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Of this issue of the ELECTRIC RAILWAY JOURNAL *9,000 copies are printed.*

Advertising Freight Facilities

One of the best suggestions regarding publicity which has been made before the Transportation & Traffic Association was included in the paper of B. R. Stephens, traffic manager of the Illinois Traffic System. Mr. Stephens advocated special advertising of the freight facilities offered by electric roads. There is no reason why such advertising should not be conducted with great success. The steam railways, as Mr. Stephens pointed out, do not advertise any features of their freight service, even of that offered by the fast freight lines. The electric railways inspire more local pride than the steam lines and are in a position to call attention to their freight business in so effective a way as to produce substantial results in most localities.

The Electric Railway Conventions of 1908

The twenty-seventh annual convention of the American Street & Interurban Railway Association and its four affiliated associations has come to a close, after a delightful and profitable week at Atlantic City. The attendance of railway officers was large, the exhibits were presented on a scale never before equalled, and last, but not least, the weather was ideal during the entire week. Exceptionally good papers and committee reports were presented to the Association. These reports and papers represented a large amount of hard and conscientious work on the part of the gentlemen who prepared them, but they were amply repaid for their labor by the interest aroused among the delegates as evidenced by the free and full discussion which took place at all the meetings. The members participating in the discussions indicated by their remarks the close attention which is being given by all companies to the practice of economies in the operation of electric railway properties. If any large stockholders, directors or other individuals directly interested in the income return of any of the electric railway companies represented, had attended the sessions they must have been impressed with this fact. It would have been equally apparent that the expenditure required to defray the expenses of sending delegates to the convention is amply repaid by the information of operating problems, which the officers in attendance acquired through the discussions and papers presented and by the interchange of ideas with officers of other companies in the quiet conversations of spare moments. Reduced to a final analysis, a convention of this kind is a unique course of instruction, lasting a few days each year, which is valuable for the departmental officers as well as for the managers. In other words, it teaches knowledge which can be gained in no other school, and money spent to learn the best way of conducting one's own business is seldom wasted.

While the papers, committee reports and the discussions thereon constituted the objective work of the convention, the elaborate display of exhibits of electric railway apparatus which was arranged on the Million Dollar Pier where most of the meetings of the different associations were held, was of even more value in an educational way to the delegates in attendance than the formal work of the convention as outlined in the program. The exhibits covered every branch of electric railway operation and surpassed in every way the exhibits heretofore made, which means that they were better than any similar exhibits displayed for other associations.

Much of the credit for the elaborateness of the displays and the attractive appearance of the booths and their surroundings is due to the untiring efforts of President J. R. Ellicott, of the Manufacturers' Association and his associates on the executive committee, and also to K. D. Hequembourg, vice-president, and H. G. McConnaughy, Director of Exhibits, who had immediate charge of the innumerable details connected with the assignment and arrangement of space, decorations and arrangements for shipping the apparatus displayed to and from the pier. These gentlemen, for months previous to the holding of the convention, were indefatigable in their efforts to interest manufacturers of railway devices and in planning the general scheme of the most interest and valuable feature of the week's gathering.

The suggestion made in President Goodrich's address to the American Street & Interurban Railway Association that separate times and places be selected in the future for the meetings of the main and affiliated associations reeeived careful consideration. Undoubtedly there are many advantages in this plan, particularly to the larger companies, to whom the absence at one time for a week or longer of most of the department heads is a hardship. On the other hand, there are serious objections to the plan which undoubtedly outweigh its merits. With the majority of those who are vitally interested in the continuance of the conventions, the sentiment seemed to be that it would be better to pursue the conservative eourse and thoroughly canvass the situation in order to ascertain the wishes of all of the member companies before making so radical a change. This conservative sentiment in fact, prevailed at the final meeting of the American Association and resulted in the adoption of a resolution that a committee be appointed by the incoming president which will report next year to the convention what action, in its opinion, should be taken in the matter. This preserves the status quo for at least that period and insures a general convention next year on the present basis.

The Design of Car Houses

Last year a committee of the Engineering Association considered the advantages, from an operating and construction standpoint, of open and closed storage for cars, and in its report presented some general conclusions as to the relative merits of these two methods. The report of the committee on operating and storage car house design presented at this year's convention, takes up the detail of car house design in a somewhat more complete manner. The committee states that its first idea was to outline the principles of standard car house design, but that it quickly abandoned such a plan for the obvious reason that standardizing car house designs is hopelessly impracticable. Instead, it devoted its work for the year to some of the problems of detail entering into the design of car houses, and in its report offers its criticism of existing practice and its suggestions for improvement. The task which it assumed was so great that it is not surprising that some of the topics considered are dismissed with only brief comment.

