many of which, at least, would be of use to them, but of these 2,874, 2,467 have been contributed by three companies, and the balance of 407 have been contributed by the other 31 companies, a very small average. Besides that, the companies which have been reporting freely have out of the 175 cases which we have given them back again, received 125, and the 31 companies reporting 407 claims have received items of more or less interest from us in 50 cases, over 12 per cent of the number of cases they have reported to us; while the three companies giving the large number of reports have received fully 7 per cent of what they reported. I give these figures to indicate how much the service of the bureau has been utilized up to the present time.

"There seems to be a general idea that this work is protection against fraud, but that is not all of it. There are about 7,000,000 insurance policies in force in the United States to-day. Now it is very natural for a man who has sprained his ankle getting on or off a street car, if he has an accident policy, to make application for benefits under that policy. He must, under his contract—that policy is a contract—do certain things. He must give immediate notice of the injury to the company; he must fill out blanks detailing the nature of the accident, the nature of the injuries, the witnesses who can bear him out; and he must produce a statement, made by his own physician, and signed by the physician and under oath, as to the nature of the injuries and the amount of disability.

"Now to make his claim valid, under his contract or pol-

icy, the beneficiary under the policy must do the things which I stated and one or two others, but if that same man has received his injury on a street car he does not perhaps report immediately. Sometimes three or six months or a year would elapse before any claim is made by him—too late for the company to make a proper and thorough investigation. This is particularly true of the unjust and unfounded claims. If, however, the railroad company is in possession of the absolute statements, many times sworn to by the same man who has made a claim for the same accident against a casualty company, and he can get the possession of those papers and of that record, you can see how immensely it would help the street railway claim agent to settle that man's claim on a just and equitable basis.

"The insurance company also has the right to send its medical examiners as often as it desires to examine the person and the body of a claimant to determine the justness of his claim. In many, if not all of the States, the railroad company cannot do that. Here is where coöperation between the two lines of organizations is so valuable. Within the last two or three years we have had 100 or 150 cases where the insurance company has been only too glad to coöperate with a railroad subscriber to the bureau in making such examinations, always giving any information that it has.

"We have been at this work since February, 1895. Our experience has been that the transportation companies are really getting more benefit from this work than the casualty companies are, in proportion to what it costs them and in proportion to the number of claims they have. The report of the bureau for the past year—the year ending the 1st day of July—shows that we had 229,664 disabilities reported to us by the different subscribers, and we found either simultaneous or previous records against these various parties in 92,842 cases, 40.4 per cent of the claims reported to us. During the same period, the railroad companies, who only report filed claims, received from us 22 per cent of what we call duplicates; that is, two or more records on the same man. I think you will realize how valuable it is to you to receive on an average information of other claims in, say, 7 per cent of your cases. If you receive but one out of 100 you are going, at least, to get information of much benefit. It only costs five cents to report a case.

"I imagine from the reports that we have received that most of you have been reporting only the cases which you have thought were fraudulent or in suit. It is wisdom for you to spend five cents when a man is injured on your road in order that you may be prepared for his claim in case it should come in. I do not mean to say that you would get information in every case that you report to us, but you are going to get at least 7 per cent and in a little while about 22 per cent, I think.

"We have at the present time 55 large active casualty insurance companies and 48 of the largest steam railroads in the country coöperating in this work, reporting about 250,000 claims a year to us, in addition to the 354 members of this organization, most of whom are not reporting at all. Now there are 456 corporations which each and every one of you can coöperate with in this work. In no other way can you do it except through this bureau with such a number as that. The price you pay, then, is, under our contract, first, five cents for every name you report to us. The other price you pay is loyalty and good faith to the other subscribers, and a small amount of labor. You are all supplied with blanks upon which to report. We have never yet had a case of bad faith upon the part of our subscribers."

REMARKS

The amendments to the constitution and by-laws of the association providing for a change in the name of the association to "American Electric Railway Claim Agents' Asso-

ciation," and the admission of associate members who are officers of member companies, were adopted.

ELECTION OF OFFICERS

The nominating committee presented the names of the following gentlemen who were unanimously elected to serve as officers of the association for the ensuing year:

President, H. V. Drown, general claim agent, Public Service Railway, Newark, N. J.

First vice-president, H. K. Bennett, claim agent, Fitchburg & Leominster Street Railway, Fitchburg, Mass.

Second vice-president, C. A. Avant, claim agent, Birmingham Railway, Light & Power Company, Birmingham, Ala.

Third vice-president, Walter S. Heaton, claim agent, Los Angeles-Pacific Company, Los Angeles, Cal.

Secretary and treasurer, B. B. Davis, claim agent, Columbus Railway & Light Company, Columbus, Ohio.

APPOINTMENT OF COMMITTEE

The following members were appointed by President Drown to serve on the executive committee for the following year:

James R. Pratt, assistant general manager, United Railways & Electric Company, Baltimore, Md.

John S. Reynolds, Boston, Mass.

J. H. Handlon, claim agent, United Railroads, San Francisco, Cal.

W. Tichenor, claim agent, Terre Haute, Indianapolis & Eastern Traction Company.

The committee on employment consists of the following members:

R. H. Schoenen, claim agent, Lehigh Valley Transit Company, Allentown, Pa.

C. J. McLeer, claim agent, Schenectady Railway, Schenectady, N. Y.

Thomas A. Cole, claim agent, Los Angeles Railway, Los Angeles, Cal.

The committee on ways and means for 1911 includes:

T. B. Donnelly, claim agent, West Penn Railways, Pittsburgh, Pa.

Charles B. Brunner, claim agent, Easton Transit Company, Easton, Pa.

C. B. Proctor, claim agent, Memphis Street Railway, Memphis, Tenn.

C. H. Mathews, claim agent, Georgia Railway & Electric Company, Atlanta, Ga.

Upon the index committee appointed for 1911 are the following gentlemen:

H. R. Goshorn, general claim agent, Philadelphia Rapid Transit Company, Philadelphia, Pa.

B. B. Davis, claim agent, Columbus Railway & Light Company, Columbus, Ohio.

Cecil G. Rice, claim agent, Pittsburgh Railways, Pittsburgh, Pa.

William F. Weh, claim agent, Cleveland Railway, Cleveland, Ohio.

R. E. McDougall, claim agent, Utica & Mohawk Valley Railway.

A vote of thanks was given to the retiring officers, to the members of the banquet committee, and to the management of the Traymore Hotel for the courteous treatment which it had accorded the association. A vote of regret was passed on the absence of H. R. Goshorn, past-president, who is ill.

A motion was made and carried that E. C. Carpenter should be elected an ex-officio member of the executive committee.

The meeting then adjourned.

A model of the Wellman airship up at the Inlet is on exhibition at the booth of the Consolidated Car Heating Company. "Pegleg" Farmer is making ascensions every hour. A thermostatic control of electric heaters is hatching chickens every little while.

WEDNESDAY MEETING OF THE ENGINEERING ASSOCIATION

President Harvie called the meeting to order at 9:40 a. m., and the first order of business was the continuation of the discussion on the report of the committee on power generation.

C. O. Mailloux, New York, referred to the statement made in connection with the subject of forced draft that the "problem of handling forced-draft systems efficiently in railway power plant service comes back to getting firemen to fire well at the varying rates which are required by the varying loads." It is much easier, he said, just to meet the demand for steam when the load is steady than when it varies widely, and that is one reason why the CO₂ recorder is more valuable in a station carrying a lighting load than in a railway station. Constant steam pressure has an important bearing on the economy of compound engines and there is also a particular pressure which gives the best economy in steam turbines. When the steam pressure in the boiler starts to fall, the usual practice is to open the damper and put on more coal. Very often this results in holes in the fire which reduce the efficiency and do not increase the output. When the pressure gets too high, the first thing which is done is to close the dampers and this leaves an insufficient supply of air for the combustion of the coal already in the furnace. Consequently the gases contain a larger proportion of CO₂. Under practical operating conditions, the speaker believed that the percentage of CO₂ was far from being a fair index of boiler efficiency. Efficiency, after all, was a secondary consideration in boiler operation. The primary function of the boilers is to supply the amount of steam necessary. Sometimes the efforts of the firemen to obtain high efficiency are worse than useless, because in the attempt to attain a high efficiency the proper operation of the plant is interfered with. Improper control of the dampers is responsible for more loss of efficiency than any other detail of operation of boilers. Automatic damper control devices are not very satisfactory. The best method is to have a system of signals connecting the boiler room with the switchboard so that the firemen can control the dampers under instructions from the switchboard operator who sees the load fluctuations. The boiler room is entitled to receive as much attention in this respect as the engine room. Damper control should not be regulated solely with reference to the CO₂ in the flue gases. The first thing which the dampers should control is the steam pressure and the second essential in their manipulation is to control the volume of steam produced in the boiler. Because a satisfactory steam flow meter has not yet been developed, it is practically impossible to determine accurately the amount of steam which is being generated by the boiler. The quantity of feed water is not an accurate index. Mr. Scott had told the speaker of instances in which two boilers of 1500 hp each had been found to be operating at very different rates of production, one giving 500 hp and the other 2,000 hp. Boiler efficiency was the most important element in a boiler plant. Every increase in the efficiency of the boiler is multiplied at the switchboard in the ratio of the efficiency of the entire plant.

William Roberts, Akron, Ohio, said that exhaust steam turbines were like the first storage batteries. Unfortunately, some of them had been put in places where they did not produce the results expected. Referring to the development of steam meters, he did not see that any great progress had been made during the past three years. Progress was being made in the development of reliable and accurate flue gas analyzers.

On motion the report of the committee was accepted.

President Harvie then announced that it was with much regret that he had to present to the association the fol-

lowing letter of resignation from John W. Corning, the secretary and treasurer of the association.

"Oct. 10, 1910.

"To the Acting President and Members of the American Street & Interurban Railway Engineering Association.

"GENTLEMEN:—Owing to increase in my duties with the company with which I am connected, I feel it incumbent upon me to tender you my resignation as secretary-treasurer.

(Signed) "JOHN W. CORNING, Secretary-Treasurer."

REPORT OF COMMITTEE ON EQUIPMENT

John Lindall, Boston, presented the report of the committee on equipment. He said that in taking up the subject of car-body design it had been suggested that the committee undertake the design of a car giving consideration only to weight and strength, but it was early concluded that this would be of no practical value, as cars must be designed primarily to be safe, comfortable and convenient. Weight was important, but a secondary consideration. He believed that still further improvement could be made in reducing the weight of cars by better design, better material and a closer check of the weights of all parts of the car and its equipment. Referring to the recommendations on steel wheels, he said that, on account of the necessity for keeping car steps as low as possible and on account of the saving in weight, the committee had recommended dropping certain sizes of steel wheels with rims 3 in. thick from the list of proposed standard sizes. The committee had been unable to make a thorough study of gears and pinions, but it was evident to everyone that the practice of considering only the mechanical strength of the teeth is insufficient. Consideration should be given to the effect of wear on the teeth and also the effect of wear in the armature and axle bearings.

M. V. Ayres, Worcester, referred to the table of weights of three cars arranged on the basis of pounds per passenger seat and pounds per square foot of floor area. He thought that the weight per square foot of floor area was a much better unit for comparison than the weight per passenger seat.

W. Thorn, Chicago, pointed out that the distance between centers of cross seats had an important bearing on the total floor area required to install any given number of seats. The distance between centers of seats varied from 29½ in. to 33 in. He thought that many cars are equipped with too much horsepower to the motors. The manufacturers of the equipments were inclined to recommend sizes a little larger than necessary in order to be on the safe side. He referred to the use of aluminum sheets for interior head linings, which have been tried on a number of cars. The principal objection to the use of aluminum was that it was almost impossible to varnish it. Considerable weight was saved by its use. He did not believe that the plain appearance of an arched roof was a valid objection to this type of construction.

W. H. McAloney, Denver, said that the use of fare boxes and other prepayment devices on the platforms of cars required the platforms to be made exceedingly heavy and strong. With regard to bolsters, he had been using cast-steel bolsters for the past three years and had saved considerable weight over the ordinary built-up bolster. The cast-steel bolsters are very rigid and no trouble is experienced with noise. He believed that the arch-roof construction was going to come into general use, but the problem of ventilation and the location of destination signs were matters to be worked out. For city cars he believed that plate glass was not only a luxury, but it was considerably heavier than ordinary window glass, and when used in drop sashes was very likely to break.

Samuel Curwen, J. G. Brill Company, said that the question of standardization in car construction was the most important problem of the day. The condition of the track over which the cars are to be operated had an important bearing on the construction of the car. On a perfect track a much lighter

car could be run without serious deterioration than on a worn-out track. With regard to the distance between seats, he thought that this could be reduced to 29 in. without inconvenience to the passengers. The relative merits of the plain arch roof and the monitor-deck roof were largely a matter of taste. By using mechanical ventilation no trouble should be experienced on this score. In India and other hot countries where it is necessary to have good ventilation in order to keep the car moderately cool the roofs were made double and a current of air was circulated between the upper and lower layers by a mechanical device.

At the present time hardly any two cars are built alike. When this wide variation in designs is brought to the attention of a purchaser, he gets the idea at once that his conditions likewise are different from those in other cities and he wants a special design of car. The speaker did not believe that the conditions differed so very much in different cities, and thought it would be possible to come to standards in car construction which would be not merely standards of length or other detail dimensions, but would be complete standard designs. As a means of decreasing the weight of prepayment cars with long platforms Mr. Curwen suggested moving the truck centers out as far as possible so as to decrease the leverage of the overhanging ends.

H. H. Adams, New York, discussed the report of the committee on equipment at length. He thought that the items that go to make up the complete car equipment should be subdivided as to the car body, trucks, electrical equipment and air brakes. The car-body weight should be given complete without any of the other parts, but should include such items as wiring, lamp fixtures and switches, etc., together with the necessary brake levers and the brake rods. The electrical equipment should include the complete weights of motors with gears and gear cases and the balance of the electrical equipment on the car, such as controllers, resistances, cables, conduit, etc. In the installation of equipment on the cars considerable saving in weight can be made. In a recent study of this question Mr. Adams found that by combining three resistance boxes into two and by the use of a lighter end plate instead of heavy end castings a great reduction was made in the weight. The size of the hangers used to support apparatus under the car body can also be studied carefully with good results. In one instance a reduction of at least 600 lb. in the weight of the material required for the installation of the apparatus under the car was made. Lighter conduit probably could be used for the car wiring. Many air reservoirs are two or three times as heavy as they need to be for the pressure which they are required to carry. The manufacturers of car-heating apparatus can assist materially in lightening their product by the use of pressed steel instead of cast iron. With modern controllers of the K-35 type it would be possible to reduce the weight by using aluminum backs on the controller case. With older types of controllers, however, the back is used in conjunction with the magnetic circuit and consequently it cannot be made of aluminum. With regard to the recommendations of the committee as to comparisons of car weights on the basis of weight per seat and weight per square foot, Mr. Adams thought that in each case a description of the car and its equipment should accompany a statement of the weights in order to make an intelligent study of the subject.

The amount of paint that goes on a car varies with the type and size of the car, but it runs as high as 600 lb. for cars of large size. Lead paints are exceedingly heavy and their use should be limited wherever possible. The weight of the finish on the headlining is considerable. In one particular car the use of paint as against a varnished natural finish represented a difference of 27 lb. in weight. Expressed in terms of weight per square foot, a lead-paint finish weighs 1.75 oz. more than a natural varnish finish. The underside of the platform hoods on cars is usually finished with lead paint. It might be advisable to go back to the old practice of finishing these parts in the natural wood. Another small item is the weight of the signs which are printed and framed

in the cars. Printed aluminum signs have an attractive appearance, are easily cleaned and effect a material reduction in the weight. He figured that the substitution of aluminum signs for glass-covered signs effected a saving per car of 40 cents per year. In the construction of car bodies considerable reduction in weight can be accomplished by using special sections of pressed or structural steel. Another place where it is possible to make some reduction is in the flooring. By grooving out the underside of the floor boards sufficient strength will still be left to meet the requirements of stiffness.

William Roberts, Akron, Ohio, said that in the cars on his road the distance between seat centers had recently been increased from 32 in. to 34 in., and that the width of the seats had been increased to 40 in. by reducing the width of the aisle from 23 in. to 19½ in. This change had been appreciated by the operating department and by the traveling public. Where a car is used for long-distance travel the spacing of the seats was most important and the width of the aisle was of secondary importance. He did not believe that any attempt should be made to reduce the weight of cars by decreasing the size of the axles.

F. R. Phillips, Pittsburgh, in reply to a question about the experience with side-rod trucks, said that the power consumption with these trucks was considerably less than the power consumed by four motors of equivalent size. The additional maintenance of the side rods was probably offset by the lower maintenance of the two-motor equipment. The side-rod cars did not ride as easily as the cars equipped with four motors. With reference to the relative merits of steel and wooden cars, he said that his company started with steel underframes and is now having cars built with steel roofs. The next development would probably be cars made entirely of metal. His experience was that the plates in the side girders had little or no part in carrying the load on the car. The side sill, the belt rail and the posts carry the load as a built-up truss. The bolsters on the new steel cars of the Pittsburg Railways were formed of pressed steel shapes; for a 45-ft. car the bolster weighs but 120 lb.

DISCUSSION ON WHEELS

C. G. Bacon, Jr., Carnegie Steel Company, submitted a written discussion on steel wheels. Assuming that the conclusions in the committee report are correct, that is that the net cost of a two-wear wheel is \$21.05 and that the cost of the one-wear wheel is \$17.25, he made some comparisons based on actual mileage records.

The two-wear wheel of the type under consideration weighs 515 lb. when new, and 358 lb. when scrapped after a life of 125,000 miles; it had an average operating weight of 437 lb. The one-wear wheel of the same type weighed 465 lb. when new and 384 lb. when scrapped after a life of 75,000 miles; it had an average operating weight of 425 lb. If the cost of hauling dead weight was 5 cents per lb. a year, and this was multiplied by the factor 1.88, the cost per lb. of hauling weight in the wheels was 9.4 cents. The average operating weight of the two-wear wheel multiplied by the cost of power, 9.4 cents per lb. and by the estimated life as given by the committee would show a total cost for hauling of \$96.34. This added to the net cost of the wheel, made a total cost of \$117.39 for 125,000 miles, or a cost of \$9.39 per 10,000 miles. On the same basis, a one-wear wheel cost \$9.80 per 10,000 miles, or 41 cents more than the two-wear wheel. It should not be assumed that because the one-wear wheel weighed less than the two-wear wheel there was any appreciable difference in the cost. The one-wear wheel 33 in. in diameter would cost as much if not more to manufacture than the two-wear wheel. If the two types of wheels were considered on the same basis of first cost, the difference in favor of the two-wear wheel would be even greater than 41 cents per 10,000 wheel miles.

Mr. Bacon earnestly urged that no action be taken by the association at this time with regard to endorsing one-wear wheels as more economical than two-wear wheels. The manu-

facturers of wheels had no selfish motive in recommending the two-wear wheel, as it would be to their advantage to sell twice as many one-wear wheels. The speaker felt that the best interests of all concerned required that further investigation be made before any action is taken in altering the present standard practice.

W. P. Barba, Midvale Steel Company, briefly described the method of manufacture of steel wheels and said that it was almost impossible to roll wheels with rims less than $1\frac{3}{4}$ in. thick. He suggested that experiments be made during the coming year with one-life wheels to see if they gave the service claimed for them, and also that the structure of the wheels be carefully studied. He was sure that the cost of rolling a wheel with a thin rim would be greater than the cost of a wheel with a thick rim. The cost of the weight of metal was nothing. His company had had inquiries for wheels with rims as thin as $1\frac{1}{4}$ in. He did not know where any more weight could be taken off of the present types of wheels.

N. W. Storer, Westinghouse Electric & Manufacturing Company, in speaking from the standpoint of the manufacturer of motors, thought that there would be a distinct advantage in favor of the one-wear wheels. The wheel of smaller diameter would enable a larger gear ratio to be used, and hence the power consumption would be less. He thought that a motor designed for higher speed for a given output could be used with a one-wear wheel.

C. O. Mailloux, New York, said that the energy absorbed by the wheel depended not so much upon the weight of the wheel as upon the distribution of the metal. The radius of gyration of ordinary car wheels ranged from 0.65 to 0.85 of the radius of the wheel. He took exception to the statement of the committee that weight carried in the wheel did not contribute to journal friction, but did contribute to track friction.

A. D. Campbell, Seattle, Wash., said that what was wanted was a wheel which had greater resistance to flange wear. Very few wheels were turned on account of wear of the tread. Much of the flange wear took place on straight track because of the tendency of the truck to move sidewise. He thought that some of this wear could be eliminated if better side and center bearings were employed.

M. V. Ayres, Worcester, Mass., in reply to the remarks of Mr. Barba, said that Mr. Benedict, of Albany, did intend to carry out the experimental tests with light wheels which Mr. Barba recommended, but he was unable to do so because he could not get the wheel. Referring to Mr. Mailloux's remarks about the radius of gyration, he said that it was only necessary to consider in this case the radius of gyration of the metal which would be removed from the rim. That metal would be located approximately 15 in. from the center of the wheel.

The section of the report of the committee on steel wheels was accepted and referred to the committee on standards. The section of the report relating to a mounting gage for wheels was also referred to the committee on standards, as was the section on gears and pinions and specifications for wrought-iron bars.

HEAVY ELECTRIC TRACTION—DISCUSSION ON AXLES

The report of the committee on heavy electric traction was presented by Mr. Doyle, who asked Mr. Barba to give a brief description of the heat treatment of axles.

Mr. Barba said that heat treatment was simply the process of oil tempering and cooling applied to inherently good steel of proper composition in order to get the molecules of the metal arranged so that they would offer the greatest stiffness and resistance under the bending strains to which they were subjected in an axle under a car. Steel, as it came in the form of an ingot, was a granular substance which might be represented by a pile of bricks without mortar. The surfaces were easy to cleave apart. Heat treatment put the grains into a condition which might be illustrated by interlocking

the fingers of each hand and bringing the palms together. After the steel was heated, it would not break apart. The finer the granular structure, the greater was the resistance to rupture. All that heat treatment required was intelligent use of the heat-controlling instrument. The specification recommended by the committee would absolutely insure that axles offered by the manufacturer for inspection and acceptance as heat-treated material actually had been given proper heat treatment.

W. A. Bostwick, Carnegie Steel Company, said that while he had not been in full accord with all of the specification proposed by the committee, at the same time he wished to assure all those present that the specification would result in companies obtaining the very best carbon steel axles for use in heavy service.

J. L. Repogle, Cambria Steel Company, said that since the Denver convention the various manufacturers had been in consultation with Mr. Doyle and their ideas were incorporated in this specification, with which they were in entire accord. He believed that severe electric traction service required something better for axle steel than steam railroad service, particularly because of the high gyration stressing due to the motor being attached to the axle.

Frank S. Slocum, Jones & Laughlin Steel Company, said that his company had not been invited to the conferences of the committee. Before any official action was taken in regard to hammered heat treated axles, it should be known on behalf of his company that it had been manufacturing cold rolled railway axles for several years. His company would be pleased to cooperate with the committee in any way the latter thought desirable in the effort to formulate satisfactory specifications.

J. S. Doyle said that the consideration by the association of the specifications for heat-treated axles did not debar any company from buying cold-rolled steel if they so desired. The committee was not trying to discredit in any way the use of any material now being furnished.

COMMITTEE ON NOMINATIONS

The president appointed the following committee on nominations to report at the meeting on Friday: J. W. Corning, Boston; William Roberts, Akron, Ohio; G. H. Kelsay, Anderson, Ind.; Charles Hewitt, Philadelphia; L. W. Jacques, Fort Wayne, Ind., and A. T. Clark, Baltimore.

The meeting then adjourned until the afternoon, with the understanding that the discussion on the report of the committee on heavy electric traction should be continued.

AFTERNOON SESSION

President Harvie called the meeting to order at 2:30 p. m. and the discussion of the report of the committee on heavy electric traction was resumed.

J. S. Doyle explained that E. B. Kette, New York Central & Hudson River Railroad, who wrote the section of the report referring to location of third rail, was unable to be present at the meeting on Wednesday, but that he had written asking that the recommendations concerning the location of the third rail should be laid on the table for the present, owing to the fact that the American Railway Engineering and Maintenance of Way Association did not agree with the recommendations contained in the report.

H. N. Latey, New York, criticised the wording of the definition of gage of the third rail. He said that the definition contemplated a standard rail section, but that with a rail section having a beveled edge, such as is used in the Hudson tunnels, it would be difficult to define the gage limit. He also objected to definition No. 11 of "third-rail covering," on the ground that the part defined was intended to protect the third-rail shoe. He also thought that in definition No. 13 the words "shoe incline" should be "side incline."

Mr. Doyle accepted these criticisms and explained that Mr. Kette would be in Atlantic City on Friday, and that he hoped the discussion would not be finished until

such time as Mr. Katte could be present. Referring to the specifications for heat treated axles again, he thought that in the future any committees appointed to consider metallurgical questions in connection with standards should work with a joint committee of the American Society for Testing Materials.

C. F. Adams said that such a plan would be of the greatest value to the American Society for Testing Materials, and that it would be a good plan to withhold final adoption of the specifications for heat-treated axles until a conference could be held with a committee appointed by the American Society for Testing Materials.

Mr. Bostwick outlined the methods pursued by the committees of the Society for Testing Materials. These committees consist of a joint representation of the manufacturers and consumers of material. The chairman of each committee must be either a consumer or a designing or consulting engineer. On behalf of the American Society for Testing Materials, of which he was an executive committee member, he said that the society would be glad to work in harmony with the Engineering Association in all matters of common interest.

Mr. Stevenson, said that the American Society for Testing Materials now had a sub-committee on specifications for rolled steel wheels which had been at work for nearly a year and a half. The committee expected to submit specifications next June.