Too much stress eannot be laid on the recommendation of the committee that a most careful consideration of the location of a car house and the possibilities for future extensions or ehanges in operating methods is first essential before proceeding with detail plans. It is seldom possible to predict with accuracy the trend of growth of the city's population and the future facilities which will be required and certainly the experience of the last 10 or 15 years discourages making predictions of the possible advance in the art of electric traction during the next decade. The design of car houses also depends on a large number of factors, many of which are indeterminate at the time of making plans for a new structure. At the same time there are certain general principles which, if kept in mind, will result in reasonable economy in the beginning, and at least no serious waste of time or money in the operation of the house at some future period when it needs to be enlarged and its methods of operation entirely revised.

The committee objects to the arrangement of three or four tracks in one bay of the car house, stating that sueh construction requires trussing on account of the roof span. Later on in the report, it reeommends a track spaeing of 11 ft., which would give a span of not more than 35 ft. for three tracks in a bay. In the eonstruction of a number of modern car houses spans as great at 56 ft., using reinforced concrete girder construction, are employed. Possibly the committee may have been influenced in this recommendation by its expressed prejudice against the use of eonerete in walls and roofs. The committee favors wooden roof framing and posts of heavy slow-burning mill type construction.

The committee makes only passing mention of the recommendations adopted by the American Street & Interurban Railway Association last year, eovering the requirements in ear house design for fire protection. It states that the designer should familiarize himself with the regulations of the fire underwriters and should follow their suggestions as far as practicable, but does not specifically recommend that the specifications adopted last year be followed throughout. In this connection, however, the committee recommends a modification of one of the requirements of the American Street & Interurban Railway Association in the matter of the value of the rolling stock to be stored in one sectional fire area. Last year's recommendations include the stipulation that no single section should eontain rolling stock equipment worth more than $200,000. The committee believes that a better plan to follow would be to reduce the amount of equipment stored in any one fire area to a eertain percentage of the total rolling stock of the company, but, as Mr. Adams pointed out, the monetary limit of last year was simply the maximum which the underwriters would grant. Any company can, however, adopt a smaller amount and naturally its limit would depend somewhat on the extent of its equipment.

Economical Maintenance

The report of the committee of the Engineering Asso- eiation on economical maintenance constitutes an ingenious effort to compare the monetary advantages of keeping rolling stock equipment up to the highest efficiency and of extending the lengths of the periods between overhauling. Some of the factors which enter into the question, such as the actual cost of the work put upon the car, ean be directly reduced to a financial basis. Others, like the effect on traffie and the increased liability to accident, cannot be so positively expressed. Consequently the committee has

to make assumptions of their relative values. For the former the committee suggests 10 cents, or two fares, per day. For the latter it believes a conservative estimate would be 2 cents, which, based on a car-day earning capacity of $20, would amount to one-tenth of 1 per cent of the gross receipts. Other savings credited to yearly instead of biennial shopping are the effect on the crew, extension of the life of the car and reduction in car cleaning, to each of which a cash equivalent is assigned. Suggestions are also made as to possible economies in the maintenance of trucks and electrical equipment and in the purchase of supplies. The efforts of the committee to collect statistics on minimum, average and maximum costs of maintenance for various classes of equipment and service were unsuccessful, indicating the need of uniform methods of details in shop accounting.

It is interesting to note that at the annual conference of the Municipal Tramways Association, just concluded in Great Britain, a paper on a somewhat similar subject was presented by two of the electrical engineers of the Manchester Municipal Tramway. These authors attempted to determine the critical point at which the saving effected by increasing efficiency is balanced financially by the cost of obtaining such increases, by the application of Kelvin's law. This law, when applied to a transmission line, for which purpose it was originally formulated by its author, is that the most economical size of conductor to adopt is that for which the annual cost of energy lost just equals the annual cost of interest and depreciation. This law has been applied to overhead construction, and indicates that where a copper trolley wire is used it should usually be larger than that ordinarily employed, and for the Manchester system the proper sizes are found to be the No. 000,000 and No. 00,000 for city lines and No. 0000 for suburban lines, but as No. 000,000 requires special line fittings, the two smaller sizes are usually employed. The authors promise to present a paper describing more in detail their system of calculations at an early meeting of the British Institution of Electrical Engineers.