H. H. Adams moved that the president of the Engineering Association be authorized to communicate with the secretary of the American Association for Testing Materials and determine the proper procedure for the appointment of a committee to work in conjunction with that society in connection with specifications for heat-treated axles, and that the president be given power to appoint such a committee. The motion was carried.

H. H. Adams, chairman of the supervising committee of the Electric Railway Dictionary, which is being published by the McGraw Publishing Company, described briefly the purpose and arrangement of the dictionary.

POWER DISTRIBUTION

A. F. Hovey, in presenting the report of the committee on power distribution, explained that the committee had been at a disadvantage on account of the death of Mr. Heywood, chairman of the committee, and that it was able to hold only one meeting prior to the convention. Two meetings had been held at Atlantic City since the convention began to take up some of the matters referred to in the specifications for cables and the specifications for overhead crossings. The specifications for cables, as printed, are correct, with the following addition and omissions: In the specifications for high tension three-conductor paper cables, under the sub-head "Insulation," there have been added to the first paragraph the words: "with jute filing in the valleys formed by the separate conductors."

The section on "Braid" has been omitted.

The paragraph under the head "Inspection" has been omitted.

In the specifications for rubber compound, which are practically the same as have been used for some years by the Railway Signal Association, a change has been made in the second paragraph under the heading "Tests." The words "free access to the place of manufacture" have been changed to read, "the manufacturer shall give an opportunity to test at all necessary times."

Under the specifications for underground feeders, the test requirement has been reduced from 8,000 volts to 5,000 volts. The section on "Braid" has been omitted. A paragraph has been added at the end of the specification reading as follows: "No splices are to be allowed between the manholes, and but one splice per cable will be allowed in each manhole." A paragraph on "Reels" has also been added,

reading as follows: "The manufacturers will be responsible for reels and flagging."

Under the section on "Protectors" the committee has omitted the word "splice." The committee has also decided to omit the last paragraph under the heading of "Bonding."

George H. Hill presented some criticisms of the specifications for paper cables which had been handed to him by Wallace Clark, General Electric Company. Mr. Clark suggested that the requirement of 98.5 per cent. conductivity was rather high. The manufacturer to meet this specification would have to make the conductivity considerably higher than 98.5 per cent in order to avoid the possibility of objection from other causes. With regard to the specification for the twisting test, Mr. Clark suggested that this be modified so that one complete twist should be made in a length of conductor equal to 25 times the diameter of the conductor. This was the usual rule in making up cable. He also suggested that the thickness of the insulation be arranged on a sliding scale, somewhat similar to the cable specifications prepared by the Power Cable Engineers' Association. The same criticism applies to the lead covering, which is ordinarily made of different thicknesses for different sizes of cable. Mr. Clark thought that the paragraph relating to the guarantee could be made more clear.

G. W. Palmer, Boston, thought that 98.5 per cent conductivity for copper which made up the cable was none too high. He thought that the paragraph relating to the taking of a sample of the lead sheath from each 2,000 ft. of the cable should be modified because cables were often bought in shorter lengths. Under the section which specified the maximum number of amperes which the cable was intended to carry, Mr. Palmer thought that it should be stated whether continuous or alternating current was to be transmitted.

E. N. Lake, Chicago, said that his experience had shown that soft drawn copper wire would test from 99 to 101 per cent conductivity by the Matthiesen standard. The practice in Chicago had been to specify, for cables which were not subjected to any particular mechanical strain, a conductivity of 99 per cent. and the manufacturers had had no difficulty in making cables which conformed to this requirement. With regard to the allowable variations in the finished size of the conductors in the cable, his practice had been to permit a variation of only two per cent. above and below. In recent specifications, he had required the dies to be one per cent under size at the beginning of the drawing, and they were discarded when they exceeded the exact size by two per cent. He did not find in the specifications anything about the resistance of the insulation. In comparing the practice of a number of different companies, he had observed a wide variation with regard to the insulation of the individual conductors and the insulation between the conductors and the sheath. He thought it was practicable to specify the relation between these two elements of the insulation in a cable. In his opinion, it would be desirable to make further study of the question of protection of the cable sheaths by bonding the sheaths in the manhole, and by means of auxiliary return cables from the manholes to the power house.

Mr. Palmer thought that the contractor was the one to bond the sheaths of the cables. In his opinion all of the cable sheaths should be bonded together, thus making an even distribution of the stray currents which are carried by the cables.

Mr. Lake said that inasmuch as lead had a very much lower conductivity than copper, it was not possible to carry an excessive amount of return current through the cable sheaths alone. If any short circuit occurred, the sheaths would be burned out.

E. J. Dunne, Public Service Railway, said that it was his practice to bond all cables together within the dangerous zones. A fuse was inserted between the cables and the bond to the return track circuit.

As a rule, the cable sheaths were bonded to the track return circuit wherever there was a difference of potential. In addition, he made it a practice to run an independent copper return circuit to protect the cable.

J. W. Corning, Boston, said that his company bonded the sheaths in every manhole and also at the power stations where the cables come into the basement. A relay in the power house caused a bell to ring, in case one of the cables was grounded. Some years ago, he had made some tests which showed that about 6 amperes per sheath flowed under normal conditions. This might be increased to 8 or 10 amperes during peak loads. He did not bond the cable sheaths to the track.

G. W. Palmer, Boston, said that all of his cables were bonded at every manhole, and that at the power station a connection was made to the negative bus through a recording ammeter, which kept a constant record of the flow of current. He had known of cases in which as much as 250 amperes flowed in the sheaths of 3 cables.

A. F. Hovey, New York, said that his practice was very similar to that of Mr. Lake and Mr. Palmer.

The report of the committee was accepted with the thanks of the association.

SPECIFICATIONS FOR OVERHEAD CROSSINGS

A. F. Hovey presented the supplementary report on overhead crossings which he said was a preliminary draft of a proposed specification which had been sent him by R. D. Kunz, chairman of the committee of the American Railway Engineering & Maintenance of Way Association, which had been considering the subject. At a meeting of the committee on power distribution, the specifications were carefully gone over, and changes were suggested in almost every paragraph. The specifications had been drawn from the standpoint of the steam railroad and as presented they would entail many hardships on electric railways. Mr. Hovey asked that the Engineering Association instruct the committee to return the specification to Mr. Kuntz and to suggest any changes which the Engineering Association thought should be made.

On motion, the committee was instructed to consider the matter during the coming year.

Mr. Hovey then outlined for the benefit of those present the principal changes which the committee had in mind to suggest, in order to make the specifications more fair to the electric railways.

The president called the attention of the members to the fact that Thursday was the day set apart for the examination of the exhibits, and he expressed the wish that all of those in attendance at the convention would make the most of their opportunity to see the many new devices which were being exhibited for the first time.

The meeting then adjourned.

A TALK ON RAIL JOINTS

John Kerwin, superintendent of tracks and buildings, Detroit United Railway, has sent to the convention two joints of the 9-in. 98-lb. Lorain Steel Company rail that were put in place in the spring of 1895 in the tracks of the Detroit United Railway on Woodward Avenue. One joint was taken from the track before any repairs were made. The second joint was repaired and ground and then cut out of the track and both joints were brought to Atlantic City. They arrived too late for Mr. Kerwin to exhibit them at the time the report of the committee on way matters was discussed on Tuesday. Mr. Kerwin has had the joints placed in Aquarium Court Hall, where the meetings of the Engineering Association have been held, and this morning at 11 o'clock he will give a short talk to any engineers who may be interested in this subject, in which he will outline the saving accomplished by this method of repairs in

Detroit. All engineers of maintenance of way in attendance at the convention are cordially invited by the way matters committee to be present when Mr. Kerwin tells how he was forced to develop this method of joint repairing and the saving which has been effected by its use. Mr. Kerwin will gladly show any visitor to Detroit more than 60 miles of track that have been repaired in the manner shown.

MEETING OF THE AMERICAN ASSOCIATION

The second meeting of the American Street & Interurban Railway Association was held at the Greek Temple yesterday afternoon.

President Shaw called the meeting to order at 2:30 p. m., and announced the appointment of the following gentlemen as members of the nominating committee: C. Loomis Allen, Utica; S. L. Tone, Pittsburgh; R. I. Todd, Indianapolis; W. F. Kelly, Oakland; Wilford Phillips, Winnipeg.

He next called for the report of the committee on welfare of employees. The committee reported progress.

REPORT OF THE COMMITTEE ON INTERSTATE COMMERCE COMMISSION AFFAIRS

This report was presented by General Harries. It will be printed to-morrow. The report of the committee on insurance was also presented. It is published elsewhere in this issue.

REPORT OF THE COMMITTEE ON PUBLIC RELATIONS

C. Loomis Allen, chairman of the committee on public relations, reported that it had held two meetings during the present year—one at the mid-year meeting of the executive committee, and the other in Atlantic City, during this convention period. At the first meeting it was the sense of the members present that it would be interesting and useful to the association to have an address on service work. It had not been possible, however, to bring this about at this time, but the committee hoped that at some future meeting of the association it would be possible to do so.

The mid-year meeting was also marked by the attendance of representatives of the various State, sectional and national electric railway associations, at which joint meeting the question of closer co-operation between all associations was thoroughly discussed, with the result that it was the unanimous opinion that the most favorable results could be accomplished through having the presidents of all street railway associations throughout America become members of the committee on public relations, a decision which was subsequently approved by the executive committee, and the appointments afterward made.

The meeting on Tuesday, Oct. 11, was the first meeting of the complete committee. The only definite progress so far made had been the assembling in the office of the secretary of the association of the acts of State legislatures in force up to July 1, 1910, in the States and Territories. It could be readily appreciated that this was a mass of legal documents which it would not be possible to present to the members of this Association, but it had been gathered and would be held for the use of the members who may desire any information upon the subject. It was doubtful whether any library in the United States contained the complete information which the secretary of the Association had secured.

The next development proposed was a digest to be prepared by a subcommittee of the information that was now on file, which compilation would be forwarded to the member companies during the coming winter.

The committee stated that it was also its intention each year to amend and correct this library of acts concerning public service laws, keeping it up-to-date and forwarding such amended information to the member companies during each year.

H. H. Adams, superintendent of rolling stock and shops, presented the following report of progress, on behalf of the committee appointed in 1908 to supervise the publication of the Electric Railway Dictionary by the McGraw Publishing Company. The committee is composed of H. H. Adams, chairman; Paul Winsor, Boston Elevated Railway, and Richard McCulloch, United Railways of St. Louis.

REPORT OF ELECTRIC RAILWAY DICTIONARY COMMITTEE

Your committee, appointed at the 1908 convention to supervise the publication of the Electric Railway Dictionary, which is being compiled by the McGraw Publishing Company, reports great progress having been made on the book during the past year. The publishers confidently expect to have the book completed and ready for distribution by Jan. 1, 1911.

The committee submits with this report several sample page proofs which give a better idea of the form and scope of the Electric Railway Dictionary than could be given in an extended description. The definitions which have been prepared are concise, and are not intended to be descriptive. The object is to state the purpose and, in general, the location on the car of the part defined, and wherever the part is capable of illustration, a reference is given to a figure number on another page in the book, where the part defined is illustrated by a drawing or an engraving from a photograph. The definitions will occupy approximately 100 pages. They are, at the present time, all written, and it merely remains to insert the references to figure numbers and have them set in type.

All of the engravings illustrating general views and floor plans of cars and car body framing and sections have been completed. Upwards of 15 half-tone views of cars, 100 floor plans of different types of cars, and between 50 and 75 framing plans will be included in this section of the book, which will occupy approximately 125 pages. A large part of the remaining engravings, which are included under the headings of car body details, trucks, truck details, motors and control apparatus, have been made, and within a very short time after presentation of this report the editor will be able to complete the make-up of all of the illustrated pages.

The chairman of your committee has had frequent conferences with the editor of the dictionary during the past year, and has been over all of the material which has been obtained for use in the book.

Your committee desires at this time to express its appreciation of the work of Rodney Hitt, the editor of the Electric Railway Dictionary, Mr. Hitt's connection as associate editor of the ELECTRIC RAILWAY JOURNAL, as editor of the 1903 and 1906 editions of the Car Builders' Dictionary and as one of the editors of the Railway Signal Dictionary makes him peculiarly fitted for the position of editor of this volume, and the committee feels sure that this dictionary, when it is completed, through the arduous efforts of the editor, will be of the greatest value to all interested in the electric railway industry.

Your committee requests that it be continued until such time as the preparation of the book is entirely completed, when it will make a final report and ask to be discharged.

ADDRESSES

Patrick Calhoun, president, United Railroads of San Francisco, then presented a very interesting address on the "Public Side of Street Railroading." This address was followed by a paper by Charles O. Kruger, president, Philadelphia Rapid Transit Company, on the "Philadelphia Question." Mr. Calhoun's address is published in abstract elsewhere in this issue. At the conclusion of these addresses both gentlemen were tendered a resolution of thanks by the association.

Vice-president Brady, who was in the chair, then asked for a vote on the amendments to the constitution and by-laws of the association which had been sent out to the membership

in regard to the change of the name of the association to the "American Electric Railway Association." The vote was unanimous in favor of the change.

PROPOSED PERMANENT LOCATION

Mr. Brady then referred to the proposition which had been received from Saratoga Springs in regard to the erection in that city of a permanent meeting hall for the association and asked whether the members of the association wished to discuss the matter at that time.

Upon an inquiry as to whether the executive committee had any recommendation to make in connection with the plan, General Harries stated that the executive committee had no recommendations to make either in favor or against the plan. He added, however, that personally he did not favor the acceptance of the proposition as, among other reasons, it did not give the association the flexibility of movement or choice in place of location which he thought it should have. Upon motion, the association decided to decline with thanks the offer made by Saratoga Springs.

Upon motion, the meeting then adjourned.

REPORT OF THE COMMITTEE ON CITY RULES*

BY R. E. DANFORTH, CHAIRMAN; H. H. HUNT, L. H. PALMER, D. A. HFGARTY, HARRY BULLEN AND F. I. FULLER

Your committee, after careful consideration of the code of rules as amended and adopted at the Denver convention of this association in 1909, is not satisfied that the amendments made at that time are to the best interests of member companies. Bulletins and letters were mailed to all member companies asking them whether the code as amended and adopted at the Denver convention was satisfactory to them, and also submitting to them the amendments which we hereby offer for your consideration. Sixty-six companies replied to the inquiries.

On July 11 the committee inaugurated a system of follow-up reply postals which were sent to member companies who had not acknowledged the first bulletin, asking if the city rules as adopted at the 1909 convention were satisfactory, and, if not, why not; also asking if the committee's recommendations as submitted were approved. To these 54 companies responded, 39 affirmative and 8 negative replies being received to the first question, and 18 affirmative and 2 negative replies to the second.

Thus it is seen that only 120 companies out of a membership of 350 replied to the various communications sent out by the committee. Your committee therefore concludes that the member companies are generally satisfied with the existing code of rules with the amendments herein proposed, which summarized are as follows:

RULE NO. 2—RESPONSIBILITY

The motorman is held responsible

- (a) For the safe running of the car.
- (b) For the proper operation of the machinery of the car.
- (c) For running car according to schedule.

The conductor is in charge of the passengers on the car and is held responsible

- (d) For the safety and convenience of the passengers.
- (e) For the collection and proper accounting of fares.

Conductors and motormen will see that route and destination signs are properly displayed and will be held jointly responsible therefor.

RULE NO. 10—BELL SIGNALS

When the car is standing and motorman desires to back, for any reason, he will give the conductor four bells, but must not move the car until the conductor has answered with four

*Abstract of report read before the American Street & Interurban Railway Transportation & Traffic Association, Atlantic City, N. J., Oct. 10 to 14.

bells to signify "All is clear behind." When it becomes necessary to back a car for a greater distance than 10 ft. motorman must take handles to the opposite end of car and operate it from that end. The conductor, under these circumstances, will change his position, that is to say, he will go to the opposite platform in order to give proper signal to motorman.

RULE NO. 21—STANDING ON STEPS

Permit no person to stand or ride on the steps, buffers, dashers, fenders or roof. Passengers should be fully inside the car or safely landed on the platform before the signal is given to start.

RULE NO. 34—PROVIDE CHANGE

(New Rule Under Car House Rules)

Previous to taking charge of the car conductors will provide themselves with _____ dollars for the purpose of making change.

RULE NO. 101—POSITION ON CAR

Remain on rear platform when not collecting fares, keeping a lookout for persons desiring to board car. Keep careful watch of passengers to observe requests to stop car. When stops are made at principal streets, places of amusement, churches or at any point where a considerable number of passengers enter or leave the car, conductor should be on rear platform until such point is passed. When descending steep grades conductor will remain on rear platform.

RULE NO. 116—CHANGE

When necessary to give change, first register the fare, and immediately thereafter give change, stating the amount received and the amount returned. Should a conductor have any dispute with a passenger in regard to change he must make a report in writing to the superintendent. Conductors will make change for passengers to the amount of _____ dollars.

RULE NO. 213—POWER OFF LINE

When the power leaves the line cars must be stopped clear of all crossings or danger points. The overhead switch must then be thrown off and the light switch thrown on and the car started only when the lights burn brightly.

HOOSAC TUNNEL EQUIPMENT ORDERS

W. K. Archbold, of the Archbold-Brady Company, Syracuse, New York, is receiving many congratulations over the order which he has received for transmission and catenary towers to be used in the electrification of the Hoosac Tunnel line of the road, with which it will be connected by a high short account of this proposed undertaking was published in a recent issue of this paper. The new power station which the railroad company will erect will be $2\frac{1}{2}$ miles south of the main line of the road with which it will be connected by a high tension transmission line. The Archbold-Brady Company is furnishing A frames for this line with square towers for right angle turns. It is also supplying catenary bridges for 2 or 3 miles of 2 and 3-track construction for the line branches from the portals. These bridges will be spaced 150 ft. apart and there will be 69 of them, mostly for 3-track construction. In this work, the New York, New Haven & Hartford Railroad is adopting the square type of catenary bridge somewhat similar to that which the Archbold-Brady Company has erected for the Beebe lines in Central New York State, but heavier and larger and, of course, with clearances for regular steam railroad rolling stock. The Archbold-Brady Company also has a contract with the New Haven road for the supply of 2 miles of cross catenary construction for yards. The cross spans will also be placed 150 ft. apart, and it is expected that all of this material will be ready by Dec. 1.

The Archbold-Brady Company has also received another contract in Massachusetts for transmission line work. This is in connection with the extension of the power system of the

Worcester Consolidated Street Railway. This company is building a new power station at Milbury, and the transmission line will connect this station with the new sub-station being erected in Worcester, a distance of 6 miles. The transmission line towers will consist of A frames and anchor towers constructed along the New Haven road right-of-way between Worcester and Milbury, and comprise several special devices, including some 85 ft. in height where the line crosses the Boston & Albany Railroad. In this instance, the Archbold-Brady Company has been awarded the entire contract for the erection of the line except that of supplying and stringing the wire.

SPORTING EXTRA—FULL ACCOUNT OF THE BALL GAME

A crowd variously estimated at from 2000 to 3000 (the higher estimate being based on the consumption of the free cigars) gathered at Young's Million Dollar Ball Park Tuesday evening to witness what will undoubtedly go down in history as the only ball game of its kind that ever happened—a struggle for the world's championship between the Asiras and the Asirmas.

Announcer C. C. Castle reduced the bleachers to tears by declaring that it would be a game for blood and that there was to be no interference with the players. It appeared later that the reason for this ruling was that the players were quite capable of interfering with themselves.

The crowd howled with delight when the Asira team marched on the field of battle preceded by a brass band and arrayed in Bessie McCoys of black silk, tastefully trimmed with white pompons and aigrettes. (The pompon season is now open.) Gathering in a corner, the team tried to sing a song, which, fortunately, was soon drowned by the fanfare announcing the approach of the Asirmas, clad in white pajamas with black fixings.

Umpire Hank Fassett, garbed in a green kimono, followed, and after him came the water boy, Joie Cunningham, in an appropriate Kate Greenway suit of brown knickerbockers and a pink blouse.

The first fumble was marked up against the photographer, who tried to take a group picture of the two teams. In the confusion an unidentified Asira player was seen to hand the umpire \$2, which may account for the final score.

THE FIGHT BY ROUNDS

First Inning—Shaw for the Asiras was first up to bat. He waited for a soft one and hit to left for one base. Brady tried hard but fanned. While Conwell, the Asirma backstop, was lighting a cigarette Shaw took an ungentlemanly advantage and pilfered two bags. Harris got on but was out on a fadeaway steal to second, Shaw scoring the first run of the game amid thunderous applause. Allen was out at first on a bunt. One run.

Pop Ellicott dropped a Texas leaguer in right but was out trying to stretch it to two bases. Honus Hawley had his lamps on that automobile and poled a homer through the back door. Hequembourg got on and made the grand tour on outs by Sisson, Porter and Williams. Two runs.

Second Inning.—Hedley flied and Wood was safe at the first sack on an error. Brush hit into a double play, Wood expiring at second. No runs.

Evans opened the Asirma's half with a toboggan slide to first, but was out. Conwell walked and was caught off second by a quick throw from Hedley. Partridge beat out a bunt and made the circuit on a wild heave to the center field fence. Ellicott smashed one into the left of Stage for three bases and Hawley sent him home, but was out at first. Hequembourg flied out. Two runs.

Third Inning.—Page walked. Shaunahan smote the air thrice and was sent to the bench. Shaw cracked a liner to the Greek Temple, bringing in Page. Brady was out at first. Two runs.

Sisson made the fourth home run of the game. Porter went to third on a base hit and Williams got two bags, scoring Porter. Evans went out at first. Conwell drew a gift and scored on two passed balls. Partridge, Ellicott, Hawley and Hequembourg were out in quick succession. Five outs, three runs.

Fourth Inning.—Harries died at first, but Allen pushed a hot liner through the umpire's kimono with a sound like a six-inch shell going through a backyard full of washing. While Hank was getting out his nosegard Allen stole third. Hedley sacrificed, scoring Allen. Wood got on and scored on two passed balls. Brush, Shannahan, Pardee and Shaw made a succession of hits and all scored. Brady went out. Six runs.

After all this excitement the umpire was overcome and had to take a drink of water—the only time that this beverage was served during the game.

Conwell, Porter and Williams went out in succession. Hedley's infielding was the feature of this inning. No runs.

Fifth Inning—This was a purely hypothetical session. Nothing happened except that the scorer marked up two goose eggs and inning six began.

Sixth Inning—Page hit safely and Donecker, who had been on the bench up to this time, followed with another hit. Shaw connected for two bags, scoring Page. Brady and Harries went out and Donecker couldn't get around. One run.

Disgraceful as had been the earlier scenes of the game, they paled into insignificance when at this exciting moment the members of the two teams seized the umpire, placed him in a cage and offered him sundry indignities. Rising to the occasion, Right fielder-general President Harries pinned a pay-within sign on the cage, thus putting a finishing touch on a scene which, as an exhibit of turpitude and unrestrained passion, has had no equal during the convention. The umpire was revived by a pail of water poured upon him by Joey Cunningham, and finished the game in his cage.

Evans, Conwell, Partridge and Ellicott went to the bat and chased each other around the bases once or twice, but a disappointed supply man overturned the score board, thus putting an end to the game. The official score was as follows:

	1	2	3	4	5	6
Asira	1	0	2	6	0	1—10
Asirma	2	2	3	0	0	x—7

Anticipating the need thereof, the management had provided enough bladders to place at least two in the hands of each player. They were intended, no doubt, to be used on the umpire, but after the ambulance had borne Fassett from the field the players turned on each other and indulged in a free fight. Nobody seemed to care what happened except the crowd on the bleachers. The unanimous opinion of these critics was that it served 'em right.

Grip Nut Company, Chicago, is showing, at space 674, Building No. 2, its various sizes of grip nuts for use on track and on car equipment where locking devices are required.

Templeton Kenley & Company, Ltd., booth 651, Building No. 2, are making an attractive exhibit of Simplex car and track jacks.

Berry Brothers, Ltd., Detroit, are exhibiting, at space 651, Building No. 2, several panels of various classes of wood finished with the company's celebrated varnishes.

Poole Brothers, Chicago, are showing in booth 678, Building No. 2, many samples of attractive folders, time tables and advertising booklets and tickets which they have designed and printed recently for steam and electric railways.

A POEM TO JAMES M. WAKEMAN

On June 21, 1910, a group of friends gave a farewell luncheon to James M. Wakeman, formerly vice-president of this paper, just prior to his departure to England. The day was also Mr. Wakeman's birthday, and among the letters and other communications sent to him on that occasion was a poem from J. Harry Stedman, of Rochester. Both Mr. Wakeman and Mr. Stedman have attended a large number of national street railway conventions in the past, and the many friends of both will undoubtedly be interested to see the verses contributed by Mr. Stedman. They follow:

What's Flag Day? New Year's? July Fourth?
Skiddoo! For Heaven's sake, man,
June twenty-first we celebrate—
It gave us Jimmy Wakeman.

No wonder Nature honored it,
Longest-to-gladden-earth day,
With sheen of sun and summer joy—
'Tis Jimmy Wakeman's birthday!

And Jim reciprocates in kind,
Warm heart—all silver lining—
Old Sol has intermittent moods,
But Jim is always shining.

To-day the shadows dim our skies,
For Jimmy's going to leave us;
But well we know that New York's loss
Is London's redivivus.

Old pals, when'er they rally,
Will know a vacant chair
And a dearth of mirth and sally,
For Jimmy won't be there.

We will miss that martial figure,
That jeunesse dorée style,
That thrill of hearty hand clasp,
That kind, pearl-pointed smile.

On Friendship's shares and Friendship's bonds
The wealth of life depends,
Jimmy has won life's highest prize,
Jimmy is rich in friends.

May every twilight find you glad!
Go vegetate in clover!
But send a tender thought to us
When you are half-seas over.

God bless you, Jimmy Wakeman!
And guide you o'er the main
To rest and recreation;
Then bring you back again.

Cordially,
(Signed) JOHN HARRY STEDMAN.

In the presidential address of C. J. Spencer, general manager of the Bradford Corporation Tramways, before the ninth annual conference of the Municipal Tramways Association, held at Bradford, England, Sept. 21, some interesting statistics were given of the allowances for depreciation, obsolescence, etc., made by the private tramway companies and by the municipal tramways in Great Britain. The private tramway companies put aside during the year 1909 1.05 per cent of their total capital investment of \$119,440,000, whereas the municipal tramways put aside 3.5 per cent of their total capital investment of \$235,670,000.

REPORT OF COMMITTEE ON EQUIPMENT*

BY JOHN LINDALL, CHAIRMAN; H. A. BENEDICT, M. V. AYRES, R. C. TAYLOR, TERRANCE SCULLIN, A. T. CLARK

The chief subject assigned to the committee this year was the consideration of methods for reducing the weights of cars in new construction, with due allowance for strength of parts. The following is submitted:

CAR-BODY DESIGN

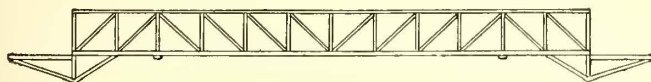
Reduced to its simplest form, the double-truck car body consists of a rectangular platform supported at two points on its longitudinal axis, equidistant from the ends. The points of support are the truck centers. The primary problem of car design is to construct a car body which will be both strong enough and stiff enough. Strength and stiffness are two distinct and different requirements. Strength is the ability to resist fracture, and stiffness is the ability to resist distortion. A car body or any part thereof may be deficient in either one of these qualities and amply provided for in the other.

All possible combinations of methods for trussing and stiffening the side frame of cars have been used, and a majority of all the designs shown are frequently to be found in one and the same car. The result is that cars are almost always strong enough, but very seldom stiff enough, and almost invariably much more weight than required for strength is put into these side frames for the sake of stiffness.

It is probably impracticable to produce a stiff car side of reasonable weight where wood is relied upon to furnish part of the strength. For affording stiffness in wooden cars, the sill plate construction is by far the most effective, because all the vertical stiffness comes from the plate, and the wood sill serves principally as a fastening for the posts and floor timbers.

Three types of car sides are in use in which wood is relieved from carrying the load. One is the so-called fish-belly girder. In this the side sill has all the strength and stiffness needed, and the superstructure can be designed without much regard to strength. The second type referred to is one in which the entire side of the car below the window constitutes a plate girder, metal posts acting as stiffeners, and the plates forming also the outside covering of the car. The third form is one in which the whole side of the car is a plate girder. In this form it is necessary to make the windows circular, or at least of some special shape allowing the transmission of the diagonal strains from the lower to the upper part of the girder. The plate-girder construction can undoubtedly be made the lightest, for the necessary strength and stiffness, of any design so far mentioned.

A design of side frame which seems not to have been tried but which presents some attractive features is the steel lattice girder. This might be made as illustrated. A truss of this form, made of extra high-strength steel, would have ample



Equipment Report—Steel Lattice Girder Side Frame

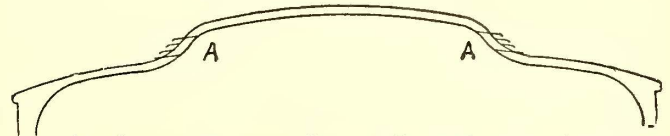
strength with a surprisingly small weight. It would, however, need to be covered on both sides with some sheathing material, which might be heavy enough to largely cancel the saving due to the lightness of the frame. Either sheet aluminum or hardwood fiber could be used with satisfaction for this purpose.

It is almost standard practice to use two center stringers close together the whole length of the car, which serve both to transmit the drawbar strain and form supports for the flooring boards. Needlebeams also are put underneath the

longitudinal members. It is a question whether it would not be better to transfer the drawbar strains to the side sills and omit the center stringers altogether. This would necessitate the use of deep crossbeams, but those beams could be so spaced as to let the floor come close to the motors.

BOLSTER DESIGN

The built-up plate bolster construction is strong, but heavy, and has been largely supplanted by a truss made of two pieces of steel plate, about 9 in. or 10 in. wide. This bolster is simple, and the tension and compression strains are easy to calculate; but it is too easily distorted, and has to be made heavy to prevent bending up in the middle. Moreover, the method of attachment to the side sills has been found in some cases to



Equipment Report—Curved Roof Construction

produce crystallization and fracture at the point where the top member is bent downward at the sill. The principal reason for the great popularity of truss bolsters is that they offer no interference to longitudinal brake rods, wiring and piping.

Cast-steel or malleable-iron bolsters can be produced of ample strength and of very much less weight than the type of bolster above described, and such bolsters are being successfully used. Probably good results could be secured with a built-up construction of angle iron and plates. Undoubtedly a pressed-steel form could also be used satisfactorily for this purpose.

PLATFORM SUPPORTS

It is necessary to support the platforms with beams of the cantilever type, commonly called platform knees. These exert a downward pull on the transverse members at the end of the body floor framing, and an upward reaction on the side sill some distance back from the end. Platform knees, if stiff enough, are usually unnecessarily heavy, because too shallow. Some cars have been built with deep lattice truss platform knees and some with plate-girders having large holes punched in the webs. Either of these designs is capable of giving great strength and stiffness with light weight.

When the car side below the window sill is a plate girder, the method of attaching the posts that extend above the window sill is a perplexing problem. Perhaps the best solution is to make the posts of steel, and continuous from the bottom sill to the eaves, dispensing with wooden posts altogether. A recent design shows a "U"-shaped pressed-steel section, with its flanges turned outward and riveted to the plate below the window sill, and to a cover plate between the windows.

In a design of this kind it is necessary to remember that the window sill or belt rail is in compression, and the posts prevent giving it sufficient width to resist buckling. The posts, and the roof rafters must, therefore, be depended on to brace the belt rail against this tendency. The "U"-shaped post sort serves this purpose.

The monitor type of roof is not well adapted to hold the tops of the posts, as required by this construction, and is in all cases a rather heavy and costly construction. It would seem that a satisfactory modification would be a curved roof like that seen in some tunnel cars and here illustrated. This can have a louvre type of ventilator set in as shown at *AA*. Doubtless both posts and rafters could be made of suitable rolled sections instead of pressed steel.

OPINIONS OF COMMITTEE

In the hope of obtaining the opinions of car builders in regard to the principles of design above discussed, 13 principles of car-body design were set down and sent to 10 car manufacturing companies, with a letter requesting criticisms. The

*Abstract of report read before the American Street & Interurban Railway Engineering Association, at Atlantic City, N. J., Oct. 10 to 14.

principles not fully approved by the car builders were in part as follows:

(1.) The ordinary wooden car body is usually more than strong enough in most of its members, but seldom stiff enough.

(2.) The wooden ear side sill trussed with iron rods, and the wood bridge type of truss used in the side framing of many steam passenger cars, if made sufficiently stiff, contain much more material than required for strength.

(3.) In the common built-up bolster a slight buckling of the compression member or a slight slipping of the rivets results in a humping up of the center of the bolster. Also vibrations in the bolster and ear body cause a continuous slight bending of the upper plate at the downward bend, resulting in crystallization and ultimate fracture at that point. A bolster construction resembling either a tapered box girder or a tapered "I"-beam would afford a lighter construction with equal stiffness and strength.

(4.) When steel and wood are used in combination in the same beam, or in the same tension or compression member, the strength of the wood is practically wasted, the steel bearing substantially the entire load.

(5.) It is practicable to transfer all drawbar strains to the side sills, dispensing with all other longitudinal members in the floor, except platform supports.

(6.) Some form of curved roof will prove lighter, stiffer and stronger than the conventional monitor type.

(7.) Double floors add to the weight of a car to an amount disproportionate to any benefits they confer.

(8.) Plate glass in side windows and wire-glass in ventilator sash also involve unnecessary weight.

From 10 letters sent, only four answers were received, and one of these was a refusal to discuss the matter. The three companies replying expressed themselves as indicated below:

OPINIONS OF CAR BUILDERS

(1.) Was criticised by two of the companies, one of them claiming that steel bodies are as likely to be deficient in stiffness as wooden ones, and the other advancing the novel view that a car body can easily be made too stiff, in which case its riding qualities are bad.

(2.) Was criticised by one company, claiming that the queen post truss "is one of the best, lightest, cheapest and most effective in all cases, if properly designed."

(3.) One company states that the common plate bolster, if carefully machined and fitted at the ends, is the most economical and that the type of bolster mentioned would cost more than the advantages gained would be worth.

(4.) Two companies deny this, but only state that wood and steel together give satisfactory results.

(5.) The suggested design is disapproved by two companies, both objecting to transmitting drawbar strains in any other way than a direct line, and one claiming, further, that the design is deficient in diagonal strength.

(6.) All three companies object to a curved form of roof on the ground of ventilation difficulties. One states that practically nothing can be gained in lightness or strength, while another admits that it would be "lighter, stiffer, stronger and cheaper," but less attractive.

(7.) All three companies point out advantages of the double floor, these being as follows: (1) Seats can be fastened more securely; (2) aids in stiffness of body; (3) deadens noise; and (4) warmer.

(8.) One company, while admitting a saving in weight by using the thinner glass, says that it would amount to only 1/8 of 1 per cent of the total ear weight.

One company discusses the general subject as follows:

"On the whole, we think the propositions brought up by your committee are correct, and if car designers would follow the principles laid down in your propositions, making sure that everything is correctly worked out and checked, if possible, by test in service, the result would be a very light, strong and

serviceable ear, although the first cost would probably be somewhat more than for the car of equal capacity built on lines more generally used at the present time."

UNITS OF COMPARISON

The recent growth of interest in the question of car weights has developed a demand for a rational system of units of comparison. The unit most used in discussing car weights is "pound per passenger seat." This may be quite meaningless in comparing cars of dissimilar types. There seems to be a need of a unit of comparison applicable to car bodies of different types, and it is suggested that this unit should be "pounds per square foot of area." The area considered should be calculated by multiplying the extreme length of the car, over platform end framing, by the greatest width, excluding steps or running boards.

This unit can be used for comparing weights both of car bodies and of complete cars. As an example, the following table has been prepared, applying to three specific cars, fully equipped:

Car	Lb. per Pass. Seat	Lb. per Sq. Ft.
60-passenger, semi-convertible	1210	163
44- " " "	1135	148
14-bench, open	543	126

Undoubtedly the weights in the second column give a fairer idea of the relative massiveness of the ears than those in the first column. Your committee has given great attention to the reduction in weight of ear bodies for the obvious reason that the reduction in weight of car bodies permits reducing the weight of trucks and electrical equipment. For instance, on certain types of equipments, the truck weight per ton of center plate load (weight of ear body and maximum load) is 760 lb., and the weight of electrical equipment 65.4 lb. per horse-power. Now, assuming that the service required 7 hp per ton, the total theoretical saving in weight for each ton of ear-body weight saved would be as follows:

Saving in ear-body weight	2000 lb.
Saving in truck weight	760 lb.
Saving in equipment weight	566 lb.

Total saving in ear weight 3326 lb.

The actual saving might be greater or less, depending on whether or not the reduction in ear-body weight were sufficient to permit the use of the next lighter class of truck, motor and control equipment.

In the matter of reduction in weight of trucks, your committee has been in correspondence with many of the truck manufacturers and finds that the subject is being given very careful consideration. One manufacturing concern points out that while they are making every effort to reduce weights of trucks, they do not control the weights of wheels and axles.

Your committee feels that while undoubtedly some reduction in weight of trucks can be made by more carefully designing the parts, the greatest gain is to be made in the general design of trucks.

It is suggested that weight of trucks should be compared on the basis of "pounds per ton on center plate," as it is obvious that trucks must be designed to carry the maximum load. The weight of car plus maximum load is the proper center plate load basis.

WEIGHT OF EQUIPMENT

The reduction in weight of electrical equipment was taken up with the electrical manufacturers, who suggest four possible means of reducing weight of electrical equipment, as follows:

(1.) By increasing armature speeds—recent improvement in pinions, carbon brushes, commutator surfaces and brush holders tending to make this possible.

(2.) By forced ventilation of motors.

(3.) By the use of fireproof insulation and operating motors at higher temperatures.

(4.) By the use of field control, which would permit reduction of rheostat weights.

Your committee believes these suggestions are worthy of very careful consideration.

As a means of reducing weights of new cars it may not be out of place to call attention to the saving of weight by the use of single-end cars. The following data apply to a double-truck car of the semi-convertible type.

Weight eliminated by making car single-ended:

Step risers, hangers and brackets	306 lb.
Reversing mechanism for seats	108 lb.
Brake rigging	332 lb.
Fender and hangers	125 lb.
Doors, door pockets and operating mechanism.	548 lb.
Sand box and mechanism	40 lb.
Brake valve	21 lb.
Airbrake piping	100 lb.
Trolley equipment	140 lb.
Electric equipment, wiring, etc.....	292 lb.
Headlight	35 lb.
Switch cabinet	75 lb.
Life guards	130 lb.
Snow scrapers	225 lb.

Total2477 lb.

While undoubtedly single-end operation (as a means of reducing weight) is out of the question in many instances, your committee believes that it should be carefully considered.

UNITS OF COMPARISON

In discussing this question of units of comparison, the point has been repeatedly raised, by members of the committee and others, that a factor should be introduced making allowance for the different speeds for which equipment is required. Probably every one will concede that the weight should increase in some ratio with increase of speed. Perhaps a reasonable approximation may be that the weight should increase as the square root of the speed.

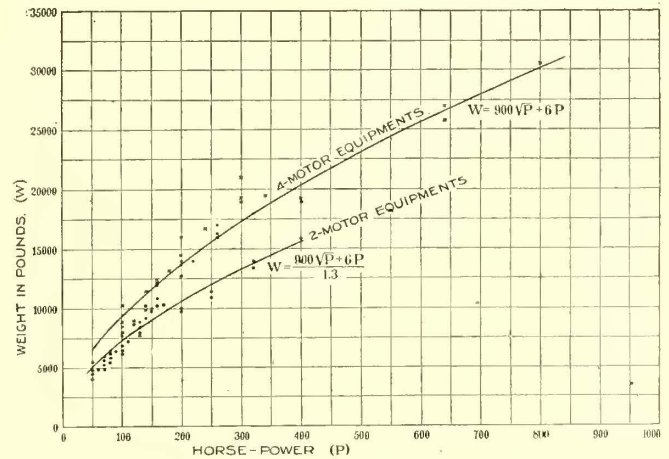
If this assumption be correct, our "weight factor" should be obtained by dividing the pounds per square foot by the square root of the maximum speed in miles per hour. In this case a car weighing 150 lb. per sq. ft., intended for a maximum speed of 30 m. p. h., would have a "weight factor" of 27.4. A car intended for 60 m. p. h. to have the same "weight factor" would weigh 212 lb. per sq. ft. Obviously such a "weight factor" would be a very valuable basis of comparison, provided we could find any law connecting the weight of cars with the speed, but in the absence of such a law a "weight factor" based on an assumed relationship, such as the two above discussed, would be misleading and dangerous. As a matter of fact the weight of commercial electrical equipments seems to vary nearly as the square root of the horse-power. However, there is no direct relationship between speed and horse-power, as the latter is affected by the rate and frequency of acceleration more than by the maximum speed. The weight of trucks, of course, will increase with the horse-power, but not necessarily with the speed; and there seems to be very little need of increasing the weight of car bodies with speed. It will always be impossible to reduce the problem to one of pure mathematics, and there will always be room for the exercise of individual opinion.

It is believed, nevertheless, that it will materially increase the knowledge of this subject if those who make contributions to its literature will use the units of comparison above suggested, namely: "Pounds per square foot of area," the unit of car-body weight; "pounds per ton of center plate load," unit of truck weight, and "pounds per horse-power," unit of electrical equipment weight.

TWO-MOTOR VS. FOUR-MOTOR EQUIPMENTS

There are a number of locations where it is not feasible to consider the adoption of two-motor equipments. These places usually present a number of severe grades, curves of short radii and bad rail conditions, but where conditions are favorable, your committee believes the two-motor equipments to be fully as reliable as those having four motors. Any reduction in weight of equipment is manifestly a reduction in cost of operation, which is, of course, in favor of the two-motor car equipment, and your committee would estimate the cost of maintenance of two-motor equipments to be in the neighborhood of 25 per cent to 35 per cent less than cost of maintenance of four-motor equipments.

The accompanying curves have been prepared to show the weights of two-motor and four-motor equipments, as given by the manufacturers. The crosses indicate the weights, in pounds, of four-motor equipments of various horse-powers, and the dots of two-motor equipments. It is evident at a glance that the two-motor equipments average much less in weight per horse-power than the four-motor equipments. The effort to draw a smooth curve through the points represent-



Equipment Report—Curves of Weights of Two-Motor and Four-Motor Car Equipment

ing the weights of the four-motor equipments suggested that it would approximate a parabola. The upper curve has the equation $W = 900\sqrt{P} + 6 \times P$; W being the weight in pounds and P the horse-power.

This curve probably represents the average position of the points through which it is drawn as closely as any curve that could be selected, and it certainly is a matter of much interest that the weight of any commercial line of apparatus, designed without any thought of a consistent relationship of this kind, should so nearly follow a mathematical law. The extreme variation from the curve is probably due to the circumstances attending the design of particular machines, either special lightness being demanded, or, on the other hand, a special ruggedness being desired.

The lower curve was drawn by dividing the equation of the upper curve by 1.3. That is to say, the upper curve represents weights 30 per cent greater than the lower, or the lower curve, weights 23 per cent less than the upper. The lower curve does not represent the average of the points through which it passes quite so well as does the upper curve, and is obviously somewhat too high. However, to get the best possible curve for the lower set of points would require changing the form of the curve, which would result in making the percentage difference between the two curves vary from point to point.

It seems, however, to be a conservative statement that between 100 hp and 400 hp per car the two-motor equipment is likely to be about 25 per cent lighter than the four-motor, though the saving in any particular case may vary considerably from this figure in either direction, depending on the particular equipment chosen.

As shown in last year's report of the committee on equipment, the electrical equipment usually constitutes about 28 per cent of the total weight of the car, so that a saving of 25 per cent of the weight of the electrical equipment would amount to about 7 per cent of the total car weight. Allowing for the variations in equipment, it seems fair to estimate that the use of two-motor instead of four-motor equipment would save from 5 per cent to 10 per cent of the total car weight. Doubtless these figures can be exceeded when advantage is taken of the use of two motors to lighten the trucks by using smaller wheels and axles for the idlers. This estimated saving of 5 per cent to 10 per cent in weight, while not of conclusive importance, is sufficient to make the change one worth considering.

For a 25-ton car, at the usual value of 5 cents per pound per year, it would amount to a saving of \$125 to \$250 per year. This, in connection with the possible lower first cost, would constitute an opportunity for economizing not to be ignored.

ROLLED-STEEL WHEELS OF LIGHT DESIGN FOR ONE WEAR

Your committee is obliged to treat this subject entirely from a theoretical standpoint. There is a demand for such wheels, and the following calculations have been made to show the saving that should be expected from their use.

The one-wear wheel, 34 in. in diameter, will be about 100 lb. lighter than the wheel intended to be turned several times. Most of the material removed will come from the inside of the rim, at an average radius of 15 in. from the center. Metal exactly at the tread of the wheel will absorb exactly double the power during acceleration and give up exactly double the power during braking that the same weight of material would if carried in the car body. The mass removed in lightening the wheel, being located about 15 in. from the center, has a velocity of rotation of about fifteen-seventenths of its velocity of translation. The power required in accelerating this mass is, therefore, about $1\frac{5}{17}$ or 1.88 that of an equal mass carried on the car body.

POWER CONSUMPTION

In frequent-stop service the power consumed in acceleration is the greater part of the extra power consumption. In a typical case, discussed in an article by M. V. Ayres in the Aug. 21, 1909, number of the ELECTRIC RAILWAY JOURNAL, power consumption was distributed as follows:

	Per cent
Rheostat losses	9.52
Motor losses	17.28
Track and journal friction	9.55
Windage	3.45
Acceleration	60.20
	100.00

From this it will follow that the mechanical power delivered to the car axles was distributed as follows:

	Per cent
Track and journal friction	13.06
Windage	4.64
Acceleration	82.30
	100.00

There are no available data for separating track and journal friction. Perhaps it would be sufficiently near to assume these two losses as equal. Weight carried in the wheel does not contribute at all to journal friction. It does, however, contribute to track friction, presumably in greater proportion than if carried on spring-supported parts of the car. Let us assume, however, that it contributes only in equal proportion with other weights.

This 100 lb. removed from the rim of the wheel would in the above typical case reduce mechanical power consumption

in proportion, which, compared with the effect of 100 lb. carried on the car in general, would be as follows:

	Per cent
Journal friction	0.00
Track friction	6.53
Windage	0.00
Acceleration 1.88×82.30	154.70
	161.23

The total electrical input is, of course, practically proportional to mechanical power consumption. We are then led to the conclusion that 100 lb. removed from the rim of the wheel reduces power consumption at least as much as 160 lb. removed elsewhere; therefore, the reduction of 100 lb. in each of eight wheels is equivalent to removing 1280 lb. from the car body.

If we take the commonly accepted figure of 5 cents per pound per year as the cost of power, this reduction in wheel weight is worth \$64 per car per year, or \$8 per wheel. Figuring on the mileage basis we may estimate, for city cars, a power consumption of 125 watt-hours per ton-mile at a cost of 1.5 cents per kw-hour, including interest on the investment in power plant. This amounts to a saving of \$12 per 10,000 car-miles for eight wheels, or \$1.50 per 10,000 miles for one wheel. For this to equal the above estimate of \$64 per year would require an annual mileage of 53,300, or 146 miles per day.

In order to show the effect of this saving during the life of the wheels, the following tabulation has been prepared from estimates made by your committee:

	Two-Wear Wheel	One-Wear Wheel
Mileage, first wear.....	75,000	75,000
Mileage, second wear.....	50,000	
First cost.....(per wheel)	\$20.00	\$18.00
Cost fitting wheel25	.25
Putting wheels in car.....	.40	.40
Removing wheels after 75,000 miles.....	.40	.40
Transporting and turning.....	1.00	
Putting in car.....	.40	
Removing from car after 50,000 miles.....	.40	
Pressing off and scrapping.....	.20	.20
	\$23.05	\$19.25
Scrap value	2.00	2.00
Net cost of wheel.....	\$21.05	\$17.25
Net cost of wheel per 10,000 miles.....	\$1.68	\$2.30
Excess cost of power for carrying heavier wheel..	1.50	
Cost per 10,000 wheel miles.....	\$3.18	\$2.30
Saving by use of lighter wheel per 10,000 wheel miles88

In view of the apparent advantage of the light wheel, as indicated by the above investigations, your committee would recommend that this matter be given careful consideration by the railway companies and wheel manufacturers.

PROPOSED STANDARDS FOR ROLLED-STEEL WHEELS

This subject was referred through the executive committee to the 1910 committee on equipment for further consideration

CARNEGIE STEEL COMPANY STANDARDS					STANDARDS RECOMMENDED BY COMMITTEE ON EQUIPMENT OF A. S. & I. R. A.			
Draw- ing No.	Diam- eter	Rim Width	Rim Thick- ness	Hub Length	Diam- eter	Rim Width	Rim Thick- ness	Hub Length
S-1420	33 in.	3 1/16 in.	2 1/2 in.	5 1/2 in.	33 in.	3 1/16 in.	2 1/2 in.	5 1/2 in.
S-1440	34 "	3 1/16 "	2 1/2 "	5 1/2 "	34 "	3 1/16 "	3 "	6 "
					33 "	4 3/16 "	2 1/2 "	5 1/2 "
S-1444	34 "	4 3/16 "	2 1/2 "	6 "	34 "	4 3/16 "	3 "	6 "
S-1454	35 "	4 3/16 "	3 "	6 "	35 "	4 3/16 "	3 "	6 "
S-1462	36 "	4 3/16 "	2 1/2 "	6 "	36 "	4 3/16 "	2 1/2 "	6 "
S-1473	37 "	4 3/16 "	3 "	6 "	37 "	4 3/16 "	3 "	6 "
S-1447	34 "	4 1/16 "	2 1/2 "	6 "				
					34 "	4 1/16 "	3 "	6 "
S-1457	35 "	4 1/16 "	3 "	6 "	35 "	4 1/16 "	3 "	6 "
S-1467	36 "	4 1/16 "	2 1/2 "	6 "	36 "	4 1/16 "	2 1/2 "	6 "
S-1477	37 "	4 1/16 "	3 "	6 "	37 "	4 1/16 "	3 "	6 "

in connection with a communication and the accompanying table of standards which were received from the Carnegie Steel Company. Particular attention was directed to the question of reducing weight, not only in the thickness of

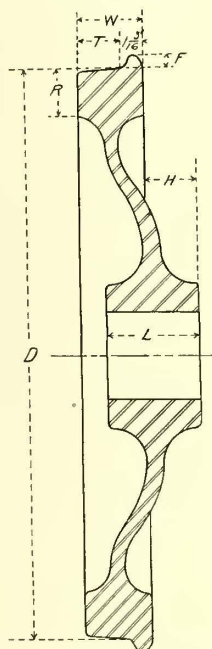
the wheel rim but also in the web. An early report was requested.

Owing to the limited time which your committee had to investigate and report on this subject it has been unable to go into the matter very thoroughly, but having previously studied the question of a light rim wheel as compared with a heavy rim wheel which has just been discussed, your committee believes that the light rim wheel is the most economical proposition and that the suggestion of the Carnegie Steel Company, that certain sizes having 3-in. thickness of rims be dropped from the proposed standards, is a timely one, and in accordance therewith has revised the list of proposed standard sizes as shown in the tabulation and recommends them for adoption as standards.

In reference to the proposed reduction in thickness of web, your committee believes this is desirable providing it can be accomplished without sacrificing necessary strength, and recommends that the manufacturers give the question earnest consideration.