Report of the Committee on Way Matters

The report of the Committee on Way Matters took the form, this year, of a symposium on three totally different subjects. One was a bold suggestion to discard entirely the use of flanged wheels which have characterized all horse, steam, cable and electric railways practically since their origin, and to revert to a wheel with a flat periphery like those used by ordinary vehicles. The second paper discussed the methods of preserving timber, while the third gave an account of the experience of the Boston Elevated Railway Company with manganese steel rails on curves. In its introductory report, the committee indorses the use of T-rails in paved streets and cites two large cities in central New York in which they have been laid during the past year. It urges the association to investigate the subject fully through a special committee, which should report at the next convention.

Mr. Voynow presents a great many arguments in favor of his proposed type of flanged track and flangeless wheels, but most of them can be summed up by the claim that an unbroken surface is presented to the tread of the wheel at crossings. This results, of course, in less wear at these points on wheel, rail and rolling stock, as well as in less noise and greater comfort to passengers. Incidental advantages are ease in keeping the track clean, a form of wheel which permits deeper and more uniform chills and a smaller number of special shapes to keep in stock. The other advantages claimed for the system are not so evident, such, for instance, as reduction in switching troubles, increased life of joints and rail, more permanent paving and greater convenience to vehicular traffic. So far as these points are concerned, it would seem as if the proposed rail did not differ materially from the old style of girder rail, illustrated in the fourth engraving in Mr. Voynow's paper, except that as the wheel ran on the head of the old girder rail, the head is broader than that of the proposed section. The suggestion, as a whole, is a novel one, certainly so far as recent engineering discussions are concerned, although we believe a thorough search of the literature on the subject might reveal similar suggestions during the early history of track construction. Whether this is so or not, equal credit is due Mr. Voynow for working out the system carefully in all its details and presenting the arguments in favor of it.

The selection of a representative of the Forest Service to present a paper before the Convention on the latest methods of preserving timber was a wise one, as all railway companies are vitally interested in the question and no department of the Government, perhaps, has been more efficient in enlightening the public as to its experimental work than the Forest Service. Intelligently administered and conducted along modern lines, the United States Forest Service has been of incalculable benefit in awakening the public to the importance of the use of scientific methods in preserving the timber resources of the country. Mr. Weiss described in detail the open-tank treatment, whose practical development has been very recent, and explained that the plant required for the treatment of timber could be so cheaply constructed as to be within the means of any company which employs many poles or ties.

The question of the performance of manganese steel of the rails of the Boston Subway, presented by Mr. Steward, was instructive in bringing to date the results of the tests which the Boston Elevated Railway Company has been conducting with this material during the last seven years. The experience has been very satisfactory, but even better results are expected with rolled manganese rails, which can be secured in lengths considerably in excess of those possible with cast rails, and, we assume, at a lower initial cost. The points made by Mr. Steward in connection with the resistance of manganese steel to different kinds of grinding friction and to blows were extremely interesting.

Power Distribution Standards

The report of the Committee on Power Distribution of the Engineering Association touches upon only about half of the items in the list for present and future consideration. Entire books have been written on the subjects of high-tension feeders, lightning protection, return systems, electrolysis, and conduit systems, about which the report of this year's committee makes no mention. The committee, which is new, has a large task before it in making satisfactory recommendations on the many matters concerned in the dis-

tribution of power. Since the very possibility of the existence of electric railways depends upon the electrical distribution of power, the consideration of the proper system and most practical methods will always be most important.

The committee's report considers underground low-tension feeders; and trolley, third-rail and catenary construction of working conductors. Under the head of trolley conductors, the committee eliminates the once popular "figure eight" trolley wire from consideration, but makes no definite recommendation as to the shape of cross-section most desirable for various classes of service. A specific suggestion is made, however, that the height of trolley wire above top of rail be standardized at 19 ft. Definite recommendation is also made on the protection or reinforcement of iron poles at the ground line. No recommendation is at present made regarding trolley ears or hangers.

Under the subhead of "Third Rail," interesting information is given regarding percentages of breakage of insulators with under-running and over-running types of third rail. With either type the breakage is somewhere near 3 per cent per year. A following paragraph refers to a road which supports the third rail independently of the track structure, and which reports entire absence of insulator breakage. A uniform spacing of supports of three to a rail, for 30 ft. and 33 ft. rails is recommended. The most definite recommendation offered by the committee is with regard to specifications for galvanizing messenger cable for catenary construction. As during the discussion a member of the committee made the statement that later information led him to believe that the committee erred in recommending double galvanizing, and giving his reasons, this, the most detailed recommendation contained in the report, loses its force.