GAGE FOR MOUNTING STEEL AND CHILLED WHEELS

The gage as proposed by the 1909 committee on equipment could not be used on wheels having different thicknesses of flanges, and while it could be used for checking wheels on the axle, it is not convenient for locating the first wheel. We be-



*Rolled Steel Wheels
Proposed Standard Sizes*

D	T	F	H	L
33"	2 1/2"	2 1/2"	1 1/2" or 2 1/8"	5 1/2"
34"	2 1/2"	2 1/2"	"	5 1/2"
34"	3"	2 1/2"	"	6"
34"	3 1/2"	2 1/2"	"	6"
35"	3"	3"	"	6"
35"	3 1/2"	3"	"	6"
36"	3"	2 1/2"	"	6"
36"	3 1/2"	2 1/2"	"	6"
37"	3"	3"	"	6"
37"	3 1/2"	3"	"	6"

*Relation of Tread Width
Total Width and
Flange Height*

T	W	F
2 1/2"	3 1/8"	3/8"
3"	4 3/16"	7/8"
3 1/2"	4 1/4"	7/8"

Equipment Report—Recommended Standard Dimensions of Rolled Steel Wheels

lieve that the present general practice of locating the first wheel by gaging from the end of journal to the hub of wheel and then locating the second wheel by gage is more convenient and sufficiently accurate.

The gage here illustrated is recommended for adoption.

STANDARD TAPER FOR PINIONS

A standard pinion taper would reduce the possibilities of errors and materially facilitate the work of the railway companies in ordering pinions from manufacturers. The advantages to be gained by adopting as a standard a pinion taper which is now in extensive use appear to outweigh the probable advantages of a new pinion taper of dimensions corresponding to units of decimal system. Your committee approves the recommendation of the 1909 committee on standards, that the standard taper for pinions be made in the proportion of 1/4 in. in diameter to 1 ft. in length.

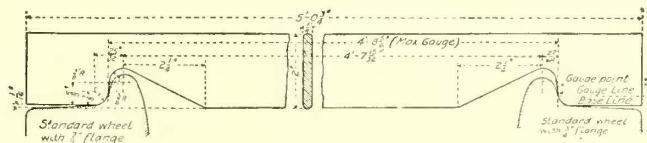
The difficulty of standardizing gears and pinions was not overstated by the 1909 committee on standards, and no material progress could be made by the committee along that line during the present year. It is the general feeling that for motors

of 50 hp or over, a material of high grade, or especially treated, is a necessity, and can be used to advantage on the smaller motors.

GEARS AND PINIONS

A very complete paper on "Railway Motors Gears and Pinions," presented by T. W. Williams before the annual meeting of the Street Railway Association of the State of New York, at Cooperstown, N. Y., June 28, 1910 [ELECTRIC RAILWAY JOURNAL, July 2, 1910], treats in a very able manner of the theoretical considerations in design of gears and pinions, their lubrication and the present state of the art in their manufacture, etc. Your committee would suggest that careful consideration be given to the matter of gear vibration, as it is evident from experiments made by one of the large manufacturing companies that this is responsible to a large degree for many failures such as broken armature leads, broken gear bolts, gear and motor cases, as well as broken armature shafts and axles. It would seem, therefore, advisable to establish limit of gear wear with reference to the elimination of gear vibration rather than with reference to the mechanical endurance of pinion and gear teeth as is the present practice. This naturally includes the limits of wear on axle and armature bearings with reference to the proper meshing of pinions and gear teeth. Such limits can only be properly established after careful investigation, which your committee has been unable to make, and would recommend that it be taken up during the coming year.

One manufacturer says that "Excessive wearing of armature and axle bearings not only gets the pinion and gear out of mesh, but causes the teeth not to fit en-



Equipment Report—Gage for Mounting Wheels

tirely across the face. The gear and pinion are, therefore, at an angle to each other, bringing a greater strain on the end of the teeth nearer the motor. It seems that a good limit for the wear of bearings is that they should not be worn in any place to a greater extent than 3-64 in. measured radially. It would not be safe to measure this as 1/8 in. in diameter for the reason that the bearings might be worn on one side."

Another manufacturer suggests that in general it is considered good practice to wear pinion teeth until they measure 1-16 in. flat at the tips.

It would probably be better to consider the amount of wear at the pitch line rather than at the extreme tip of the tooth, and it is probable that with the standard pitch of gears now used 3-32 in. on either side of the tooth is about the limit.

SPECIFICATIONS FOR WROUGHT IRON BARS

Your committee believes that the specifications of the International Association for Testing Materials are best for the railway companies to purchase wrought iron under, and that for certain parts of cars grades "B" and "C" could be used to advantage, but as it is seldom practicable for the railway companies to make inspections and tests at the place of manufacture, the clause in reference to "Inspection" contained in specifications recommended by the 1909 committee on standards should be substituted for a similar clause in the specifications of the International Association for Testing Materials. With this change your committee recommends that the Revised Standard Specifications for Wrought Iron, as shown in Bulletin No. 24, dated June, 1901, and adopted Aug. 12, 1901, by the International Association for Testing Materials, be adopted as the standard of the association.

Your committee would recommend the adoption of the M. C. B. limit gage for round iron and also that association's table of sizes of limit gages for round iron as the recommended practice of the association.

REPORT OF THE COMMITTEE ON TRANSFERS AND TRANSFER INFORMATION*

BY M. R. BOYLAN, CHAIRMAN; ALEXANDER RENNICK, F. T. WOOD,
HARRY BULLIN, R. E. LEE, T. C. CHERRY

In framing the questions in its data sheet, your committee sought, among other facts, specific data concerning the methods adopted by various companies to prevent abuse of the transfer privilege. A fund of information was acquired, from which stands out prominently the fact that, while most companies suffer more or less financial loss from the misuse of transfers, no general scheme has ever been put into effect by means of which companies can protect themselves from the fraudulent use of the tickets. Your committee does not mean to imply that no company has devised a system for the regulation and accounting of transfers which reduces transfer abuses to a minimum. On the contrary, the replies which the committee received indicate that scientific and substantially effective methods of dealing with the problem are in vogue on many railway properties. The committee was impressed with the wide diversity of practice.

All answers received were compiled and summarized. With the data thus in hand the committee sought to agree upon a form of transfer which would be as nearly perfect as possible, conserving to the passenger the full enjoyment of the privilege conferred, and at the same time safeguarding the company against abuses on the part of dishonest employees and unscrupulous patrons. Although the members of the committee were not in full accord as to certain minor details, an agreement was reached on the fundamental propositions, and it was decided to make these recommendations:

- A. That a standard form of calendar transfer be adopted.
- B. That the transfer tickets intended for a. m. and p. m. be distinctive.
- C. That date of transfers be canceled by clerk at car barn before they are placed in hands of conductors; or, in case of larger companies, date to be printed if desired.
- D. That use of transfers be limited, so far as possible, to travel in one general direction, which might be controlled by creation of transfer districts, showing point at which slip is issued as well as direction in which it is intended to be used. (See Appendix A, with map.)
- E. That conductors be required to make returns of transfers collected every half trip where feasible, otherwise at the end of each round trip.
- F. As to the advisability for using distinctive transfers for a. m. and for p. m. traffic, the committee was unanimous that the utilization of different tickets was conducive to good operation, but opinion as to the most effective method to pursue was divided. The use of tickets of different colors, different forms of transfers and the coupon form to designate the separate periods each had its advocates.

The following is a summary of the replies received to certain questions:

Fifty-seven out of 94 companies issue undated transfers, and 44 of the 57 allow their conductors to cancel the date.

Forty-three out of 90 companies admit that passengers on their lines can return to place of starting for one fare by the use, or abuse, of transfers. Fourteen companies say that they know of no safeguard to be used against this round-trip practice. Other companies have already adopted the zone system or other regulatory methods. Fifty-seven companies say it is possible under their system for conductors to exchange transfers, and only 27 companies reply in the negative. Apropos of the advent of the prepayment type of car, it was gathered that its only effect on

the transfer system was to reduce the number of punches to be made in the tickets.

The questions relating to the issuance of transfers and the privileges conferred by them show that 63 companies designate the line to which transfer is issued, 12 transfer designate the junctions, 9 the destination and 10 name no specific point of transfer. Fifty-two companies punch the beginning and 41 the end of the time limit; 77 companies issue transfers only when fare is paid, as against 18 that do not enforce this requirement; 32 companies issue transfers on transfers, 56 companies do not and 6 do conditionally; 28 companies insist on transfers being used at the first intersection, 12 at the last intersection, 22 at either, while 20 of the replies received have failed to specify clearly what practice was followed. As to time allowed on transfers, 29 companies limit it to the "next car," 48 allow from 10 to 20 minutes and 13 over 20 minutes, the time limit being governed in certain cases by schedule provisions.

Efforts to learn what percentage of transfers remain unused, what percentage of passengers receive transfers and what percentage of transfers are collected brought a variety of replies. The percentage of unused transfers reported ranged from 10 to 70 per cent; of passengers receiving transfers all the way from 2 to 75 per cent; the majority of companies, however, reported 25 per cent or less. As to transfers collected, 10 companies reported figures ranging from 18 to 60 per cent, while 53 companies said their returns were from 60 to 99 per cent of the total number issued.

The question dealing with the return by conductors of transfers collected brought out the information that 38 companies require returns to be made at the close of the day's work, 24 companies at the end of each round trip, and 22 companies at the end of each half trip. In this connection your committee recommends that the practice of requiring transfers to be placed in sealed envelopes at the end of each half trip be adopted wherever feasible, especially in the case of long runs. For comparatively short runs a return for each round trip would suffice.

The question asking how transfers are checked has to do with a matter of much importance to companies, yet the character of the answers received indicates a greater diversity of methods on this feature of accounting than almost any other phase of the transfer problem inquired into by the committee. Seventy-eight replies disclosed 16 varieties of accounting for transfers, with the subdivisions of methods as to detail not specified. Nine of the responding companies announced that no check on the use of transfers was attempted and 35 others reported that they check daily, without saying, however, what means are employed to get results.

When transfers are issued to conductors entry should be made by clerk at car barn on a daily transfer report giving the commencing and closing numbers of the transfers given to each man. This report may be printed in book form with originals and duplicates; the original perforated to permit of detachment for forwarding to auditor and the duplicate remaining in book. When conductors make returns at end of run the commencing and closing numbers of unused transfers should be noted in the column provided for that purpose. The unused transfers should then be forwarded to the auditor and checked with transfer report.

At beginning of day's work conductors should be required to enter on their day cards commencing number of transfer, which must coincide with the commencing number on the clerk's daily transfer report. Subsequently, the conductors should be required to enter upon their day cards the closing number of their transfers at the end of each half trip. They should then be required to enclose the transfers collected for the half trip in an envelope, recording thereon the number collected, together with the commencing and closing numbers of the transfers issued by them during

*Abstract of report read before the American Street & Interurban Railway Transportation and Traffic Association, at Atlantic City, N. J., Oct. 10-14, 1910.

that half trip. Envelopes containing transfers should be sealed and deposited in receptacles provided for the purpose at the end of either each half trip or each round trip as convenience may decide. At the close of each day these envelopes should be listed in duplicate on forms showing the number of trips made and the number of envelopes forwarded to the auditor. The original of these forms with the envelopes, unopened, should then be sent to the auditor's office to be checked.

APPENDIX A

The accompanying map illustrates three connecting lines and two forms of transfers. Fig. No. 2 is a transfer designed to prevent abuse of transfer privilege through looping process.

Through the use of transfer, Fig. No. 1, a passenger

ing to point "E," one block from original starting point "F."

This "looping" can be duplicated in a reverse direction on all of the three lines mentioned. The district form of transfer, Fig. No. 2, would make this impossible.

The line marked "D," and marked by dashes and dots, represents an imaginary or district line, dividing all three lines into districts. All that part of the line marked by dashes west of the line marked by dashes and indicated as "D" is district No. 1 and all east is district No. 2. The same applies to the dotted and solid lines.

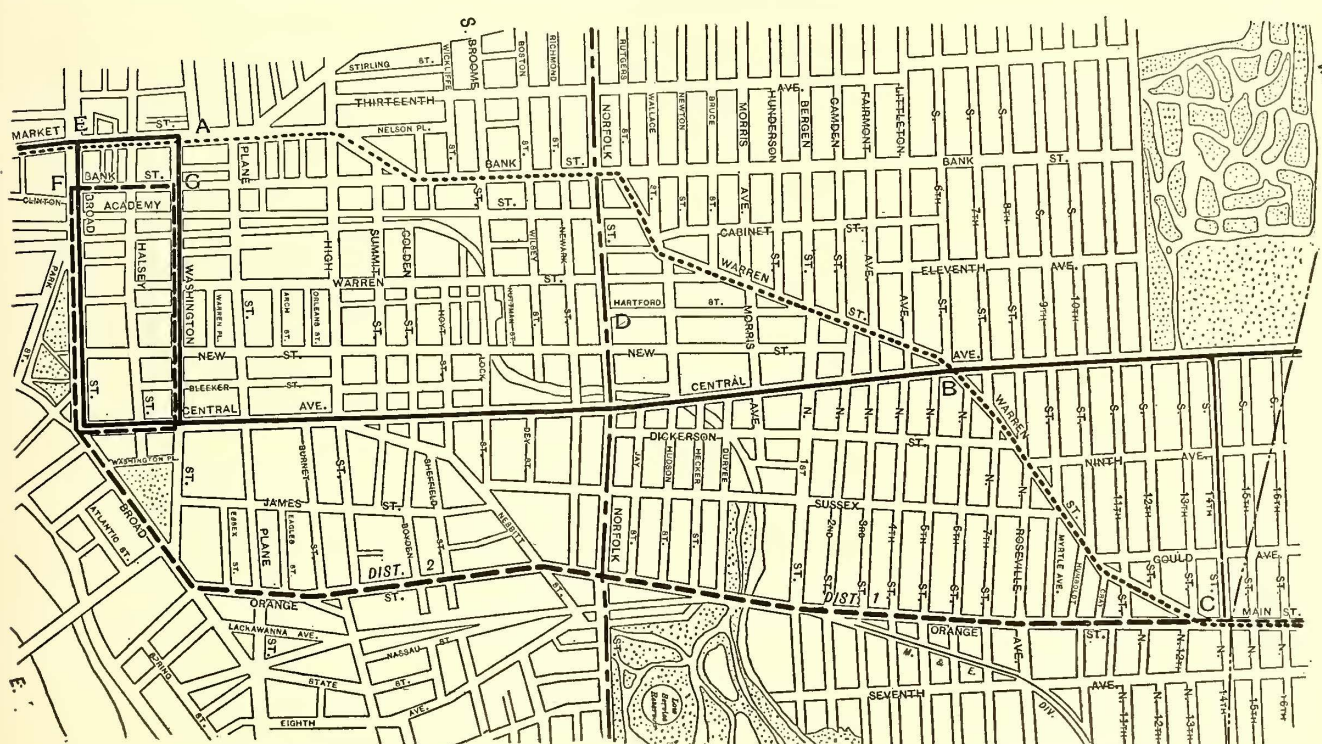
Through the use of the district form of transfer it would be necessary for passengers on the line marked by dashes between the points "F" and "D" desiring transfers to the dotted line to board eastbound cars and transfer at point "A," and passengers west of district line or between points "D" and "C" desiring transfers to the dotted line would

No. 1

COMPANY	LINE	NOT TRANSFERABLE	If no Coupon attached hour punched is A.M. HOUR	
NOTICE Not good if detached. This coupon denotes that the hour punched on body of transfer is P.M. HOUR	BANK	ORANGE	1	15
			2	30
			3	45
			4	15
			5	30
			6	45
			7	15
			8	30
			9	45
			10	15
S.O. R. MARKET 1 15 S.O. R. 2 30 WASH. & ST. N. & S. 3 45 S.O. R. 4 15 S.O. R. 5 30 S.O. R. 6 45 WASH. ST. CAN. 7 15 ORANGE 8 30 DANFORTH 9 45 CLIFTON N. & S. 10 15 ORANGE 11 30 BRIDGE 12 45 BRIDGE 1 15 WASHINGTON 2 30 WASHINGTON 3 45 WASHINGTON 4 15 CLIFTON 5 30 BRIDGE 6 45 CLIFTON 7 15 ORANGE 8 30 BRIDGE 9 45 BRIDGE 10 15 WASHINGTON 11 30 WASHINGTON 12 45 WASHINGTON 1 15 CLIFTON 2 30 BRIDGE 3 45 CLIFTON 4 15				

No. 2

COMPANY	LINE	35	DISTRICTS	
NOTICE Not good if detached. This coupon denotes that the hour punched on body of transfer is P.M. HOUR	LINE - 35	NOT TRANSFERABLE. This transfer is issued and accepted subject to the conditions printed on reverse side 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC. 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	1	15
			2	30
			3	45
			4	15
			5	30
			6	45
			7	15
			8	30
			9	45
			10	15
			11	30
			12	45
			13	15
			14	30
			15	45
			16	15
			17	30
			18	45
			19	15
			20	30
			21	45
			22	15
			23	30
			24	45
			25	15
			26	30
			27	45
			28	15
			29	30
			30	45
			31	15
NOTICE Not good if detached. This coupon denotes that the hour punched on body of transfer is P.M. HOUR				



Map and Transfer Forms to Prevent Looping on Lines Shown

boarding a car on the dotted line, west of point "A," may receive a transfer good at point "B" and return via the solid line to original starting point "A."
A passenger boarding a car on the solid line, north of point "A," may receive transfer good at point "B," returning via the dotted line to point "A."
A passenger boarding a car on the dotted line, west of point "E," may receive a transfer good at point "C" and return via the line marked by dashes to point "F," one block from original starting point "E."
A passenger boarding a car on the line marked by dashes at point "F" may receive a transfer good at point "C" and return via the dotted line shown on the accompanying engraving

to point "C."
Transfers issued to westbound passengers on the line marked by dashes between points "F" and "D" would not be accepted by conductors on dotted line eastbound at point "C" owing to district No. 2 having been punched. The same rule would govern the acceptance by conductors on westbound dotted line cars of transfers good at point "A" issued between points "C" and "D" (district No. 1) to eastbound passengers on the line marked by dashes.
One great advantage of the district form of transfer is that it enables the receiving conductor to tell at a glance approximately where the passenger began his journey.

TRANSFER LAWS AND SUGGESTED CHANGES*

BY LEFFERTS S. HOFFMAN, GENERAL SOLICITOR, PUBLIC SERVICE RAILWAY

There are only six States, besides the District of Columbia, in which there is a general law bearing on the abuse of transfers, as follows: Alabama, Maine, Massachusetts, New Jersey, New York and Wisconsin. Besides these general State laws there are ordinances providing for the imposition of a penalty for the fraudulent use of transfers in the following cities: Chicago, Ill.; Cincinnati, Ohio; Little Rock, Ark.; San Francisco, Cal.; Savannah, Ga., and Tampa, Fla.

There was an attempt made in Kentucky to have a bill passed making the fraudulent uses of transfers a crime. The bill passed the lower house of the legislature, but was defeated in the upper house. There was also an attempt made in Virginia to have such a law passed, but without success.

All the laws and ordinances referred to are of comparatively recent origin, none of them having been in existence more than a few years.

There are at least three very important decisions on the law books, the first being an opinion of the Supreme Court of California involving the ordinance of the city of San Francisco. The second is the opinion of the Supreme Court of Illinois involving the ordinance of the city of Chicago, and the third is the opinion of the Supreme Court of Alabama involving a general law of that State.

The first case is entitled "Ex parte Henry Lorenzen, 50 L. R. A., p. 55," decided by the Supreme Court of California in 1900.

Lorenzen was charged with having given away or sold a transfer in violation of the ordinance of the city of San Francisco and was convicted in the lower court. He took the matter to the Supreme Court of California and urged that the ordinance was not valid because "it violates the guaranty of personal liberty contained in the Constitutions of the United States and the State of California; that it is an unconstitutional interference with a right of private property; that it is arbitrary, oppressive and unreasonable, and finally, that it is an illegal attempt to enforce the obligations or assumed obligations of private civil contracts by penal legislation."

By a divided court, the vote being three to two, the conviction in the lower court was sustained. One of the two dissenting judges wrote an opinion, from which it appears that he did not question that a properly framed law or ordinance would be perfectly valid, but held that the particular ordinance of the city of San Francisco was invalid, as it made every giving away of a transfer a violation of the ordinance, irrespective of the intent with which such transfer might be disposed of; so it would appear that the real question involved, that is, the constitutionality of such a law, was decided by practically the entire court in favor of the ordinance.

It was held in this case that a transfer serves a two-fold purpose: "First, to the passenger as an evidence of his contract by which he is entitled to continue his journey upon the connecting road; and, second, to the company as a means of identification afforded to its conductors and servants, by which they may know that the passenger presenting the transfer is entitled to ride without further payment of fare." The court held that the transfer was taken under a contract of passage, and that if used, the original holder alone could use it, and "if he sold it or assigned it, or gave it to another, to the end that another might use it, he clearly violated his contract and put a fraud upon the company."

Another objection raised against the ordinance was that it was an attempt by penal legislation to enforce a private civil contract; that is, it was an attempt to compel the passenger who had received the transfer to use it within the limits of his contract, and subject him to fine and imprisonment for the viola-

tion of merely a private agreement between him and the railway company. The court said that if this was the only purpose of the ordinance, the objection might be fatal, but that it appeared to the court that the primary object of the ordinance was to "protect and advance the convenience and welfare of the traveling public."

The second case referred to was that of the city of Chicago vs. Openheim et al., 229 Ill. 313, 82 N. E. Rep. 294, decided by the Supreme Court of Illinois in 1907. The defendants were charged with trafficking in transfers in violation of an ordinance of the city of Chicago prohibiting such traffic and providing a penalty for such violation. The lower court, apparently not being in sympathy with the railroad company, discharged the defendant on the grounds "that the ordinance in question is unreasonable in its terms, and that it is unconstitutional because it operates to take property without due process of law."

The Illinois Supreme Court, following the reasoning of the California court in the Lorenzen case above referred to, decided, however, that the limitation put upon the use of transfers by the ordinance is not taking such transfer away from a passenger "so that he is divested of his title and possession and does not therefore deprive him of his property." The passenger who received the transfer might still in theory have the right to ride on the connecting line except for the fact that he has deprived himself of the only evidence of his contract by disposing of his transfer, as it must be kept in mind that a transfer is "a simple token of a passenger's right to be transported over a connecting line, and when it has served this purpose, to be delivered to the carrier issuing it."

Of course, as soon as a passenger to whom a transfer is issued has disposed of the transfer in any way he has abandoned his right to use it under his contract of passage, and as such right could not have been transferred to another, it is hardly conceivable how any one could have seriously contended that a person has such a property right in a transfer, or a privilege to be carried on a connecting line, as to enable him to dispose of it in violation of the terms of the contract under which he received it.

The third case referred to arose in Alabama and is entitled "Whaley vs. State, 52 So. Rep., 940," decided in 1909. The law of the State of Alabama, passed in 1907, authorized street railways "to adopt rules and regulations for the issue and use of any transfer tickets, commonly called transfers," and provided that a violation of such rules would subject the offender to a fine not exceeding \$200 and imprisonment for twelve months or both.

The Supreme Court of Alabama first held that this law was unconstitutional, apparently on the ground that it was an attempt of the legislature to delegate its law-making powers, in that it gave the street railway companies power to make their own rules and provided a penalty for the violation of such rules. A rehearing was had, and by a vote of four to three the act was held to be constitutional.

The only question involved in this case was as to whether or not the legislature had the right to so far delegate its powers as to authorize a street railway company to make rules and regulations a violation of which would be punishable as a crime.

CHANGES IN THE PRESENT LAW

The abuse of transfers has grown to such an extent that in some cities where large and complicated street railway systems are in operation there are usually many places which may be designated as "transfer exchanges," and where a thief is able to obtain a transfer for his ride home at night in place of a transfer which he has deposited in the exchange in the morning. No doubt many of the street railways find that the right which they have to eject a passenger for non-payment of fare when he presents a defective transfer or one that was not issued to him is a sufficient remedy to prevent the abuse to which the transfer system is subject. This remedy, however, does not appear to be adequate in any place where there is a large congregation of people who habitually use the street cars, because,

*Abstract of a paper read before the American Street & Interurban Railway Transportation and Traffic Association, Atlantic City, N. J., Oct. 10-14, 1910.

on account of the establishment of "transfer exchanges" and other equally pernicious customs, the people who take advantage of an improper transfer are quite willing to take a chance of being ejected from a car in order that they may get the benefit of free rides month after month and year after year. It seems necessary therefore that stringent laws should be passed in all of our States where there are street railways carrying large numbers of passengers and that these laws should be actively enforced.

It would no doubt be a great advantage to have as nearly as may be a uniform law throughout the country covering the subject of the abuse of transfers. The New York law, with some changes, would be one which might well be adopted as a uniform law, and the following is suggested as a law which would cover all the features necessary for the successful prosecution of offenders of the transfer system:

SUGGESTED TRANSFER LAW

"No transfer ticket or written or printed instrument giving or purporting to give the right of transfer to any person from a public conveyance operated upon one line or route of a street surface, elevated or underground railroad to a public conveyance upon another line or route of a street surface, elevated or underground railroad or from one car to another car upon the same line of street surface, elevated or underground railroad shall be issued, sold or given except to a person lawfully entitled thereto. Any person who shall issue, sell or give such a transfer ticket or instrument aforesaid to a person not lawfully entitled thereto, and any person not lawfully entitled thereto who shall receive, with intent to use for passage, or who shall use or offer for passage any such transfer ticket or instrument, or shall sell or give away such transfer ticket or instrument to another with intent to have such transfer ticket used or offered for passage after the time limited for its use shall have expired, shall be guilty of a misdemeanor, and, on conviction thereof, shall be punished by a fine not exceeding one hundred dollars or by imprisonment for a term not exceeding six months, or both."

The above suggestion is made for the use of street railways in the States where no such laws exist. The suggested law covers the essential features of the laws of the various States which already have similar laws on their statute books.

The main features of all the laws and ordinances now in existence are about the same, but they differ widely in the penalty provided for the violation of their provisions, varying from the imposition of a fine of only from \$5 to \$10 in Wisconsin to the severe punishment provided by the New York statute of a fine of \$500 or imprisonment for one year, or both. No doubt a small penalty for a single offense of illegally buying or selling a transfer is adequate punishment for that one act, as the amount involved in that particular transaction is only 5 cents, but such a punishment would have little effect upon the public at large, and it is only fair that the punishment should be a severe one.

CRUSADES CARRIED ON UNDER EXISTING LAWS

Several companies have carried on crusades against the abuse of the transfer system.

The Chicago Railways carried on a crusade with considerable success, as evidenced by the fact that up to Oct., 1909, there had been as many as 1000 arrests in a year by that company under the ordinance of the city of Chicago.

The Boston Elevated Railway Company, of Boston, Mass., has carried on a crusade with considerable success.

The Birmingham Railway Light & Power Company, of Birmingham, Ala., and the Utica & Mohawk Valley Railway Company, of Utica, N. Y., have attempted to enforce the laws to prevent the abuse of transfers in the States in which they are located.

The Little Rock Railway & Electric Company, of Little Rock, Ark., appears to have been very fortunate in stopping the abuse by the public of the transfer privilege.

D. A. Hagerty, general manager of that company, writes, under date of Aug. 17 last, that his road had considerable trouble with the trading of transfers by the public, and in order to remedy this evil he made certain rules and regulations under the authority given by an ordinance of the city of Little Rock. He writes:

"We decided that all transfers should be registered on the same registers with cash fare, so we got up a time transfer with destination, direction and exact time punched when same was given out, and gave strict orders that the same should be accepted only on the next car following on line for which it was punched, passing the intersection point where the same was issued. The conductors were instructed to accept no transfers after the time limit had expired, and only after car had passed intersecting street where the same were given out and on line for which it was punched. These rules stopped the abuse of the transfer privilege by the public."

While the Legislature of Virginia has refused to pass a law to cover the fraudulent use of transfers, the Virginia Railway & Power Company has carried on in the newspapers quite an active campaign against the abuse of transfers. There appear in the public press from time to time items in which are set forth various frauds that are practised on the street railway company, calling particular attention to the dishonesty of the passengers in the fraudulent use of transfers and by this means shaming the public into paying their fares or frightening them into doing so through fear of a public exposure in the event of their being detected in their attempt to evade payment of fare by the fraudulent and improper use of transfers. The company does not claim that this accomplishes a great deal, but that it does a certain amount of good and is about the best it can do in the absence of any law making abuse of transfers punishable as a crime.

In conclusion, I would say that it seems to me that we have entirely underestimated the importance of stringent laws providing for the punishment of the abuse of transfers and the active enforcement of the same, and we do not realize the amount of money loss occasioned by the fraudulent use of transfers.

As an example of the money saving which can be effected, I would call your attention to the results obtained by the Little Rock Railway & Electric Company, on which road it is claimed that the abuse of transfers has been to a great extent, if not entirely, done away with. This happy result was brought about in the year 1908, and in the following year (1909) it appeared that although the cash fares increased 10 per cent, the transfers issued decreased 12 per cent, and for the first six months of the year 1910, as compared with the year 1909, the increase in cash fares has been 9 per cent, while the transfers issued have increased only 4.6 per cent. In the year 1908 the revenue derived from the Little Rock Railway & Electric Company per passenger was 3.94 cents, while in the year 1909 it amounted to 4.3 cents, an increase of 0.91 cents. This result has been brought about principally by stopping the abuse of transfers, not only by the general public, but by the company's own employees. While, of course, this may not amount to a great saving in the smaller systems, the amount in saving would reach large figures in such systems as that of the Chicago Railways Company, where a strenuous crusade has been carried on, and where during one year the road carried 373,000,000 passengers, of whom 153,000,000 rode on transfers and about 3,000,000 rode free.

According to the paper of Mr. Sullivan, general supervisor, the Chicago Railways Company estimates that the cars taking passengers at the principal transfer points in the city of Chicago during the rush hours now get about 75 per cent more cash passengers than formerly.

Even from these results we can all readily see the importance of effective laws aimed at the transfer abuse evil, and I have no doubt that a strenuous campaign carried on for the purpose of enforcing such laws will have a very important effect on the revenues of street railways, second only to the highly satisfactory results obtained by the use of prepayment cars.

REPORT OF THE COMMITTEE ON POWER GENERATION*

BY H. G. STOTT, VICE-CHAIRMAN; G. H. KELSAY, C. E. ROEHL, J. D. ANDREW, E. D. SMITH

At a meeting of the committee held on Feb. 21 various subjects were assigned to the committee members to report upon individually, and their treatment of these subjects constitutes the report. The subjects and the names of the gentlemen to whom they were assigned are as follows: Forced Draft, C. E. Roehl; Flue Gas Analysis, G. H. Kelsay; Low Pressure Steam Turbines, H. G. Stott; Steam Meters, R. J. S. Pigott, and Peak Loads, H. G. Stott.

FORCED DRAFT IN CONNECTION WITH BOILER CAPACITY AND ECONOMY

Artificial draft may be produced by reduction of pressure above the fire or by increase of pressure below the fire. Under the former circumstances it is usually termed induced draft, and under the latter circumstances it is usually termed forced draft. It is in this sense that the phrase forced draft is used in the following discussion.

Induced draft may be looked upon simply as a substitute for natural draft from prohibitively high stacks, but this is not true of forced draft. In viewing the relation of forced draft to high stacks it should be recognized that where low-grade fuel is used forced draft is a necessity. Where low-grade fuel means anthracite screenings forced draft cannot be looked upon as one of two equally efficacious forms of artificial draft substituted for natural draft, but possesses an inherent advantage over induced draft. This lies in its ability to cope with one of the trying features attendant on the use of anthracite screenings, namely, the quality of packing on the grate, whereby great resistance is offered to the passage of air through it. In induced draft this lowering of the fuel-bed resistance does not occur. A fuel bed of anthracite screenings, even when actively burning, offers far greater resistance to the passage of air than the walls of air ducts and ash pit connections. As air ducts and connections of forced draft systems are not designed to efficiently convert the energy of the air leaving the fan or impeller into potential form measured by static pressure, the air pressure values measured in ducts and ash pits refer to rapidly moving air—air moving far more rapidly than can be used without dissipation of energy by eddying currents and jets beneath the fuel bed. Each particle of coal is struck and moved around in the layers near the grate before the air moves sufficiently through the bed to reach the incandescent particles for oxidation. This shifting of position of individual particles of coal does much to break up the otherwise abnormally high resistance of the fuel bed to air flow. This shifting of fuel bed may be slight, moderate, or excessive, depending upon the air pressure. When excessive, the coal is blown from the grate and a good part of it is kept dancing in the furnace, sometimes to a height of two feet.

CONDITIONS GOVERNING CAPACITY

Capacity is fundamentally a matter of rate of firing. Firing rates vary widely, whereas efficiencies with a given grade of fuel do not; therefore, it follows that it is only necessary to get coal into a furnace and burn it to cause the rate of steaming to vary very nearly in proportion to the rate of firing. This practical response of the rate of steaming to the rate of firing follows logically from the modern recognition that with boiler equipment actually in service at the present day the limitation of the heat-transmitting ability of the metal of the heating surface is not approached. It also follows by analogy from the enormously higher evaporating rates used in locomotive practice than in stationary practice.

In power stations of large design great attention can well be given to studies of the relation of rapid firing by

*Abstract of report read before the American Street & Interurban Railway Engineering Association, at Atlantic City, N. J., Oct. 10 to 14.

one man in charge of moderate grate area as against moderately slow firing of a large grate area represented in practice by having one man fire relatively many doors.

RELATION BETWEEN CAPACITY AND EFFICIENCY

With low-grade fuel, forced draft practically always secures increased efficiency, so far as heating surface alone is concerned. At very high combustion rates the furnace efficiency is apt to fall sufficiently to offset the rising boiler efficiency. This, however, under proper conditions of control occurs only near the upper limit of the usual attempts at forcing, and when forcing is necessary efficiency is not a ruling factor.

Higher steaming capacity usually reduces labor charges and inevitably reduces investment charges. It reduces the labor charges because, as a rule, more coal per man is being fired and more steam per pound of coal is being obtained. Investment charges are reduced because greater power is obtained per boiler. Maintenance charges increase, but the increase is practically confined to the furnace and, except in very special cases, while an offsetting factor, it is not a ruling one.

One of the most seriously limiting factors in what otherwise appears a field where the higher the pressure the higher the over-all station efficiency is the blowing of coal from the grate after a critical pressure has been exceeded. Very fine coal is not only blown from the grate, which would be no serious matter if it came down again, but is blown over the bridge wall, and in some cases is blown through the heating passes and into the flues in considerable quantities. Once in the flues, a good deal is apt to go out at the top of the stack. The economic loss is not often serious, but in cities the trouble and expense may be considerable. Another limiting condition in increasing capacities obtained by increasing combustion is the inability of the lower water tubes to stand the too severe demands which may be made upon them. When forced draft is used with very small-sized coal and a high average combustion rate is being maintained it is practically impossible to avoid spots where for a time the combustion rate becomes extremely high and the endurance of isolated sections of the tubes in the lower rows is severely tested. The approach to the safe limit of endurance of the metal is probably not a matter of its limit of thermal transmitting ability, but of the failure of the water circulating arrangements to provide properly for heat absorption. It is not unlikely that in the trend of boiler modification to meet the surely approaching demand for higher steaming rates this matter of circulation will receive large attention.

Another limiting feature to continually higher air pressures for the realization of higher capacity is the rapidly rising and finally over-ruling cost of air supply at extremely high pressure. This may be a practical obstacle in the future, but it is not at the present. There is room for a large advance over the usual operating rate to-day before the value of further increase would be nullified by the initial and operating costs of the blowing apparatus required to attain it.

Moderate increase of evaporating rate, 100 per cent or 150 per cent, or perhaps more, over the present nominal rate of 3.45 lb. of water per hour per square foot, referred to a 650-hp B. & W. boiler, from and at 212 deg. Fahr., must be brought about. Installation of very large capacity turbines has forced this and in isolated instances a good deal has already been accomplished. There seems little reason to doubt that the best which has at present been accomplished will in a few years become standard practice.

CONDITIONS GOVERNING EFFICIENCY

In railway power plant work forced draft must be adapted to varying steaming rates. The maintenance of steam pressure but slightly below the setting of the safety valve is the desideratum, and as the fluctuations in steaming demand

are large in relation to the steam storage capacity of water tube boilers, the adaptation of the forced-draft system to varying rates must be accurate and prompt. Steaming rates are varied, of course, only by variation of the combustion rates. Efficiency, therefore, demands that the forced-draft system be adapted to permit variation of the combustion rate over wide ranges, and this requires variation of the air pressure. While variation of air pressure will cause variation in the rate of combustion of coal already in the furnaces, it will not do more. Therefore the problem is, where hand labor is concerned (and automatic stokers are not commonly used with high air pressures), to cause the firemen to vary their rate of firing to meet the varying rate of combustion necessary for the coal already in the furnaces. This, then, is the crucial problem in the attainment of high efficiency: to cause the firemen in forced-draft plants in some manner not only to vary their rate of firing with the draft (using the term in a broad sense), but to make their manner of varying it approach as near as possible to the correct manner. This problem is yet to be solved in a really practical way.

In work of large magnitude the ruling conditions in the use of forced draft with the attainment of good firing are most onerous, yet the quality of the labor is most unfavorable; not that the labor is cheap labor, but it is looked on en masse and necessarily so, resulting very often in almost entire loss of individuality in the relation of the man to the boiler. The labor, while reasonably well paid, is largely foreign and not infrequently low in intelligence, thereby excluding the skill which in isolated plant work is sometimes of sufficient merit to make firing approach the level of a skilled trade. In addition to the other handicaps, rapid changes in personnel are not rare.

A few years ago great interest was aroused by the development of automatic CO₂ recorders, but the hopes that they aroused as to a solution of the problem of guidance in the attainment of high efficiency have not been realized. More light is at present available on the cause of the disappointment than was available after the CO₂ recorders had been in sufficiently extensive use to make the disappointment evident. This light is, of course, that concerning the relation between gas velocities and thermal transmitting ability of the heating surface.

The same strictures may be made against the somewhat extensively exploited balanced draft systems. Unquestionably they at once gave very high CO₂ values. The claims of their sponsors in this respect were not exaggerated. Necessarily used only in conjunction with forced-draft systems, they involved the danger of flare-backs from the furnace doors, and aside from this they raised the furnace temperature so high that the tax on men required to stand up in front of the furnace doors and throw in coal was severe.

It has been recognized that high CO₂ values, which are very readily obtained with forced-draft systems, may easily become too high. In addition to the objections just mentioned, high CO₂ is an excellent direct measure of furnace temperature. Furnace temperatures so high as to be destructive to the furnace brickwork were all too easily obtained. Before the research work of the United States Geological Survey and others had made it evident why highest CO₂ values did not correspond with highest efficiencies the best practice had settled down to ruling against more than 12 to 13 per cent CO₂.

The problem of handling forced-draft systems in railway power plant service comes back then to that of getting firemen to fire well at the varying rates which are demanded by the varying load. The general tendency of poor firemen under all conditions is to throw so much coal in one door without stopping that a long interval elapses before the firing operation is repeated. A general corrective expedient for this, and one which, while very simple, is decidedly

practicable, is the limitation of the number of shovelfuls permitted to be fired in any one door without stopping. This number may be six or eight, preferably six, and while no limitation to the rate of firing, this at once goes a long way toward establishing the practice of light, thin fires as against heavy, thick ones, whether during the rush hours with high steaming rates or at other times. Equally important, if not more important than thin fires is the correct adaptation of the firing rate to the draft, or in more specific terms, the ash pit or air-duct pressure. With 1 in. air pressure in the duct, should the rate of firing with a given grade of coal and boiler equipment be 16 lb. or 20 lb. per hour per square foot of grate surface, or some other rate? On the answer to this the resulting economy of the evaporation apparently hinges. Extensive experimental work appears to show that there is a definite relation between air pressure and rate of firing, which gives the best evaporative economy over wide ranges of steaming. Differential gages reading to 0.01 in. water column have been tried and are accurate and reliable, but the difficulty is to devise a simple system for their use.

The problems which in their solution will probably mark the most significant advance in forced-draft practice appear to be the better proportioning of air ducts and sealed ash pits, particularly the intakes of the latter from the former, as now large losses of pressure are frequent; the modification of furnaces and boilers to allow the use of higher pressures and gas velocities which are necessary for the utilization of more intense evaporative rates; and the development of simpler means for the control of efficiency, which leaves at present more to be done in the way of control of firing than in control of the air pressure or draft. It is hard to say whether the second of these problems, that of control of capacity, or the third, that of control of efficiency, is the more important.

FLUE GAS ANALYSIS

This is the third year this subject has been before the committee. Inquiries were sent out to all known users of gas analyzers and automatic recorders to learn as near as possible just what development has been made during the past year on this subject. Replies were rather disappointing, as very few new ideas or expressions were received. There still seems to be considerable trouble in getting successful operation from recording apparatus. This may be due partially to a lack of diligence on the part of operating engineers. Probably this objection is gradually being overcome.

There are different opinions among operating engineers as to the importance of continuous records and intermittent records. Some believe in occasional analysis of the flue gases by means of the Orsat analyzer, so as to establish the conditions that give best economy, and then endeavor to keep the firing up to these conditions. Others believe that continuous and recorded analysis of the gases is necessary for best results.

Two methods of obtaining continuous analysis are used. One is the use of the sampling bottle which collects the average gas for a day's run, and the other is by means of the automatic recorder which intermittently or constantly records the CO₂ at the time the gas is being made at the furnace. Some very good evidence has been presented against the sampling vessel, in that it does not indicate to the engineer the time in which he is getting good or poor results in his furnace. It only gives the average for the day, whereas the fireman can watch the continuous recorder and determine what condition gives the highest per cent of CO₂ in his gases. In power stations where the load is a fluctuating one some seem to have difficulty in obtaining good CO₂ records.

It has been the opinion of some that the percentage of CO₂ could be considered as practically a direct indication of boiler efficiency. That is, a high percentage of CO₂ always meant a high equivalent of evaporation, and low percentage of CO₂ meant a low equivalent of evaporation. However, it has been

proven quite essential occasionally to analyze the gases for CO, so as to guard against the likelihood of excess CO, as it has been conclusively demonstrated that the highest percentage of CO₂ does not mean the highest boiler efficiency and that a very high percentage of CO₂ may be obtained with very low boiler efficiency or a very low equivalent of evaporation. This may be on account of throttling the air supply on the furnace to such a very low point that there is not sufficient to burn the coal, thereby producing such a high percentage of CO in the flue gases as to reduce the equivalent of evaporation, and at the same time give a very high percentage of CO₂.

It is the practice with a few operating engineers to pay firemen a fixed sum with a bonus of variable amounts, depending on the per cent of CO₂ obtained from their respective boilers while they are on duty. The following is a sample of what one company is doing in this respect.

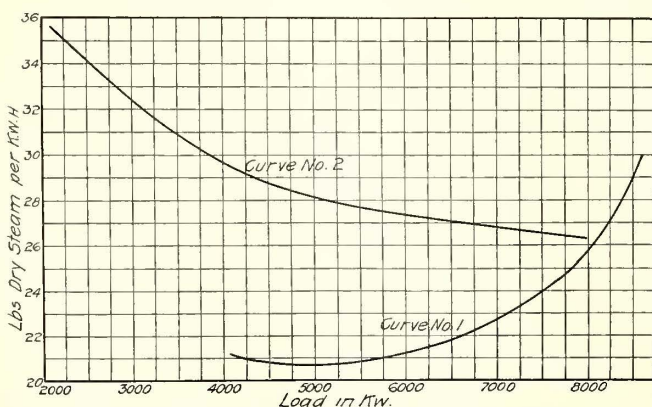
When products of combustion show CO₂—

15 per cent for 10 hours...	30c	extra	per	day	pay	will	be	given
14 per cent for 10 hours...	25c	"	"	"	"	"	"	"
13 per cent for 10 hours...	20c	"	"	"	"	"	"	"
12 per cent for 10 hours...	15c	"	"	"	"	"	"	"
11 per cent for 10 hours...	11c	"	"	"	"	"	"	"
10 per cent for 10 hours...	10c	"	"	"	"	"	"	"
9 per cent for 10 hours...	9c	"	"	"	"	"	"	"
8 per cent for 10 hours...	8c	"	"	"	"	"	"	"
7 per cent for 10 hours...	5c	"	"	"	"	"	"	"
6 per cent for 10 hours...	0c	"	"	"	"	"	"	"

It has been the argument of the engineer that the extra amount paid the fireman is a small percentage of the amount the fireman is saving the company through his efforts to obtain the increase in his wages. This method is not generally practised by operating engineers, and it appears to be doubtful whether a bonus should be paid firemen on the basis of CO₂ when there are other important elements entering into the proposition. This is particularly the case when extremely high CO₂ fails necessarily to indicate the most economical furnace operation and when it is possible for a fireman to obtain a very high percentage of CO₂ with a very low equivalent of evaporation.

LOW PRESSURE STEAM TURBINES

Several installations of low-pressure turbines have been made during the last year with satisfactory results. The largest installation has been that of the Interborough Rapid Transit Company in New York, which has installed three



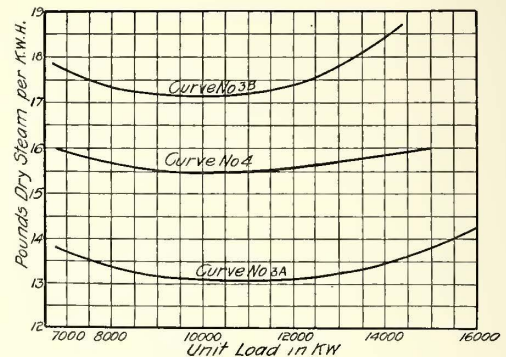
Curve 1 Shows Water Rate of Engine Running Non-condensing; Curve 2 Shows Water Rate of Low-Pressure Turbine with Varying Nozzle Pressure

7500-kw units and is now engaged in installing two more units of the same size. As full results of a very elaborate series of tests on these low-pressure units have been published,* a

*See Electric Railway Journal March, 21, 1910.

brief extract from them follows, as the results may be looked upon as typical of what may be expected in other installations under similar circumstances.

Each of the 7500-kw low-pressure turbine units receives its steam from a Manhattan type of Corliss engine having two 42-in. horizontal high-pressure cylinders and two 85-in. vertical low-pressure cylinders. The high and low pressure pistons on each half of the unit connect onto the same crank, so that the unit consists of two compound engines with the generator between them running at 75 r.p.m. and with a 60-in. stroke. The revolving field of the generator is built up from riveted steel plates of sufficient weight to act as a fly-wheel for the engines on each side of it. The high-pressure valves are of the poppet type and the low-pressure valves of the Corliss type. These units were rated at 5000-kw with



Curve 3A Shows Water Rate of Combined Unit; Curve 3B Shows Water Rate of Two Original Engine Units; Curve 4 Shows Guaranteed Water Rate of 12,000 kw High Pressure Turbine

50 per cent over-load capacity, giving their most economical results between 4000 and 5000 kw. As far as the heating limit was concerned it has never been reached, as the engine becomes too uneconomical to justify operation before the maximum capacity of the generator is reached.

Curve No. 1 gives the engine water rate when running non-condensing, and Curve No. 2 gives the water rate for

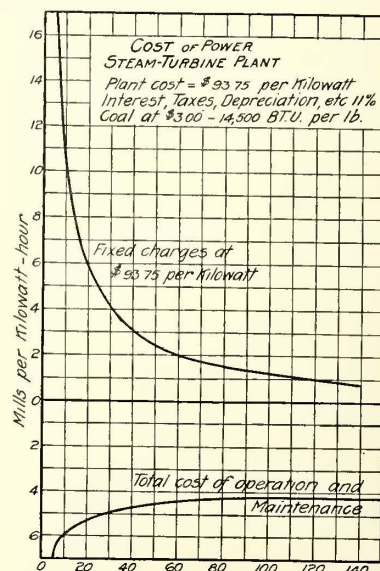


Diagram Showing the Cost of Operation and Maintenance and the Fixed Charges of a Power Plant at Various Loads

the low-pressure turbine, with the steam pressure entering it varying according to the load on the engine from 1 lb. above the atmosphere to 5 lb. below, with a corresponding condenser vacuum of 28.5 in. when referred to a standard barometer of 29.92 in.

The opposite slopes of Curves 1 and 2 result in the combined water rate shown on Curve 3A, giving an almost flat water rate for the combined unit between the wide limits of 6500 kw and 15,500 kw.

To show the gain made by the installation of the low-pressure turbines the water rate of two engines is given in Curve 3B for comparison, showing an average improvement in the combination unit of over 4 lb. per kw-hour.

Curve 4 shows the water rate guaranteed for a typical modern 12,000-kw standard high-pressure turbine unit when running under the same steam pressure and vacuum as obtained for the combined unit as shown in Curve 3A.

All these curves show results obtained with saturated steam only.

The thermal efficiency of the combined unit is over 22 per cent.

The results obtained by the installation of low-pressure turbines are as follows:

- (a) An increase of 100 per cent in maximum capacity of plant.
- (b) An increase of 146 per cent in economic capacity of plant.
- (c) A saving of approximately 85 per cent. of the condensed steam for return to the boilers.
- (d) An average improvement in economy of 13 per cent over the best high-pressure turbine results.
- (e) An average improvement in economy of 25 per cent (between the limits of 7000 kw and 15,000 kw) over the results obtained by the engine units alone.
- (f) An average unit thermal efficiency between the limits of 6500 kw and 15,500 kw of 20.6 per cent.

One of the novel parts of this installation is the use of the induction type of generator on the low-pressure turbines. The reason for adopting this type of machine was that with the enormous short-circuit capacity of the system, amounting to over 300,000 kw, the addition of large synchronous turbo-generators would result in a largely increased short-circuit capacity and it was feared that the switching apparatus would soon reach its limit of safe operation. The addition of induction generators, on the other hand, adds nothing to the short-circuit capacity and tends to help the regulation by adding so much stored energy or flywheel capacity. The results obtained have fully justified the installation and the simplicity of operation is most marked.

In general, the installation of low-pressure turbines may be recommended wherever there are good engines already installed, or in the case of a new installation where the load factor and the coal cost are high. In plants having a large installation of a good type of reciprocating engine the low-pressure turbine may be added at a total cost, including new condenser, auxiliaries, foundations, piping, etc., of not to exceed \$25 per kilowatt, thus bringing down the average over-all investment per kw of the entire plant and so reducing the fixed charges per kw-hour.

STEAM METERS

The following is a list of the principal types of meters for measuring steam:

Anemometer, or jet-turbine type—Holly & Lindenheim; Holly's device was a small vane which operated by a small by-pass, with entry pointing upstream and discharge pointing downstream; the vane wheel drove a clockwork integrating mechanism through a gland. The errors in this meter are: Friction of the gland or stuffing box on the vane-wheel spindle, variable friction losses in the by-pass system, and the absence of a correction device for variation of steam pressure.

Lindenheim's machine was very similar to Holly's, but added a correction device for variation of steam pressure, and in this way was somewhat superior; but both are rendered very unreliable by the fact that friction of the vane-wheel spindle bearings and gland has an enormous influence on the correctness of the reading.

Throttle disc type—The Bendemann, Gehr, St. John, Sargent and several other meters are of this type. The means of operation in all cases is some form of throttling disc or cup in a passage or over a seat, loaded so as to offer a slight resistance to the flow of steam through the passage. Consequently, as more steam flows through the meter the disc or cup is forced up from its seat, so as to expose more area for the steam to flow through, accompanied by an increase in pressure drop through the machine. The rise of the disc is some function of the flow, usually not a straight-line function, as the position of the disc is influenced by eddy currents, which vary with rates of flow and with the shape of the disc and seat or passage. Unless this variation of proportionality be corrected by means of an empirically graduated scale or by suitable mechanism the meter will have an inherent error.