It is to be hoped that this committee will continue with the work it has outlined in its report and will make other specific recommendations on a large number of matters, some of which are barely mentioned in this report. As has been said, the subject is a broad one, and possibly it may be found best to subdivide the committee, or to appoint new committees for the consideration of special sections of the subject. There is, for instance, the subject of electrolysis, mentioned in the committee's outline, which is one which might well be taken up and given careful study by a committee of the engineering association.

The report of the committee includes an interesting and instructive paper by R. L. Allen on the subject of the theory of catenary construction, in which the author describes a graphic solution of the problem of adjustment for sag of the messenger cable before the weight of the trolley and hangers is put on.

The discussion which followed the presentation of this report was confined principally to the matter of underground cables and the height of trolley wire. Considerable interest was shown on the subject of non-leaded cable for underground conductors, and accounts of the successful, though limited, experience which has been had in this direction in Boston and Springfield were quite instructive.

The discussion on height of trolley wire, while principally a description of the practice in vogue with various companies, seemed to concur with the committee's recommendation for a standard height of about 19 ft.

Power Generation

The report of the Committee on Power Generation of the Engineering Association, which was read on Wednesday morning, presented much new and interesting data on the experience of companies which have steam turbines in practical operation. Little attention was given to matters of theory or design, as these phases of the subject have been well covered at previous meetings of this and other kindred engineering organizations. Data regarding practical operation have not been so general, and the committee brought out a number of interesting points by the analysis of some 30 replies to a well chosen set of questions on the subject. The replies to these questions represented companies operating turbines ranging in capacity from 75 to 5000 kw, in nearly every case in connection with reciprocating engine plants. The operating experience of these various companies has been, in general, quite favorable to the cause of the steam turbine in railway service. No exact figures on efficiency are given, but the general comparison of fuel consumption per kilowatt hour appears to favor the turbine as against the reciprocating engine, when operating under the conditions of the usual railway load. While the report does not specifically refer to the exhaust steam turbine, Charles Hewitt, superintendent of motive power of the Philadelphia Rapid Transit Company, in the course of the discussion stated his belief that greater economy could be secured with an exhaust steam turbine in connection with a well designed reciprocating engine than that of any straight turbine plant that could be built. Excellent results are being obtained by Mr. Hewitt in a plant of this character, as described in the Oct. 10 issue of the Electric Railway Journal. The reports of the costs of installation and of operation of this plant, and that of the similar, though smaller one at Scranton, are very gratifying to those who have been awaiting such figures for confirmation of the confident predictions which were made with regard to the economy of such installations by the manufacturers.

The committee emphatically states that the cost of repairs and maintenance and labor cost of operation are less with the turbine plant than with reciprocating engines. In the matter of reliability, one of the essentials in railway service, a large majority of the correspondents consider the turbine equal to or preferable to the reciprocating engines, although this is qualified by the reminder that the importance of high vacuum and superheat necessary to the most economical operation of a turbine necessarily adds more complicated and less reliable equipment to both boiler and engine room. Possibly it might be well to remember that fully as much of this auxiliary equipment is essential to the most economical operation of the reciprocating engine, and that this important matter of comparative reliability should be considered in connection with plants of corresponding economy. Such a consideration probably would lead to a comparison of the reliable qualities of the engine and turbines alone, possibly with still greater unanimity in favor of the turbine.

In the matter of quick starting the consensus of opinion seems to be that the turbine plant cannot be started much more quickly than the reciprocating plant, under like conditions. This is contrary to the early claims of the advocates of the turbine, who probably considered the turbine as

an individual machine, and did not take into account the limitations of the auxiliary equipment.

On the subject of steam meters, the committee was handicapped in collecting data by the fact that only a few such meters are in use in large power plants, and these have been in service only a short time. Only one or two railway plants have steam meters in use. That the meter is a practical piece of apparatus is being demonstrated, however, and the committee is undoubtedly correct in its belief that in the hands of skilled power plant engineers much better results will be had than have been obtained by the engineers of small factories and industrial plants to which their use has been generally confined until recently. The records of conditions between the coal pile and the switchboard, such as steam consumption of various units and steam production of various parts of the boiler plant, which always have been desirable, will be obtained much more easily if a simple and reliable steam meter should be perfected.

The section of the report devoted to flue gas analyzers contains a record of experience with various types of CO_2 recorders. Here the criticism may be advanced that in many instances where CO_2 recorders have been installed, the installation apparently has not been followed by the attention which its importance deserves. Where the best results are reported, the recorder is given regular attention by the fuel engineer; the importance of frequent calibration of the recorder should also be emphasized. Curves drawn by the committee show the relation between the percentage of CO_2 and the losses due both to excess air and to incomplete combustion, and are most interesting in a consideration of the subject of flue gas analysis.