The Bendemann meter consists of a disc floating in an inverted conical passage, in which the stream is flowing upward. The spindle of the throttle disc is carried up into a glass tube (under pressure) and the scale is attached to the tube. Thus the friction error of a stuffing box on the spindle is avoided, but no recording device is attached to the meter. In a later modification the spindle was extended downward and ended in a long taper plug partially closing an orifice. The amount of steam released from this orifice, therefore, varied with the main flow, and was condensed and passed through a small water meter. The St. John meter has a taper plug, moving in an orifice vertically, the movement being transferred by a system of levers, through a stuffing box, to a recording sheet. There is no device on these meters to correct for pressure variation. The Sargent meter has a conical cup, fitting over a conical seat; the motion of the cup spindle is transferred without levers through a labyrinth stuffing box and has a pressure variation correction in the shape of a bourdon gage. This type of meter has the advantage of large movement of the throttle disc over the range, which gives open scales; but the friction of glands and lever systems introduces an error which may overbalance this. The throttling action tends to erode disc and passages, and must eventually destroy the accuracy of the meter with wet steam. If the meters are spring loaded, or use spring-pressure corrections, they become subject to the additional inaccuracies of springs. The bulkiness of this type of meter prevents its use in anything above 6-in. pipe sizes.

An electric meter was proposed by Prof. Thomas, in which the temperature of steam is taken before and after passing an electric-heating coil; the energy sent into the coil is also measured. If the quality and pressure are known the above quantities give a measure of the flow, which is absolutely accurate; but the quantity of electrical energy needed becomes enormous if the steam is 2 or 3 per cent wet, practically prohibiting the use of the meter. For superheated steam or dry gases it is a very good means of measurement. There is no limit to its size.

The remaining forms of steam meter are those in which difference of pressure is employed—working on the principle of the Pitot tube and the Venturi meter. These meters have the best opportunities for accuracy, since there are no moving parts to stick or cause friction, and no parts to wear from erosion. They can also make use of mercury and other accurate differential gages.

The advantages of the Pitot tube type are obvious. There is nothing to do to the piping but put in a small Pitot plug; the recording device may be at any reasonable distance from the point of measurement, and may be made portable. But the total difference of pressure amounts to only $\frac{1}{2}$ in. of mercury at ordinary velocities, so that a very slight leak or bubble of air in the piping to the meter recorder is sufficient to throw it off, and only a most delicate recording device can be used. The Venturi type has the additional advantage of being designed for almost any difference of pressure, allowing a robust recording device and not being easily affected by small leaks.

One feature which is not taken account of by any meter, but has a large effect, is the variation of moisture in the steam. The Pitot tube, Venturi and electric meters are most affected by

variation in quality, but their accuracy in actual measurement partially offsets this when the quality variation is not compensated for.

To sum up, the throttle disc meters suffer, both in measurement and mechanically, from moisture, are usually impaired in accuracy by friction in the mechanism, and are prohibited in large sizes by bulk and expense of installation. In small sizes they are reasonably good.

The electric meter is most accurate, but is too expensive to operate for wet steam, and requires knowledge of the quality to be of any value whatever.

The Pitot meter is simple, durable, and easy to install and operate, but is affected by very slight leaks or pulsation in the steam mains.

The Venturi meter has the same advantages as the Pitot tube, with the additional point of much greater differences of pressure and less delicacy. It is probable that the Venturi form of meter will offer the most reliable and accurate means of measurement.

All the meters are affected by variation in quality, and some by variation in pressure (when no compensation device is used). In the present state of the steam meter, it seems as if the safest way to measure the steam output is by means of a Venturi meter placed in the feed line to the boiler. By this means results can be readily secured which give the output to 1 per cent.

MOST ECONOMICAL METHODS OF CARRYING PEAK LOADS (WITH SPECIAL CONSIDERATION OF FIXED CHARGES)

In any electric railway the first requisite of the system is that the power supply shall be absolutely reliable, and the second is that it shall be produced economically. The first principle is so thoroughly understood that nothing further need be said in regard to it. The second, however, involving all the cost of power, is not so clearly understood as might be wished, especially as regards peak loads.

The curve below the horizontal axis in the diagram herewith shows the total maintenance and operating costs per kw-hour for various percentages of load factor, while the curve above this axis shows the fixed charges per kw-hour for various load factors. The sum of the ordinates above and below the axis gives the total cost of power under the conditions which have been assumed.

From a consideration of these curves it will be seen that for peak loads having an annual load factor of from 5 to 15 per cent the operating and maintenance charges are relatively unimportant and the fixed or capital charges are of the greatest importance.

The various sources of power to be considered for peak-load purposes are as follows:

(1) Storage Batteries. (2) Purchased Power. (3) Hydroelectric Power. (4) Gas Engines. (5) Steam Turbines.

(1) Storage batteries would seem at first sight to be an ideal means of carrying peak loads, as obviously they would not call for any additional plant capacity, but if we apply our double curves to it, we will find that the fixed charges on a battery capable of discharging at its maximum rate for two hours at a time are so high as to leave it out of the question.

(2) Purchased power almost invariably carries a heavy fixed charge per kilowatt of maximum demand, varying from \$15 to \$25 per kw per annum, with a further charge per kw-hour actually used. The first charge should be treated as a fixed charge and so plotted above the axis. This will in all probability show an extremely high cost per kw-hour of peak load.

(3) Hydroelectric power, if transmitted more than a few miles, will inevitably show very high fixed charges, owing to the large investment in the power plant, hydraulic development, transmission lines, etc.

(4) Gas engines, while attractive from the point of view of small cost for fuel during the period the plant is idle, are inadmissible from the point of view of high fixed charges due to the large investment per kilowatt.

(5) Steam turbines are at present the most satisfactory type of prime mover in the market for the peak-load problem, owing to their low first cost. If a reciprocating-engine plant in good condition is available, then the addition of low-pressure turbines will result in the development of a kilowatt at an investment of about \$25, provided there is enough room available in the engine room and if the boilers can be forced sufficiently to carry the extra load.

In the boiler room the investment can be kept down by adding grate surface instead of more boilers, and by the use of forced draft the old rating of 10 sq. ft. of heating surface per boiler horse power can safely be reduced to four or five without materially adding to the cost of boiler or furnace maintenance.

While the over-all boiler efficiency will begin to fall off gradually beyond 175 per cent or 200 per cent rating, the small loss thus entailed is insignificant compared to the saving in fixed charges as shown in the sheet.

The solution of the problem of carrying peak load economically is therefore to be found in reducing the investment per kilowatt to a minimum, and this can be best accomplished at present by the use of steam turbines and by the use of large grate area, such as a ratio of 30 or 40 sq. ft. of heating surface to each foot of grate area, instead of the present ratio of 55 or 60 to 1. Forced draft may be employed with advantage with any grate area and will in almost any case result in increased economy as well as capacity.

ELECTRIFICATION OF THE LONDON, BRIGHTON & SOUTH COAST RAILWAY

On Sept. 5 Philip Dawson read a paper at the meeting of the engineering section of the British Association for the Advancement of Science on the single-phase equipment of the London, Brighton & South Coast Railway. Several short articles on the equipment of this line have been published in this paper.

The selection of the system was determined not only by the conditions on the suburban lines, but in view of the possible extension of the line to Brighton. Between Brighton and London there are at present 36 trains each way a day. The 25-cycle, single-phase system is used with 6700 volts on the trolley wire. Acceleration seems to be as rapid as on the underground lines in London, equipped with direct current. The weight of a complete single-phase train is between 5 and 10 per cent more than if direct current was used. The energy consumption at the station per ton-mile has been from 70 to 80 watt-hours.

Each motor car is equipped with four 115-hp motors. The commutators on these motors have run 50,000 miles before requiring turning. Sparking is a little more obvious than with direct-current equipment, but apparently does not injure the commutators to the same degree as with d.c. motors. The motors have an efficiency of over 80 per cent and the power factor of the system is over 80 per cent. The average voltage at the motors is 750.

The collectors are aluminum bows with a groove containing grease. Their cost of renewal is \$1.68 and their life has been 15,000 miles. The line insulators were tested mechanically to 14 tons and electrically to 65,000 volts. In no case did the insulators break down at 70,000 volts, but there was sparking across their surface. The clearance at one point between the top of the bow and the roof of the car is only 1½ in.

Double catenary construction is used. Boosters are used on the return circuit to comply with the Board of Trade regulations that the average fall in potential in the return should not exceed 20 volts. Mr. Dawson believed that the drop on the return never exceeded 12 to 15 volts.

The cars have side entrances, side aisles and cross seats. The seats are arranged symmetrically, half on one side at one end of the car and half on the other side at the other end of the car, as illustrated in the *ELECTRICAL RAILWAY JOURNAL* for Oct. 12, 1907.

THE PUBLIC SIDE OF STREET RAILROADING*

BY PATRICK CALHOUN, PRESIDENT UNITED RAILROADS, SAN FRANCISCO

No men, not even those engaged in public life, come in such close contact with the people of the cities of this country as those who manage their daily transportation. From this contact we learn an important fact—the utter indifference of the general public to what may be termed the private side of street railroading. How many of the general public do you find who understand the tireless energy, the constructive genius, the wasted experiments, the tremendous labor which have been required to develop the art of electrical transmission necessary to propel economically a street car? How many who realize the vast sums expended during the past 25 years in constructing, first, your horse-car lines; their conversion into cable lines, and then the conversion of the cable lines into electrical lines; or the amount wasted in abandoned electrical machinery? And yet, many of your modern, up-to-date railroads represent the entire cost of these successive stages.

Theoretically, the public side of the question should be confined to three propositions:

(1) That the complicated machinery and organization of a street railroad system shall result in cheap, first-class and efficient service.

(2) That the best methods of granting the use of streets for transportation purposes shall be adopted, and full payment be made for such use.

(3) Whether a higher return for the use of the streets and a better and more efficient street car service thereon can be more cheaply obtained through public than through private operation.

These propositions involve non-political questions of a business nature. Their discussion should create no heat and arouse no rancor. All classes are interested in their correct solution. In every city of the country the problems of street railway transportation are receiving the attention of the most skilled and competent men, yet, no questions affecting our city life have created more virulent, demagogic attacks, have been discussed with less intelligence or more bitterness. The politician, the yellow journal, and the muckraker have combined to misrepresent the position of the railroads. Managers and owners are falsely charged with being the chief source of corruption in city government, and the effort is being made to separate them from the balance of the community. They are denounced as the enemies of society. The result of these attacks has been in a notable instance, in the city of Cleveland, to throw a perfectly solvent, splendidly managed property into the hands of receivers; to make many conservative investors fearful of the future of the securities of street railroads, and to place such securities in the speculative, instead of in the investment class, where they belong properly.

The reason for this is twofold: The railroad management is brought in contact with every phase of city life; every character of request for assistance is made upon it, from a contribution to a church bazaar, to a contribution to an international exposition; from furnishing a special car for an infant's baptism, to a funeral car for a man's last ride; from the just demand for increased service during the busy hours of the day, to the unjust demand of the real estate speculators that unprofitable roads should be built into unpeopled suburbs. No other business comes in contact daily with so many people, so touches the daily life of the citizen, or is so important to the orderly conduct of the people's business.

The railroad has no control over the street traffic. Often-times its tracks are the only well-paved part of the street; wagons and teams crowd upon them, and an inefficient or inimical city administration, neglectful of the people's comfort, allows the ordinary street traffic to delay the cars. The hur-

ried and impatient patron, who does not see the cause, blames the railroad for the delay. While a large majority of the people are reasonable, the railroad must haul all kinds, the halt, the lame, the old, the blind, the thoughtless, the careless and the impatient. The inconvenience necessarily incident to the surface transportation of all large cities breeds discontent and creates a fertile field for the agitator.

And this brings us to the second cause for the attacks upon street railroads. There is a growing class of men in all of our cities, socialistic in their views, some sincere, others insincere, who desire to create that condition of unrest and distrust which will prevent further street railroad extension and bring about municipal ownership. With this class the end justifies the means. No attack is too wicked, no misrepresentation too false, provided it aids in the creation of public sentiment in favor of municipal ownership.

Allied with these men are local agitators and ward politicians who hope through municipal ownership to acquire jobs for themselves, or increased power through the increased patronage which would come from public operation.

Allied with both of these are the unscrupulous demagogues who seek support, frequently as reformers, sometimes as progressive reformers, through fostering unrest and discontent, and who believe that so great is the unrest and discontent of the country that popularity and power are to be gained through attacks upon corporations. Not frequently this demagogue is a practical politician who declares that the interests must be driven out of politics, while he seeks to extort excessive fees or campaign contributions from the railroads on the ground that he alone is strong enough to protect the corporation from the attacks of its enemies. The logic of his position is this: The corporate manager cannot and should not take an active part in local affairs. To do so will render the road unpopular. The managers therefore should stand aside and rely upon others to protect their interests. Publicly this politician will declare that he seeks to drive the corporations out of politics; secretly he will say to the corporate managers that he proposes to protect their interests and they can rely upon him. Under this system the corporation finds itself with no means of protection except the good will of the political boss. It has been and will continue to be open to cinch-bill annoyances and blackmail of every character. There is but one safe rule. A politician who will not enter by the front door should be barred from the back door.

There is not an intelligent street railway manager in the country who does not desire to keep his corporation per se out of politics. No class of men is more opposed to corrupt alliances between corporations and politicians; no men more earnestly favor the overthrow of the boss system in party management; no men more sincerely desire non-partisan discussion and non-partisan action in regard to the serious business problems involved in city transportation; no men are better equipped to help the people arrive at correct conclusions on this subject; no men have greater selfish interests or broader patriotic motives in seeking the proper solutions of the problems; no men will unite more cordially with their fellow citizens in an effort to better conditions, materially and morally. They believe earnestly that the railroad companies and the problems involved in their operation should not be made the targets of political attacks, but should be left unmolested, subject to public, non-partisan control, to carry on their business.

They know that coöperation between the railroad, the general public and city officers—cordial, sympathetic, willing coöperation—is an essential to efficient service. In some of our larger cities intelligent police regulation of the general traffic of the street has become most effective in preventing blockades and in keeping the street car tracks free for public use. It is only through such regulation, which the railroad itself cannot enforce, that delays can be prevented.

There are two methods by which corporate interests can be protected. One is by their officers and officials apparently abstaining from politics, apparently devoting themselves en-

* Abstract of paper presented at meeting of the American Street & Inter-urban Railway Association, Atlantic City, Oct. 10-14, 1910.

tirely to business, claiming to be business men and not politicians, and making secret deals with those politicians who will give them protection. This has been in some degree the method of the past, and this has been unquestionably a cause of political corruption. The corporation, without a just public opinion upon which to rely, has found itself without any defender except the corrupt politician, whether under the name of reform or machine, who has demanded his price for his protection.

The other method is for the corporate manager to defy boldly the politician, high or low, who undertakes to drive him from a participation in public affairs; to refuse to be blackmailed, to refuse to buy political protection through campaign contributions, to put his trust in the plain people of the country, and, willingly, boldly and fearlessly lay his case or his needs before them.

I advocate, absolutely, clean political methods—bold, fearless, courageous methods—and the establishment in every community, by the men who manage corporations, of a reputation for fearless political courage, until they secure a leadership in civic affairs recognized to be disinterested and for the public good.

I advocate a campaign of education, the widest publicity of the affairs of public service corporations, freedom from entangling political alliances, the sternest integrity in the administration of both the private and the public side of corporate management, and the passage of such laws as are necessary to establish non-partisan tribunals of a judicial rather than a political character, with power to grant franchises and regulate public service corporations.

One of the causes of political distrust of the corporation to-day is that corporate managers have sometimes professed to be out of politics, while they have had secret deals with the demagogue who has been proclaiming his desire to keep the railroad out of politics.

I have in mind the picture of a scene that occurred in the office of the Governor of one of our States. He was in discussion, friendly and cordial, with the general counsel of a railroad. While this discussion was going on some of his farmer constituents appeared at the door of the executive office. The back of the railroad counsel was to the door; the Governor faced it. He saw his constituents, immediately raised his voice, and said, without pertinency to what was then transpiring, "I tell you, sir, I will not allow myself to be dictated to and controlled by the hireling of any corporation," and launched into a tirade against railroads. His constituents paid their visit and left, when the Governor apologized for the abrupt change in his manner by the statement that it would never do for him to be found in friendly conversation by his country constituents with a corporation lawyer.

These facts are calculated to make cynics of railroad managers, and distrustful and suspicious voters. I am an opponent of corruption, a contemner of hypocrisy, and an advocate of the widest publicity. Why should we leave the field of publicity to the muck-raker and the demagogue? The people in the end are the arbiters of our destinies; the great bulk of them are honest, upright, sincere, truthful; they hate a liar, and if the demagogue lies and gets off with his lies, it is because he is not exposed and the people are not convinced of his malevolence and untruthfulness—they too frequently attribute his misstatements to mere impulsiveness. But the railroad man, whose corporation will continue to operate after his day is past, cannot afford to lie; he must be truthful, plain-spoken and upright. He has not only his own moral character and personal future to regard, but also the trusts which are imposed upon him, in behalf both of the stockholders and of the public whose servant he is.

There is no doubt that a campaign of lies has been inaugurated and is being carried on by our opponents. Why should not the railroad interests of the country inaugurate a campaign of truth and go before the people confident that the campaign of truth will win out over the campaign of lies? They may meet with temporary defeat here and there. What of it? De-

feat should only be an inspiration for more vigorous action if a man is armed with conscious integrity. The time is ripe for a movement of this character.

We represent one of the most honorable of occupations, one that requires a high order of executive ability and a high order of technical information. The men who manage the railroads are patriotic, upright and honest. They have the capacity to express themselves, and the means at hand of laying their views before their fellow citizens.

We know that no men are so interested in the material welfare and growth of a city as those who own its street railroads. We must make the public know this too. The rate of fare is fixed; it cannot be increased, and there is no possible way by which gross earnings can be increased except through increased population. The public must be educated to recognize that there is no conflict between it and its railroad managers. No men are willing to work harder, more patiently, more effectively for the public welfare. No men are more interested in good government—not the bastard sort of the reformer for office, but careful, prudent, economic, efficient, honest government.

Now, you cannot eliminate the corporations, and the men connected with corporations, from an interest in public affairs. They pay taxes; they meet the public in every direction; they want careful, prudent, economical government; they form a part of the best life of the country. It is foolish to assume that under modern conditions corporations can be destroyed, or that it would be wise to destroy them if they could be destroyed.

A bold, frank, open, courageous course will give any man a standing, whether he is a corporate manager or whether he is not, in any American community. The people will listen to what he has to say, if they believe truth and honesty are in his words, backed by strength and character.

Railroad managers should take an active leadership in providing the best method by which franchises may be granted with the least temptation to corruption and the best results to our cities. This is a subject upon which all good citizens should unite. Corporate managers do not desire to overreach the people in acquiring new franchises.

No greater misconception exists in the public mind than that the franchises generally of street railways have been founded in corruption. As a matter of fact these franchises were originally granted to the foremost men in their respective communities, often influenced by a noble public spirit and the desire to give to their communities the transportation absolutely essential to a city's growth. They were granted when the risk in street railway construction was great, and when the communities were most anxious to grant the franchises. In many cases, too, they became burdens instead of benefits to the promoters and yielded no profits for many years. Such corruption as has existed has grown mainly out of efforts to procure speculative franchises in opposition to the old established roads, most frequently not to give any needed transportation, but for the purpose of levying blackmail upon the older enterprises through forcing them to purchase the new grants.

We may admit, however, at the start in the discussion of this subject, that the present method, by which the State grants a charter to a public-service corporation, and then leaves it to the local legislative bodies in our towns and cities to grant franchises for the use of the streets and to regulate the rates of public service corporations, has been the source of corruption. The system is wrong. So long as greed is strong in the human breast, so long will you find some politicians ready to hold up the corporations until they have exacted their pound of flesh. Nor will the fact that the public laws controlling the city charter provide for the freest advertisement of franchises for sale to the highest bidder meet the difficulty. A striking illustration of this fact has been found in San Francisco. By the charter of that city to-day any franchise for a street railroad must be advertised for 90 days and the bidder must pay a minimum amount of the gross receipts to the city government. At the end of 25 years all the property of

the railroad passes to the city without consideration other than the grant of the original franchise.

Some of the foremost gentlemen of San Francisco applied to the Board of Supervisors for a franchise to build a railroad through the sand dunes of what is known as the Sunset District. There were no houses in this district and the streets had not been opened. These gentlemen, who were large real estate owners, determined to open an important boulevard at their own expense, and to build a street railroad into this desert of sand for the purpose of developing their property and putting it upon the market. The street railroad franchise was of no value. They knew that it could not be made profitable, and that they would be compelled to charge the money which they expended in the construction of the boulevard and the building of streets to the cost of their real estate. It was manifest that it was to the interest of the city that the franchise should be granted, and yet it was held up for months by the Board of Supervisors. Finally some of the men connected with the enterprise employed a prominent lawyer, who then also occupied the position of a political boss. They paid him a fee. Still the franchise was not passed during his period of political control. Subsequently certain members of the Board of Supervisors were bribed, on a skating rink ordinance, by a set of buccaneer financiers and politicians who had banded together to gain control of the city for personal exploitation. These men offered and gave complete immunity to the Supervisors whom they had bribed provided the Supervisors would incriminate, among others, these land owners in the Sunset District. The Supervisors promptly accepted the price of their immunity, and declared that they had been promised money by the so-called political boss if they would pass the ordinance for the railroad. The land owners who had projected the road and who were ready to build, and did subsequently build, a splendid boulevard at their own expense were promptly indicted. The political boss was also given a written contract of immunity in the hope that he could be forced to incriminate the land owners among others, but it developed that the Supervisors never received a cent of money either from the political boss or from the gentlemen connected with the enterprise. The political boss declared that he had received a fee in connection with the road, but that he had never been authorized, directly or indirectly, to pay or promise any money to the Board of Supervisors, and had never done so, and that he would not perjure himself to convict innocent men. The franchise was held up for nearly three years, when the so-called reform administration granted it under the public pressure which had been aroused and the fear of political retribution if they held it up longer. The result was that a most unprofitable street railroad was built, while the assessor states that real estate values tributary thereto advanced 800 per cent.

Now, no system of granting franchises under which such a condition has occurred, and may recur in the future, is wise or safe. I suggest that the remedy is for the State to refuse to delegate the power of granting franchises and regulating their rates to varied local bodies, too frequently corrupt and irresponsible, but to reserve this great right to itself; to provide franchise courts or public service commissions composed of a few men of the highest ability, character and integrity, who should have the power to grant franchises only after the fullest public hearing. The court or public service commission should hold public meetings in the different cities and towns. The grant of franchises should be withdrawn entirely from politics and left to such court or commission.

The period when public pressure and the consideration of the public phase of railroading is brought close home to a street railroad manager is during a strike. Then it is necessary more than at any other time for a railroad manager to have a definite conception of his public duties and of his private rights. Tremendous pressure will be brought to bear upon him by civic and religious bodies, well-meaning to the core, but who, without knowledge of the great fundamental rights which lie at the basis of society, are willing to temporize and adopt any

expedient which will produce a speedy resumption of traffic.

No man, no set of men, has a right to say to any man he shall not work when and how and as he pleases; no employees of a corporation have a right to abandon their occupation and still claim to have relations with the corporation. I concede to the employees the right to organize for mutual protection, to better their condition, and to stop work when they want to, even without notice to their employer, but I deny absolutely the right of any body of men to leave the service of any employer and say to him, "We will prevent by violence other men from seeking your employment and you cannot carry on your business without submitting to our dictation." No strike can be successful unless the employer is weak enough to deal with the men after they have struck, and industrial strife will necessarily stop if strikes continually fail.

Our government was formed upon the principle that there were certain inalienable rights of man of which the whole of society could not deprive him, and that one of these inalienable rights was free speech, particularly in defense of himself and his property when attacked. The railroad manager himself should seek to deprive no man of his liberty, but he should allow no group of men to deprive the humblest of his employees of the liberty to work if he wants to work and if he is faithful and honest in the discharge of his duties. He must be prepared to defend vigorously the rights of the property entrusted to his care, and that of his humblest employee in his own labor.

No man has so great an interest in the stability of property rights as the honest workman, of whatever calling, who has no property except the property to be acquired through his own labor. No prosperity can exist except where there is the utmost protection and safeguard to the rights of the individual in his property, whether it be in his labor to-day, or whether it be in the results of yesterday's labor which he has husbanded and saved. All despotic governments which have failed to give full protection to the rights of property have had in them men of large wealth, who, in one way or another, through power or corruption, were able to take care of themselves, but the masses of mankind under such despotic governments have been invariably reduced to the lowest conditions of poverty. You cannot separate the rights of man from the rights of property acquired by his labor without depriving him of his liberty and reducing him to a condition of serfdom. Railroad franchises rest upon the law to the same degree that the title to the real estate fronting upon the streets rests upon the law. Both rights were acquired by grants from government, but the rights entrusted to our care are clothed with a public use, while the rights derived from a grant to a piece of real estate may be all private. It behooves us, therefore, more than any other class of men in the country, to study and to understand what are our private rights and what are our public duties.

It is the patriotic duty of the railroad manager, fighting demagogism and socialism on the outposts of society, to stand firmly for the protection of those limitations which form the basis of the liberty of the individual. He must learn and he must teach that our principles of government did not spring from a written constitution, but that our written constitution, carrying with it the protection of life, liberty and property, sprang from principles which were the product of eighteen centuries of conflict with despotic power; that the principles that a contract must be held inviolable, and that the humblest citizen of a community, as well as the richest, has certain inalienable rights of which the whole society cannot deprive him, are necessary in order that the people may prosper and find liberty and happiness in their prosperity; that a government of, for and by the people has no place in it for the political serf or the beneficent ruler; that equal and exact justice to all men can be found only under a reign of law. In this day, when we hear so much of the conservation of our material resources—and every patriotic man wants to see them intelligently conserved and legally developed—I say to you, gentlemen, that the conservation of the country most needs is the conservation of a government of law.

REPORT OF THE COMMITTEE ON POWER DISTRIBUTION*

BY A. F. HOVEY, VICE-CHAIRMAN; S. L. FOSTER, E. J. DUNNE, E. J. BURDICK, WM. ROBERTS

The loss which the association has sustained in the death of our chairman, James Heywood, has been felt particularly by his fellow committee members, and the work of the committee, which was then largely in the formative stage, received a serious setback.

No formal report, therefore, has been prepared, but the specifications for high-tension three-conductor and for low-tension single-conductor cable, which were included last year in the appendix to the report, have been revised after conference with representatives of the cable manufacturers, and are submitted, not with recommendations for adoption as standards but rather for full discussion, as they are in the form in which it was intended to submit them to the committee at a proposed later meeting for consideration and final revision.

It was in the mind of our late chairman to attempt to arouse an interest in some of the features of last year's report which from lack of time, did not receive much discussion; and it is hoped that those members or others who were prepared to discuss some of the matters last year will feel that such discussion will be welcome this year and will take part in it.

[Inasmuch as the specifications are not yet in their final form they are not presented at this time.—Eds.]

SPECIFICATIONS FOR OVERHEAD CROSSINGS OF ELECTRIC TRANSMISSION LINES**

The following specifications are a proposed joint report of the committee on electricity of the American Railway Engineering & Maintenance of Way Association and the committee on overhead line construction of the National Electric Light Association. They are respectfully submitted by the committee on power distribution for consideration by the members of the American Street & Interurban Railway Engineering Association.

GENERAL REQUIREMENTS.

1. Scope: These specifications shall apply to all overhead aerial transmission line crossings, except trolley contact wires, over the railroad company's tracks, lines of wires, or property, and to lines parallel to the railroad company's tracks, lines of wires, or property, when side clearance is less than the height of the transmission line supports.
2. Location: The poles or towers supporting the crossing shall preferably be outside the railroad company's right-of-way.
3. The towers or poles supporting the crossing span and the adjoining span on each side shall, if possible, be in a straight line.
4. The wires or cables shall cross over telegraph and telephone wires.
5. Cradles or overhead bridges shall not be used over the railroad company's property or tracks.
6. Clearance: The side clearance from the center line of the nearest track shall not be less than 12 ft. 6 in.
7. The clear headroom shall not be less than 30 ft. above the top of rail.
8. The clearance above any existing wires shall not be less than 6 ft.

*Abstract of report read before the American Street & Interurban Railway Engineering Association, at Atlantic City, N. J., Oct. 10 to 14.

**Submitted as Appendix A of the report of the committee on power distribution, read before the American Street & Interurban Engineering Association, Atlantic City, N. J., Oct. 19-24, 1910.

9. The separation of conductors shall not be less than:
10. By voltage:

Volts.	Spacing.
6,600 or less	12 in.
11,000	24 in.
13,000	24 in.
22,000	33 in.
33,000	33 in.
44,000	44 in.
60,000	60 in.

11. By sag:

Normal Sag.	Spacing.
.
.

12. Conductors: The conductors in the crossing span and the adjoining span on each side shall generally be so strung that the normal tension will be the same in each span.

13. The conductors shall not be spliced in the crossing span.

14. Conductor Attachments: An approved device should be used to attach the conductors to the poles or towers, and such device shall be arranged to hold the wires to the supporting structure in case of excessive stresses, broken wires or shattered insulators.

15. Wooden Poles and Crossarms: Wooden poles or cross-arms shall not be used for voltages over 13,000.

16. Guys, Double Arms: Where possible, wooden poles shall be guyed both longitudinally and transversely, and the next adjoining pole be double-armed and guyed toward the crossing.

17. Clearing: If possible, all timber, underbrush and grass shall be removed from the immediate vicinity of the poles.

18. Protection and Grounding: If required by the railroad company, danger signs of an approved design shall be placed on all poles and towers located on the railroad company's right-of-way.

19. Steel structures shall be grounded in an approved manner.

20. Temperature: In the computation of stresses and clearances, and in erection, provision shall be made for a variation in temperature from 10 deg. Fahr. to 120 deg. Fahr.

21. Inspection: All material and workmanship shall be open and subject to the inspection of the railroad company's representatives.

22. Defective material shall be removed and replaced with suitable material.

23. On the completion of the work all falsework, paint and rubbish incident to the construction shall be removed and the site left unobstructed and clean.

24. Drawings: complete sets of the general and detail drawings shall be forwarded to and approved by the railroad company before any construction is commenced.

LOADS

25. The conductors shall be considered as uniformly loaded throughout their length with a load equal to the resultant of the dead load plus the weight of a layer of ice 1/2 in. in thickness and a wind pressure of 8 lb. per sq. ft. on the ice-covered diameter, at a temperature of 0 deg. Fahr.

26. The weight of ice shall be assumed as 0.033 lb. per cu. in.

27. Insulators, pins and conductor attachments shall be designed to withstand the maximum tension in the conductors.

28. The poles or towers shall be designed to withstand the combined stresses resulting from their own weight, a horizontal wind pressure of 13 lb. per sq. ft. on the windward and 9.75 lb. per sq. ft. on the leeward exposed surface of the pole or tower, and the above wire loading on all crossing spans and the next adjoining span on either side.

29. The poles or towers shall also be designed to withstand the preceding loads combined with the unbalanced tension of

FACTORS

30. The ultimate unit stress divided by the allowable unit stress shall not be less than the following:

- 31. Wires and cables..... 2
- Insulators, pins, conductor attachments..... 3
- Wooden poles and crossarms (untreated)..... 5
- Wooden poles and crossarms (treated full length) .. 4
- Structural steel..... 3
- Reinforced concrete..... 3
- Foundations 1.5

32. Insulators: Insulators shall have an electrical factor of safety of at least two at the normal working voltage, under a precipitation of 1/5 in. per minute.

MATERIAL

33. The conductors shall be of copper, aluminum, or such non-corroding material as may be approved by the railroad company.

34. The minimum size of conductors shall be as follows:

Voltage, not over 6600 Voltage, over 6600	Copper	Aluminum
	No. 6, B & S, solid or stranded No. 4, B & S, stranded	No. 2, B & S, stranded No. 0, B & S, stranded

35. Insulators: Insulators shall be of an approved grade and type of porcelain or other material of equal strength and durability.

36. For voltages over volts insulators shall be of porcelain.

37. Strain insulators in guy cables shall have an ultimate strength not less than that of the cables.

38. Pins: Insulator pins shall be of steel, wrought iron, cast steel, malleable iron, or other approved metal or alloy and shall be galvanized or otherwise protected from corrosion.

39. Guys: Guys shall be galvanized, stranded, steel cable, not less than 5/16 in. diameter.

40. They shall have a substantial anchorage of an approved type and be protected or of extra strength at the ground level.

41. Wooden Poles: Wooden poles shall be of selected timber, peeled, substantially straight, free from defects which would decrease their strength or durability, and not less than 8 in. in diameter at the top.

42. Concrete: All concrete shall be in accordance with the specification for of the joint committee.

STRUCTURAL STEEL

43. Structural steel shall be open-hearth, railway bridge steel, in accordance with the Manufacturers' Standard Specification (1903).

44. The design and workmanship shall be strictly in accordance with first-class practice.

45. The form of the frame shall be such that the stresses may be computed with reasonable accuracy.

46. The sections used shall permit inspection, cleaning and painting and shall be free from pockets in which water or dirt can collect.

47. The material shall not be less than 1/4 in. in thickness.

48. The length of a main compression member shall not exceed 125 times its least radius of gyration.

49. The length of a secondary compression member shall not exceed 150 times its least radius of gyration.

50. Bolts shall not be used in place of rivets except as specified upon the approved plans, and when used the holes shall be made to a close fit.

PROTECTIVE COATINGS

51. All structural steel shall be thoroughly cleaned at the shop and be galvanized or given one coat of approved paint.

52. Painting: All contact surfaces shall be given one coat of paint before assembling.

53. All structural steel shall be given two field coats of an approved paint.

54. The surface of the metal shall be thoroughly cleaned of all dirt, grease, scale, etc., before painting, and no painting shall be done in freezing or rainy weather.

55. Tests of galvanized material shall be in accordance with the American Telephone & Telegraph Company's specifications (1908).

56. Galvanizing: Bolt holes in galvanized material shall be punched before galvanizing, and riveted connections shall be given two coats of paint after riveting.

57. Creosoting, etc.: Wooden poles or towers shall be creosoted or otherwise treated with preservative for a distance of not less than 2 ft. above and below the ground line.

FOUNDATIONS

58. The foundations shall be designed to resist overturning, the depth and dimensions to be determined by local conditions.

59. The weight of "earth" shall be assumed as 90 lb. per cu. ft. and that of concrete as 140 lb. per cu. ft.

60. No steel shall extend below the surface of the ground, unless encased in concrete.

61. The top of the concrete foundation, or casing, shall not be less than 1 ft. above the surface of the ground or of extreme high water.

62. When located in swampy ground, wooden poles shall be guyed and set in barrels, broken stone or timber footings.

63. When located in the sides of banks, or when subject to washouts, foundations shall be given additional penetration or be protected by cribbing or riprap.

UNIT STRESSES

- 64. Structural Steel:
 - Tension (net section).....18,000 lb. per sq. in.
 - Shear14,000 " " " "
 - Compression18,000-60 " " " "
- 65. Rivets, Pins, Bolts:
 - Shear10,000 " " " "
 - Bearing20,000 " " " "
 - Bending20,000 " " " "
- 66. Wires and Cables:
 - Copper, hard drawn, solid, B&S
 - gage, 4/0, 3/0, 2/0.....25,000 " " " "
 - Copper, hard drawn, solid, B&S
 - gage, 1/027,500 " " " "
 - Copper, hard drawn, solid, B&S
 - gage, No. 128,500 " " " "
 - Copper, hard drawn, solid, B&S
 - gage, No. 2, No. 4, No. 6....30,000 " " " "
 - Copper, soft drawn.....17,000 " " " "
 - " hard drawn, stranded....30,000 " " " "
 - " soft drawn, stranded....17,000 " " " "
 - Aluminum, hard drawn, stranded,
 - B&S gage, under 4/0.....12,000 " " " "
 - Aluminum, hard drawn, stranded,
 - B&S gage, 4/0 and over....11,500 " " " "
 - 67. Timber (untreated):

	<i>Bending.</i>	<i>Compression.</i>
Long leaf yellow pine	1300 lb. per sq. in.	1300 $\left(1 - \frac{L}{60D}\right)$
Short leaf yellow pine	1100 " " " "	1100 " "
White oak	1100 " " " "	1300 " "
Chestnut	1000 " " " "	1100 " "
Cedar	800 " " " "	900 " "
Douglas fir	1200 " " " "	1200 " "

L = length in inches.
D = least side, or diameter, in inches.

Bion J. Arnold, of Chicago, is referred to in "Hampton's Broadway Magazine" as consulting engineer by profession and a street railway doctor by choice. According to "Hampton's," however, it will be some years before all the medicine which Mr. Arnold has given New York is assimilated and the ailment for which he is prescribing is cured.

REPORT OF THE COMMITTEE ON INSURANCE*

BY H. J. DAVIES, CHAIRMAN; S. J. DILL, A. H. FORD, F. A. HEALY,
G. B. HIPPEE, S. L. TONE

Your committee on insurance makes the following recommendations:

1. That the association appoint an insurance expert, with authority to employ such assistants as may be necessary, whose duty it shall be to give advice and assistance to such members of the association as may desire to avail themselves of his services on all subjects relating to fire insurance, including forms of policies, appraisals of property, schedules of rates, the elimination of unnecessary commissions, the construction and improvement of properties with a view to the lessening of fire hazards, and the adjustment of losses, and to represent member companies, upon request, before inspection and rating bureaus; the insurance expert and his assistants to be the inspection and survey bureau of the association; the expenses of the bureau, not to exceed \$25,000 per annum, to be paid by the association, and to be collected from the members in the proportions in which annual dues are now collected, or in proportion to the value of the services rendered by the bureau to the several members of the association.

2. That traction companies have appraisals made, by independent appraisers, of the value of their properties. Such appraisals, if made by recognized experts, will aid the companies in adjustments of losses.

3. That each member company employ permanently an inspector to examine its properties, particularly with reference to cleanliness, condition of buildings and fire drills, or that it assign this work to an officer or employee, and that the man assigned to these duties be of sufficient intelligence, experience and authority to criticize and condemn conditions and recommend improvements.

4. That particular attention be given to the inspection of car wiring and the wiring of buildings.

5. That car yards be protected by standpipes surmounted by nozzles that may be easily turned in any direction, each of which will throw a stream an inch or more in diameter at least 100 ft., at the rate of from 250 to 300 gal. per minute, the standpipes to be so distributed that two streams may be made to play at the same time upon any car in the yard. The water supply should be obtained from city mains or from reservoirs, and, if the pressure be less than 80 lbs. per square inch, it should be increased by a steam or electric underwriters' fire pump. Your committee has witnessed a test of this form of protection in Cleveland, where it has been installed in a large car yard containing cars valued at more than a quarter of a million dollars. Drawings showing the Cleveland installation are attached to this report.** The plan has also been adopted in Minneapolis, where a still larger yard is to be equipped. Such standpipes and nozzles will effectively protect any car yard in which they may be erected, and will entitle the company installing them to a very low rate of insurance.

6. That approved chemical extinguishers be carried in each interurban car. If a fire starts in a car between cities, where it cannot be reached by the apparatus of any municipal fire department, it is likely to be totally destroyed, whereas the fire might be easily extinguished in its incipiency if an extinguisher were at hand. Several fires have, to the knowledge of the committee, been put out under such circumstances. We see no objection to the protection of city cars in the same manner.

7. Without repeating the recommendations made in former annual reports, your committee calls attention to them, and suggests that they be read in connection with this report. The committee believes that if members will adopt its recom-

mendations they will be able to obtain contracts of insurance with the best insurance companies at reasonable rates and upon good conditions. If they protect their properties as the committee believes they should be protected, they will be in position to say to companies soliciting their insurance that if the rates offered are not fair, they (the traction companies) will carry their insurance themselves, either individually by means of a cumulative insurance fund, or jointly with other companies by means of the establishment of a joint fund or the maintenance of a railway insurance company that will operate for the benefit of street railway companies and not for the profit of others.

The committee was advised in January that a resolution had been adopted by "the executive committee of the Central Traction & Lighting Bureau," reciting a desire on the part of the bureau to establish and maintain harmonious and mutually helpful relations with the American Street & Interurban Railway Association, and inviting the association to confer with the bureau or its committees from time to time and present to and discuss with the bureau matters of mutual interest. Your committee acknowledged receipt of a copy of the resolution, and stated its willingness to meet the bureau for conference. Since that time it has extended invitations to the bureau to attend its meetings, but the last communication received from the bureau said that if it desired to have a representative at our meeting it would so advise us in due course. Your committee knows nothing in regard to the activities of this bureau except that it is said to have done some work upon "schedules."

DETAIL RECORDS: THEIR USE AND VALUE *

BY J. H. NEAL, GENERAL AUDITOR, BOSTON ELEVATED RAILWAY

To establish and maintain the maximum of efficiency in co-operation between the administrative and producing forces is well recognized as one of the fundamentals of skilful business management.

Apparently, however, it is not quite so well recognized, at least in street railway affairs, that not only one, but both of these branches should be provided with equally powerful tools in the shape of ample and carefully selected records.

Since the advent of adding machines and loose-leaf methods it is becoming more and more the custom to utilize original records at the executive offices. From these machines abstracts of figures only are made in duplicate; the duplicate going to the maker of the original records, who, of course, has kept a carbon copy of the details. Thus he is provided with two or more sets of both details and summaries.

It will usually prove an excellent investment to spend as great an amount of time and ingenuity in designing a form as would be spent upon an improvement in a machine for the purpose of achieving some special result or to save an extra operation.

EXPENDITURE RECORDS

A record which quickly shows the total amount spent upon any account and at the same time shows the cost and finest detail of each separate job included is a good and satisfactory system.

Proper filing being of supreme importance, it will be found most convenient to reduce all time sheets and time cards to not over two sizes, and all material records to one size, twice that of a time card.

The labor which is reported on time cards should conform to the modern cost-keeping systems, which require a separate time card for each job number, besides a card

*Abstract of report read before the American Street & Interurban Railway Association, at Atlantic City, N. J., Oct. 10-14.

**See also *Electric Railway Journal*, Oct. 8, 1910, page 663.

*Abstract of paper read before the American Street & Interurban Railway Accountants' Association, Atlantic City, N. J., Oct. 10, 11, 12, 13 and 14.

showing the total time for the week. Cards should be sorted by job numbers and listed on slips of the same size by adding machines. The labor which is reported on time sheets should also be abstracted upon slips instead of upon large abstract sheets, as is the usual custom.

"Material consumed" sheets should be self-abstracting. This is accomplished by using a separate sheet for each job or account number. They should be listed, folded and then filed with the listed time slips by account numbers.

Invoices charged direct to a job or account number should be abstracted on slips of the same size as time cards, as should also all miscellaneous charges.

Summaries should be drawn off on adding machines from all of these papers; totals being proven against total pay-rolls, total invoices, etc. The summaries added together constitute a report of expenditures. Carbons of summaries are sent to all departments concerned.

Everything, except time sheets and weekly time cards, should be filed in one place by account numbers, instead of in separate cabinets for labor and others for materials, etc. The cost time cards should be returned, after listing, to the department from which they came, not only to reduce bulk in main office, but to furnish detail needed by departments. All filing should be vertical and each account may be subdivided like a card record as much as may be desired.

Outside offices should file in the same manner as the main office. No recopying is necessary, and yet every item of material and even the names of men working upon any account may be quickly obtained. In department offices, to still further perfect the plan, sketches, original orders for work, shipping receipts, etc., are included in the same file.

One may do all the things outlined here, and, indeed, much more, without deriving any benefit from it if he spends too much time in perfecting systems instead of devoting a necessary amount to drawing valuable conclusions from them. From our records we should constantly endeavor to determine the efficiency of employees, we should prevent waste, establish piecework prices, detect inadequate and improper handling of equipment, gather data regarding depreciation and a hundred and one things.

REVENUE RECORDS

Conductors' records should be kept separately for each route upon which they run, but the cash and tickets need not be separated. Cash and tickets received should be checked against conductors' records for "receiver's overs and shorts." Conductors' records should be listed on adding machines, with a separate slip for each route number. These slips should contain date, amount, revenue passengers, free passengers, and trips run. Conductors' records should also be checked against starters' records for "auditor's overs and shorts."

Corrections on account of overs and shorts, etc., should be noted on the back of the listing slip for each route and one charge made in total on the front of the slip will suffice. Once a week the totals from these daily slips should be listed on a monthly slip with similar headings, but with the 31 days of the month printed at the side in addition. At the end of the month the totals of the monthly slips should be listed on a large form which contains a line for each route. The large form should contain a description of each route. Additional information should be calculated and introduced, such as mileage, earnings per mile, per passenger, etc., and comparison with the previous year.

Carbon copies should be made from start to finish.

The original conductors' records should be vertically filed for use of the claim department and for other reference purposes. The daily and monthly listed slips should be vertically by route numbers as a detail record of each

route. The monthly tabulation should be filed in a loose-leaf binder, which will eventually contain a whole year's work.

The duplicates, either in whole or in part, should be distributed for inspection and analysis to every subordinate, as well as to every executive whose criticism may prove of benefit. Continual comparison with the previous year, month or week should not only be encouraged, but even forced in every direction. Everything needed for the most exhaustive investigation and study will be found instantly accessible in the revenue system described.

PHYSICAL RECORDS

Foremost in value among physical records stand those of car defects.

Troubles with car equipment are most intimately associated with public convenience, or, I may say, inconvenience, on account of street delays. They have a direct bearing upon the cost of platform labor and furnish important evidence of the degree of wisdom displayed in the investment of large amounts of money in the types of apparatus employed.

A car defect may be due to improper handling by the operating department, to neglect on the part of the maintenance force, or to inadequate apparatus, and it makes considerable difference, therefore, as to who reports the trouble; each department, anxious to make as good a showing as possible for itself, may lay the fault to "the other fellow," or both of them to the equipment itself. A competent judge must decide these matters. All defects should be reported upon suitable forms and should be tabulated monthly for each and every kind of equipment in use.

Voluntarily, the foreman of the elevated shops connected with the same company as the writer keeps individual records of triple valves, controller parts, etc., and, as a result of studying his records, has almost entirely eliminated certain classes of defects which would have tied up the system.

Tabulations should be widely distributed among all the operating and mechanical forces. Saving in repair costs can better be effected by this method than by a study of dollars and cents expended. This plan will also permit a better study of the varying conditions of operating territory and weather. It will also indicate the frequency with which inspection should occur. It will eliminate the use of defective material and improve the quality of labor. From the highest official to the lowest it will compel attention to either expensive and wasteful methods or machinery.

Track and line records may be kept in such a manner as to constitute a perpetual inventory by showing all additions and removals, together with a memorandum of repairs.

Of course, these principles may be applied to almost any property which a road possesses, from a car barn to a register. In fact, they are applied to these identical items by the company with which the writer is connected.

In conclusion, it may be said:

1. That on some original record even the smallest transactions in labor, material or physical changes are recorded.
2. That intelligent management requires the study on the part of some one of almost every item, while economy forbids recopying or recasting in different form.
3. That assuredly the details and summaries can be used to as good, if not better, advantage outside of the main office as within, thus necessitating at least a duplicate set.
4. That proper self-indexed filing can reduce the entire mass to an almost inexhaustible library of detail instantly available and only requiring the spirit and desire to obtain and use the information contained therein.

Among the Exhibits

Some excellent samples of Cameron commutators are shown at the booth of the Western Electric Company.

* * *

The metal department of the National Lead Company is represented at the convention by Edgar A. Mueller, of St. Louis.

* * *

Bishop Gutta Percha Company, New York, is represented at the convention by J. W. Mundell, of the sales department.

* * *

Clarke P. Pond, of David Lupton's Sons Company, Philadelphia, manufacturer of skylights and fireproof windows, spent Wednesday with his friends on the Steel Pier.

* * *

Wagner Electric & Manufacturing Company, St. Louis, has no exhibit, but is ably represented at the convention by W. A. Layman, vice-president, general manager, St. Louis; E. W. Goldschmidt, manager New York office, and John Mustard, Philadelphia.

* * *

National Lock Washer Company, Newark, N. J., is showing in spaces 650 and 652, Building No. 2, its well-known sash lock. This is made of solid bronze with locking levers to lock the window at any height automatically and prevent all rattling. When used with the company's face and edge springs, a dust-proof and draft-proof sash is obtained.

* * *

The booth of the Indian Refining Company, in Building No. 2, is a Mecca for those interested in lubricating oils. This company, which has its headquarters in Cincinnati, Ohio, furnishes lubrication on fixed car mileage and kilowatt hour bases. J. V. Smith, manager of the railway department, is in personal charge here. He is assisted by A. J. Varrelman, T. B. Connor, T. U. Franklin.

* * *

The Lorain Steel Company, Johnstown, Pa., has mounted in a large frame all of its "live" girder rail sections, showing all forms of side and center bearing, grooved, guard and Trilby rails used in the United States and foreign countries. The rails vary in height from 3½ in. to 9 in. and in weight from 50 lb. to 165 lb. The exhibit is an object lesson in the necessity of standardization and in illustrating the law of the survival of the fittest.

* * *

Garwood Electric Company, Garwood, N. J., is at the entrance of Machinery Hall, where it has a working exhibit of electric welding apparatus for welding broken trucks, motor frames, bolsters and anything else of a metallic nature. The exhibit consists of a standard welding equipment, including a special motor-driven, low-voltage, double-commutator generator. Represented by W. E. Elliott, George Hills, B. H. Harrison.

* * *

Q. M. S. Company, Plainfield, N. J., exhibits in space 805, Building No. 3, the various shop and labor-saving appliances which it manufactures. A working exhibit has been installed of its pneumatic pit jack and a "D" type 3-ton capacity hand-rocked traveling crane, equipped with a No. 6 load-retaining air hoist, especially adapted for street railway shops. The well-known Stanwood car step and the Stanwood steel folding car step, of a design similar to steps furnished for many P-A-Y-E cars, is shown; also a car wheel grinder, which is attracting much attention. Represented by C. H. Holbrook, F. R. Phillips, E. R. Packer, L. Wharton-Bickley.

The well-known "National" railroad trolley guard for steam railroad crossings made by the National Railroad Trolley Guard Company, New York, is exhibited by the Ohio Brass Company and the Electric Service Supplies Company, which are sales agents for the guard. L. J. Mayer, of the New York office, however, is present in the interest of the company.

* * *

The exhibit of the Under-Feed Stoker Company in Aquarium Court is one of the most elaborate coal stoker displays ever made at a convention. This company is showing one of its full sized "New Jones" self-cleaning, automatic stokers in operation. Demonstrations are made showing how grate fires are mechanically cleaned and stoked and how the boiler capacity is increased and the cost of operation reduced by its adoption.

* * *

The American Steel & Wire Company is making an attractive exhibit of its rail bonds and bonding machines. The representatives are also calling attention to the new Crown bond-testing outfit. This device is self contained, being independent of the return track current. It furnishes a ready means of quickly determining whether a rail joint is well or poorly bonded. The company is passing out a valuable book entitled "Electrical Wires and Cables."

* * *

The American Rolling Mill Company, of Middletown, Ohio, has an exhibit of special interest to engineers and maintenance of way men. It consists of samples of the American ingot iron which is used extensively in the manufacture of Watson corrugated metal culvert pipe and for building purposes. Photographs of some noteworthy culvert installations on railways are also shown. The representatives, G. H. Charls and G. F. Ahlbrandt, are demonstrating by acid tests the rust-resisting quality of American ingot iron.

* * *

Baird Electric Company, Chicago, is exhibiting in space 455 a working model of its steam and electric railroad train dispatching telephone system. The exhibit contains a complete dispatcher's equipment, with a dispatch line and signals for both the steam and electric railways. The flexibility of the apparatus permits the service to be adjusted to suit the local conditions and operating methods of any road, it containing as well the fundamental principles for standard dispatching methods, by means of which telephone service and signals are given over existing wires.

* * *

Dossert & Co., Inc., New York, exhibit solderless splicing devices in space 813, Building No. 3. The various types include cable taps two-ways, types A, B and C; insulated two-ways and cable taps; three-ways Y's, lugs, front and back-connected angle and swivel; stud connections; cable anchors; equalizers; grounding devices; third-rail jumpers. Mr. Logan, president, reports that the Dossert joint is fast becoming standard on large electric railways for splicing and connecting work because of its adaptability and time-saving qualities. Represented by H. B. Logan, S. A. Jenkins.

* * *

Among the switch pieces exhibited by Wm Wharton, Jr., & Company, Inc., Philadelphia, spaces 208-216 and 304, are a number of their manganese steel center types, in which the centers are fastened by split keys driven through the lugs which extend downward from the manganese steel center itself. This metal and the "keyed-in" method of holding the centers in place have been Wharton standards for the past sixteen years. The company considers this result a remarkable proof of the superiority of manganese steel treated by the original Taylor-Hadfield process and of the Wharton "keyed-in" work. A few years ago "easily renewable centers" were in demand, but it was found that they came loose too easily under traffic. The "keyed-in" method holds the centers tight throughout the life of the piece.

Butler Keyes is here in the interest of the Hemming Manufacturing Company, New York.

* * *

G. C. Reiter, Canton, Ohio, is showing, at space 453, a complete line of street-car gongs, among which are the all-steel rotary gong and a pneumatic gong.

* * *

The Hoeschen Manufacturing Company, Omaha, Neb., which manufactures the Batteryless crossing signal for protecting highway crossings, is represented at the convention by its manager, Mr. Ryner, who arrived here Wednesday.

* * *

Charles F. Etter, of Harrisburg, the Rapid Ready Change Carrier man, has found during his stay at the convention that it is as necessary for him to be rapid in order to keep pace with the delegates as it is for his rapid change carrier in the hands of conductors.

* * *

Herman F. Gerhard, superintendent of the treating department of the C. A. Wood Preserver Company, Austin, Tex., arrived here Tuesday night to spend the remainder of the week at the convention. The company has no exhibit this year, but its interests will be taken care of by Mr. Gerhard.

* * *

D. I. Cooke, chief engineer of the Vacuum Car Ventilating Company, Chicago, is explaining the details of the Cooke system of car ventilation. Sample equipments are shown in space 835, Building No. 3, and a complete installation of the system is shown in the Brill car in the track exhibit.

* * *

Indianapolis Brass Company, Indianapolis, Ind., is showing in space 667, Building No. 2, an assortment of overhead line material manufactured by it. The representatives, James H. Drew and Fred. C. Hornstein, are calling particular attention to the new section insulators which were recently placed on the market.

* * *

Columbia Machine & Malleable Iron Company, Brooklyn, is showing some excellent examples of the class of special work it is prepared to do, such as special forgings, slack adjuster levers, dead and live motor truck levers, brake cylinder connecting rods, motor and trailer truck brake pull rods, hand brake levers, motor truck equalizer brake lever, etc.

* * *

"Universal" window fixtures form the major part of the exhibit of the McCord Manufacturing Company, Chicago and Detroit, at spaces 945-947, Building No. 3. This fixture includes notable improvements in car window designs. It contains gravity wedging locks which insure a light, non-rattling joint between the sash and outside stop and a cushion for the sash enclosing. A flexible weather striping at the top, bottom and sides allows loose-fitting easily operated sash and insures dust-proof air-tight joints around the window.

* * *

To delegates interested in the mechanics of steel car construction no exhibit is more attractive than that made by Forsyth Brothers Company in booth 954. Among several devices shown is the Brinckerhoff unit pressed side construction. This type consists of pressed flanged steel units, which, when assembled in connection with Doyle posts and side sills and plates, form a truss of the entire height of the car, affording unusually strong and substantial car side. The units are so constructed that the number of parts, joints and rivets is reduced to a minimum, and the units are easily removed for repairs. Among the many other car devices shown is a sample draft riggings, 1,600 of which are now being made for the cars of the Interborough Rapid Transit Company, of New York.

International Register Company, space 611-13, Building No. 2, is showing for the first time a coin register for pre-payment cars. This device receives in a hopper nickels and dimes, and pennies if desired, and registers them on a totalizer and trip which is visible inside the car. The money is passed through for the conductor to use in making change. It also makes change mechanically for a dime offered for one fare. The company is also showing several types of its standard fare registers, Heeren enamel badges, International trolley cord, ticket punches and register fittings.

* * *

W. T. Van Dorn Company, Chicago, has an exhibit in Machinery Hall of Van Dorn couplers of the M. C. B. type as well as the standard interurban type of coupler and draft rigging. One of the attractive features of the exhibit is a full-sized M. C. B. coupler mounted in working position on a frame showing also the commendable features of the new draft rigging, which combines simplicity with durability. Other devices shown include a Van Dorn No. 31 three-fourth size M. C. B. head, standard heads and four types of draft rigging. The booth is in charge of W. T. Van Dorn, president, and H. E. Van Dorn.

* * *

Emery Pneumatic Lubricator Company, St. Louis, Mo., is showing at booth 435, Building No. 1, its pneumatic lubricator. This is an automatic device for uniformly lubricating air brake apparatus, by means of a solid compound which is dissolved by the moisture normal to compressed air and is carried through the pipes to all frictional surfaces in contact with the air current. Its effect is to preserve the packing leathers of brake cylinders, switch group cylinders and all apparatus of a like nature from wear and leakage and through its cleaning effect to render unnecessary the periodical dismantling of this portion of the equipment hitherto required in order that first-class conditions may be maintained. It has become standard on many railways.

* * *

Curtain Supply Company, Chicago, Ill., is exhibiting its new "Rex" all-metal curtain roller, which is designed with a view to durability. Unlike other curtain rollers on the market, the barrels, springs, mandrels, end pieces, brackets, etc., are formed entirely of metal. The roller bearing is seamed instead of being soldered. This insures uniformity in diameter and thereby always allows the curtain to be rolled uniformly around it, and also prevents the barrel opening at the front. The pressed metal ends are accurate and uniform and keep the pins in the center of the barrel; as the pin at the end is part of the end, it cannot get out of alignment. The extension plugs, mandrels, springs and other parts are made of metal and are especially designed by the company for this service. The roller is made in standard sizes and in any required length. The various parts are interchangeable.

* * *

R. D. Nuttall Company, Pittsburg, has a very interesting exhibit, extending through from the main building to a section of Machinery Hall, with a reception space in the Main Building and a display of apparatus in Machinery Hall. F. A. Estep, president of the company, is in attendance at the exhibit. A pneumatic pantograph trolley of its latest type, for service where conditions provide low clearance, is shown in operation. This is used on the New York Central lines. Ball-bearing bases, types Nos. 11, 13 and 14, for interurban railway service, are also shown; air compressor gears and pinions; street railway gears and pinions, and automobile transmission apparatus. Another interesting feature is furnished by the butt-welded, reinforced trolley poles. These combine strength and resiliency, being built so as to withstand much abuse. When bent they can be straightened out cold and put into good condition for service. Seamless trolley poles are also shown.

Frank Ridlon Company, Boston, Mass., is represented at the convention by R. A. Perry, T. E. Stimson and Harry De-Steese.

* * *

National Brake Company, in addition to its regular exhibit in space 654, Building No. 2, has brakes installed on the Brill car.

* * *

Dayton Manufacturing Company, Dayton, Ohio, is represented at the convention by Franklyn M. Nicholl, Joseph and Peter Leidenger and B. C. Watts.

* * *

Homer Commutator Company, Cleveland, Ohio, is making no formal exhibit this year, but Fred Baird is on hand and is doing his company and the occasion full justice.

* * *

Harold P. Brown, New York, has a substitute for rubber on exhibition at his booth. It is so new that it has not been christened. Users of automobile tires and insulation for wire should be interested in it.

* * *

Speer Carbon Company, St. Mary's, Pa., is so confident of the high grade of its carbon brushes that visitors are invited to break any brush taken at random to see for themselves the fine uniform grain and total absence of laminations of this product.

* * *

Davis Expansion Boring Tool Company is exhibiting boring tools of various types for use in street railway shops. Among those shown are tools designed for boring cast-iron wheels, steel wheels and for general use. W. N. Mathews, E. E. Davis, J. W. McKeen are in attendance.

* * *

The Galena-Signal Oil Company, while not making an exhibit of its well-known lubricating oils, has one of the most popular booths on the pier. It is serving tea and cakes to the ladies and presenting them with candy. There are cigars also for their men friends. The booth is most beautifully decorated with ferns, palms and flowers.

* * *

Flower lovers have manifested much curiosity in learning the names of the beautiful and rare floral decorations in space 679 of the W. B. McVicker Company, New York. Their names are Selocia, immortelles, acutifolius and yellow Aspidium fern. They form a most attractive background for the display of McVicker lubricants, boiler and hydraulic elevator compounds.

* * *

The car seats and the chairs for private and special cars which were shipped for display in the booth of Ford & Johnson Company have been delayed in transit, and as a result the company is making no display in its booth in spaces 662 to 665, Building No. 2. Three of the company's representatives, A. D. Martin, Clarence A. Van Dervere and Walter J. Bennett, are present.

* * *

Davis-Bournonville Company, New York, has an exhibit at booth 657, Building No. 2, showing a rail bond welded to the web of a grooved rail by the oxy-acetylene process. No solder is used, as the copper in the bond is simply amalgamated to the rail to form a perfect contact. This process of bonding is now in use by the Twin City Rapid Transit Company, Minneapolis. Wilbur R. Noxon is present in the interest of the company.

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Bayonet Trolley Harp Company, Springfield, Ohio, is showing in Building No. 2 its new low-down trolley base with detachable pole clamp. Other devices shown are detachable harps, Butterfly sleet cutters, Bayonet wheels and self-lubricating bearings. C. S. Olinger and R. A. Garlough, the representatives present, are making practical demonstrations of the changing of trolley wheels and poles, which act requires about one minute's time.

The I. B. C. insulated adjustable crossing for use in overhead construction is one of the new devices shown by the Indianapolis Brass Company in space 667, Building No. 2. It is composed of an insulated wooden runner and special I. C. B. brass composition metal parts. Other devices shown include samples of the full line of overhead equipment manufactured by the company.

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T. H. Symington Company has on exhibit its well-known journal boxes, dust guards and center bearings. In the journal-box exhibit is shown an improved form of the Symington "lift off" lid, embodying the use of a safety pin for the lid, which makes its loss from a heavy jar or broken spring impossible. Something new in the center-bearing line is a design of truck center plate which, by means of a ball-and-cup bearing between the truck center plate and truck bolster, equalizes the load on each ball in the bearing regardless of any change in alignment between the truck and body bolsters. The company's representatives include C. J. Symington, assistant manager Eastern sales; W. W. Prosser, assistant manager Western sales; A. H. Weston, mechanical engineer.

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Taylor Electric Truck Company, Troy, N. Y., is showing in Machinery Hall trucks and truck fixtures. Among the exhibits is a little heavier type of single truck with very long wheel base, designed to overcome end-teetering and to be operated as fast as double-truck cars. The company is also showing the S. B. type of truck with its unusual one-piece non-chattering brake hanger. The M. C. B. quadruple type of truck shown is for high-speed service. Other apparatus on exhibition comprises a full line of full-elliptic and half-elliptic springs and coil springs; also the Taylor malleable center, steel-tired wheel. The tire is constructed of hardened crucible steel and has an internal flange shrunk and bolted to the center to prevent it from loosening when brakes are applied. The Taylor truck exhibit is in charge of John Taylor, G. A. Tupper, Thomas Thornes and Walter E. Taylor.

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Carnegie Steel Company is showing in Building No. 3 how a steel cross tie can be fitted so that the rail can be fastened to it with a common railroad spike. It requires about twice as much power to pull this spike from the steel tie as out of an ordinary wooden tie. The scheme consists of the introduction of a malleable iron hollow casing inserted between the two flanges of the I-beam ties. The interior is filled with a wooden block, into which the spike is driven after first passing through a square hole punched in the top of the tie. This scheme is only in the experimental stage, but several thousand ties installed at the Duquesne Steel Works of this company demonstrate its practicability. The track men can apply it with the same ease as they apply the steel spike in the wooden tie. This method was invented by W. W. Hill, one of the department superintendents.

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One of the most successful and interesting exhibits at the convention is that of the H. R. Langslow Company at space 821, Building No. 3. The attention which the Langslow prepayment system is attracting makes this booth a busy place at all times. The universal comments of railway men prove the undoubted value in the total check which is afforded by the combination of the fare box and automatically released turnstile. The turnstile, through its economy of space, is really adapted to any platform. Its design and operation are such that it is impossible for the projecting arm to injure a person who is crowding too closely after the passenger who is passing through the turnstile. It is also impossible for two passengers to pass through on one release. The automatic recording and admitting feature of the system economizes the conductor's time and leaves him free to make change, issue transfers and attend to starting the car.

Coleman Fare Box Company, Buffalo, N. Y., space 823, Building No. 3, is exhibiting several styles of fare boxes for pay-as-you-enter cars; also portable boxes.

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Pressed Steel Car Company, of Pittsburgh, has no exhibit, but is represented by J. H. Regan, assistant secretary, of New York, and Mrs. Regan; F. Koch, engineering department, Pittsburgh, and W. H. Wilkinson, of New York. Mr. Wilkinson is chairman of the rolling chair committee, which is a sub-committee of the entertainment committee.

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Buffalo Foundry Machine Company has a novel system of decorations in red and black for its space 825, Building No. 3. The exhibit is almost entirely of transparent views of the plant, machines and processes. This is supplemented by an entertaining and instructive stereopticon display. The devices thus advertised consist of vacuum drying and impregnating apparatus, Bell steam hammers and general castings. The company is represented by E. G. Rippel, general sales manager, and H. E. Jacoby, manager of the New York office.

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Trolley Supply Company, Canton, Ohio, is exhibiting at space 608, Building No. 2, for the first time, the No. 5 Knutson trolley retriever, also the No. 2 retriever and the "Ideal" trolley catcher. The "Peerless" No. 10 trolley base for heavy duty for high-speed interurban roads is also being exhibited for the first time. This trolley base is said to operate practically frictionless. In addition it is showing the new Star base, which is the latest development for city and interurban service. It has the same roller bearing as the Peerless base. J. A. McLain and Joseph Hollis are in attendance.

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Through the courtesy of General Superintendent John N. Akarman, of the Atlantic City and Shore Railroad, car 107, fitted with Hess-Bright ball bearings, which have been in service over two years, is on exhibition at Virginia avenue and the Boardwalk. This car will make trips to Ocean City at 3:15 p. m. on Thursday and Friday to carry convention members. A representative of the Hess-Bright Manufacturing Company will provide free transportation for those wearing official badges at the car. Other special features of this car are an automatic shim brake slack adjuster and an air purifier for the compressor.

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National Brake Company, Buffalo, N. Y., is exhibiting in space 654, Building No. 2, models of the Peacock and the Ackley adjustable brakes. The company devotes special attention to designating efficient lay-outs for brake rigging to be used with these brakes. Frank D. Miller, W. D. Brewster and S. A. Benedict are in attendance. Among the recent important orders for brakes received are the following: 650 for the Chicago Railways; 100 for the New Orleans Railway & Light Company; 100 for the Washington Railway & Electric Company; 100 for the Connecticut Company.

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Whitmore Manufacturing Company, Cleveland, Ohio, has, in spaces 555-557, an interesting exhibit of gears and pinions which have been lubricated by Whitmore lubricating composition and have seen service on the Chicago Railway and Schenectady Railway, Utica & Mohawk Valley Railways, Spokane & Inland Empire Railroad. Blue prints are shown, giving a record of these gears and pinions. Those used on the Chicago Railways were in operation 14 months and traveled a distance of 113,793.77 miles; Spokane & Inland Empire Railroad, three years and one month, 194,700 miles; Utica & Mohawk Valley Railway, nearly two years and 10 months, 126,482 miles, and the Schenectady Railway, one year, nine months and 23 days, and traveled 104,322 miles. The company is represented by S. W. Whitmore and W. M. Lawyer.

Southern Exchange Company, New York, is in space 626, Building No. 2. Arranged about the booth are sections of long-leaf pine, octagonal and square poles, sections of Southern white cedar poles, cross arms, high-grade long-leaf standard and special sizes; also large pictures of mills and yards. Represented by E. G. Chamberlin, Walter Mitchell.

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Electric Omnibus & Truck Company, Passaic, N. J., has at the convention a Field electric omnibus equipped with the Edison storage battery. This omnibus ran down from Passaic last week and made from 50 to 60 miles a day over the rough road between here and Passaic. It was recharged at Hightstown and Lakewood. The omnibus is now on exhibition on Ohio Avenue, between the Marlborough and Blenheim hotels, and demonstrations are given every hour during the daytime. C. J. Field, a pioneer in electric traction, is in charge.

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The Smith Premier Typewriter Company, which has lately won the Grand Prix at the Brussels Exposition, has a very elaborate booth, banked up with handsome palms, flowers and hanging plants, and furnished with Oriental rugs. Two expert women operators from its Philadelphia office are in attendance. These operators are attracting some attention, as they are dressed in white with red silk regalia, with "Smith-Premier" gold-lettered front and back. These young women not only demonstrate the machine, but write letters to other exhibitors and members free of charge. The company is exhibiting 12 different models of the late No. 10 machine, the different width carriages that go on same; the new carbon roll machine, carrying 60 ft., which works automatically; condensed charge and billing machines for unit, statistical work and compound forms; also different models for correspondence.

* * *

Samson Cordage Works, Boston, Mass., have an exhibit in the Electric Service Supplies Company's space, No. 800, where they are conducting a test of the durability of the Samson solid braided cotton register cord, duplicating service conditions as nearly as possible. They have two registers placed on a standard with cords leading to them, which are pulled continuously by a small motor in imitation of a conductor ringing up fares. Samson cord is said to wear at least four or five times as long as leather, besides having the advantage in first cost. The company also is showing coils of the Samson spot waterproofed trolley cord and of Samson bell and register cord in various sizes and colors, with and without wire centre. Some attractive pencils and holders are distributed for souvenirs. The Samson Cordage Works are represented directly by F. J. Coakley, secretary of the company, W. G. Webb, R. G. Whiting, E. J. Wilson.

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Acme Indicator Company, Cleveland, Ohio, is exhibiting in space 815, Building No. 3, two types of Acme indicators. One is double-faced showing stations on both sides and is hung in the center of the car. It has two push buttons, for running the machine in opposite directions. These buttons are attached to the door frames of the car and are pressed by the conductor upon leaving the station. This indicator is operated by a spring motor, capable of turning 500 stations without rewinding. The other indicator exhibited has a single face showing the station and two advertisements. It is hung at the end of a car. A model of the Acme trolley wire station shows the automatic operation of Acme indicators on cars where the overhead system is used. This station can be readily placed on the span wire at each crossing. When in contact with the station a brass collar on the trolley pole carries the current through the wire in the center of the pole. C. W. Johnson, T. W. Small and A. P. Machie are demonstrating these devices to visitors.

NEW STEEL-TREAD WHEEL

C. K. Knickerbocker yesterday received from President T. A. Griffin, of the Griffin Wheel Company, a telegram announcing that the company, after two years of experimenting and careful testing, is prepared to furnish car wheels with a special high carbon steel tread. These new wheels are claimed by the Griffin Company to be superior both as to wearing qualities and as to their freedom from objectionable noise in operation. With the advantages which the new wheels afford, the manufacturers are of course able to give increased guarantees as to mileage and wear.

ELECTRICAL APPARATUS IN THE WESTINGHOUSE COMPANIES' EXHIBIT

The Westinghouse Electric & Manufacturing Company has on exhibition a complete working outfit of its new type "HL" multiple unit control, for street and interurban lines, connected to two 40-hp railway motors, which are loaded by prony brakes. One of these motors is the familiar type No. 101-B-2 40-hp non-interpole motor; the other is a type No. 307 40-hp interpole motor. A large number of detail parts of the control apparatus also are shown. A K-34 drum type controller for operating four 75-hp motors is part of the exhibition.

The standard railway motors displayed include the No. 303-A 100-hp motor, for high speed interurban service; Nos. 305 and 306 motors, rated at 50 hp and 60 hp, respectively, for lighter cars, and No. 321 90-hp motor, for 1200-volt service.

Of particular interest are the No. 101-B-2 motor parts, including shaft, bearing housing, field coils, brush holders, etc. Many of these parts are cut in sections so that the good points of their construction can be more readily appreciated. The noted No. 3 motor, now 20 years old, is also on view.

A welded sheet steel gear case shows one of the coming possibilities for reducing the weight of equipments.

The Westinghouse single-phase system is represented by the No. 135 motor, which has a capacity of 75-hp when operated on 25 cycles, and 90-hp when operated on 15 cycles. This is the motor used by the New York, New Haven & Hartford Railroad Company. The Boston & Maine Railroad also has recently decided to electrify the Hoosac Tunnel with the same system. The rest of the exhibit includes a complete line of line material, a. c. and d. c. motors for shop machinery, transformers, and incandescent lamps.

BRILL INSIDE EXHIBITS

In addition to showing its new semi-convertible car on the Boardwalk, The J. G. Brill Company has its usual comprehensive exhibit of miscellaneous products in Building No. 1, directly opposite the booth of the ELECTRIC RAILWAY JOURNAL. The company is showing the following trucks, covering various classes of interurban and city service; No. 27—M. C. B. 1, equipped with Griffin chilled-steel wheels, total weight, 7100 lbs., and maximum center-plate load, 23,000 lbs.; No. 27—M. C. B. 3, equipped with Midvale rolled-steel wheels, total weight, 12,750 lbs., maximum center-plate load, 40,000 lbs.; No. 21—E, single-truck Ramapo steel wheels; No. 39—E, maximum traction single-motor truck, with Lobdell cast-steel wheels, weight, 4760 lbs., maximum center-plate load, 20,000 lbs., and No. 27—FE-1 truck, also with Lobdell wheels. The fare boxes are of various types so that any conditions of collection can be satisfied. There are stationary fare boxes; portable fare boxes; registering fare boxes which separate the pennies, nickels and dimes and return them to the conductor for change; boxes which take cash when the handle is pulled one way and tickets when it is pulled the other way, etc. The Brill folding gate, vertical brake handle, "Dedenda"

gong and "Dumpit" sand boxes are all mounted on one dummy stand. The various styles of car seats are both instructive and comfort-giving to the visitor. The space is also ornamented with revolving photograph racks and several framed pictures of the handsome private car built at the Kuhlman shops for the Beebe Syndicate, Central New York.

BRILL AND WASON RECEIVE GRAND PRIX AT BUENOS AYRES EXPOSITION

A cablegram received yesterday from Buenos Ayres, Argentina, announced the award of the Grand Prix for cars and the Grand Prix for trucks to The J. G. Brill Company and the Wason Manufacturing Company. The exhibit of these companies at the Buenos Ayres Centennial Exposition consists of a train of six steam coaches, and will be delivered to the Buenos Ayres & Western Railroad Company at the end of the exposition. This train will be the finest of its kind, it is said, in service in the South American continent. It is made up of two sleepers, two day coaches, one diner and one mail coach, all richly finished and completely equipped in the most modern fashion. The roofs are of the plain arch design, the underframes are all-steel, and the interior finish, with the exception of the mail coach, is of specially selected mahogany. The coaches are all mounted on six-wheel trucks built at the Brill plant. The type is a modification of the Brill heavy electric truck, with each wheel piece solid, forged in a single piece. These wheel pieces are the longest ever made by the solid forging process, in which the pedestals and end extensions are an integral part of the forging.

THE OHMER EXHIBIT

The Ohmer Fare Register Company has a very attractive exhibit, in space 600-2-4, Building No. 2. The display includes a new 60-fare recording register, and two combined detail and total counter recording machines. The 60-fare register is used for registering and printing separate records for 60 different classes of fares, giving the various values of the tickets collected. The total cash recording register besides printing a detailed record of the collections made shows the total amount of all cash fares registered. The company is also showing John F. Ohmer's "Turn-In" car. This provides a new means of entering a car and automatically registering the number of passengers boarding the car by the aid of a platform turnstile. The turnstile as well as the gates are in direct control of the conductor, who is stationed at the rear end of the platform and facing the front of the car. Other devices shown include special equipment and registers for P-A-Y-E cars and the company's standard type of registers. The booth is under the personal supervision of John F. Ohmer, who is assisted by a corps of able representatives.

American Mason Safety Tread Company, Boston, Mass., is in space 833, Building No. 3. Safety treads for all purposes, lead and carborundum filled car treads, treads for station, subway, platform, stair, elevated and building construction are shown; also "Karbolith" composition flooring for car and building construction in surface and transverse sections. The latter flooring is now widely specified by both steam and electric railways, especially for steel cars, because it is fire-proof, sanitary and durable. Among others, orders have been secured for "Karbolith" flooring from the Pennsylvania Railroad, 500 steel passenger coaches; Interborough Rapid Transit Company, 600 cars; Hudson & Manhattan Railroad, 200 cars; Philadelphia Rapid Transit, 150 cars; Long Island Railroad, 300 cars. There are now in service between 2500 and 3,000 cars with "Karbolith" flooring. Henry C. King is representing the company.