The report concludes with an observation that in many plants too little attention is given to economy in the boiler room. This is undoubtedly true, especially in the small and medium-sized power plants. It is often a puzzle to the experienced power plant engineer to account for the seeming indifference to economical conditions in the boiler room in plants where the utmost importance is attached to comparatively trifling economies on the other side of the division wall.

It is to be regretted that the limited time prevented a more extended discussion of this report, as a number of the points considered by the committee are of the greatest interest to power plant engineers, and much of value would have been added to the discussion had time permitted the association to hear more of the personal experiences of those present.

The Interstate Classification of Accounts

The Interstate Commerce Commission has promulgated classifications of accounts, effective on Jan. 1, 1909, for all the electric railways under its jurisdiction. Action on the subject of accounts for electric lines has been taken by that commission in pursuance of its disposition to exercise jurisdiction over all classes of carriers engaged in interstate commerce.

The commission, in applying the various requirements of the act to regulate commerce, has taken the position that it recognizes no distinction as between electric and steam carriers so far as its authority is concerned. Commissioner James S. Harlan stated in a communication published in the Electric Railway Review: "Regardless of the physical location of either electric or steam railroads, and whether their lines begin and end in the same State or not, if either is engaged in the transportation of property from a point in one State to a point in another, wholly by rail or in connection with a water carrier under some arrangement for a continuous movement, the act [interstate commerce act] applies in all its phases."

This being the position of the commission, any denial of its authority by interstate electric lines would probably call for judicial interpretation of the law with respect to its applicability to such properties.

Over what extent of electric railway mileage the commission asserts jurisdiction is not known with accuracy. It is believed, however, that the number of miles of track of electric lines subject to the jurisdiction of the commission is smaller than was thought by the representatives of that commission to be the case when they first started the consideration of a scheme of accounts for carriers of this character. The last expression of opinion on this subject arising from those entrusted with work pertaining to the execution of the interstate commerce act was included in a report of the Committee on Construction and Operating Expenses of Electric Railways, presented to the National Association of Railway Commissioners at its meeting in Washington last week. This report, in discussing the authority of the commission, said that it "seems to be true that a substantial portion of the electric mileage of the country is not subject to the provisions of the act to regulate commerce."

The latter statement shows that the situation respecting the electric railways is very different from that which determines the course of the commission concerning steam railways, the large part of which are admittedly engaged in business that comes within the scope of the act. If the only electric lines which followed the interstate classification, however, were those that were obliged by law to introduce it, and other roads followed the old classification which has been in use for some years as the standard of the American Street & Interurban Railway Accountants' Association, there would no longer be the uniformity of accounts which has prevailed in the past. However, a committee of that association participated in the preparation of the system of accounts, and at Atlantic City this week the association, in annual convention, adopted the accounts as its standard, though believing that discounts and commissions on securities issued for construction purposes or to raise funds for construction should be considered proper capital expenditures.

Under the conclusion finally reached by the Interstate Commerce Commission and explained in the classification of operating expenses, Prof. H. C. Adams states that the treatment of the depreciation accounts, if used, and the attitude of the Interstate Commission respecting their introduction by electric lines, will be determined by the action of the various State commissions; and such accounts therefore become questions for State, not national, decision if the advisability of their inclusion in accounting schemes is suggested.

ENGINEERING ASSOCIATION PAPERS READ ON OCT. 16, AT ATLANTIC CITY

REPORT OF THE COMMITTEE ON OPERATING AND STORAGE CAR-HOUSE DESIGNS*

BY F. F. LOW, CHAIRMAN; E. H. ROGERS AND M. H. BRONSDON

Your committee organized at once after appointment and immediately took up the study of the subject assigned to it.

It was at first thought that the report should set forth the principles of a standard car-house design, but this idea was dropped when deliberation showed that, however desirable such a course might be from some points of view, the standardizing of car-house designs is impracticable because the arrangement of a car house is governed by the size, grade and outline of the lot, the requirements of the road in question, its geographical position and the ordinances of the city or town in which it is located—these last two elements governing the kind of material to be used and the manner of employing it.

It was decided, therefore, that it would be better to treat the subject by considering the principal problems entering into the designing of operating and storage car houses, with a view of solving these problems by criticism and suggestion.

DIVISION OF SUBJECT

When a railway company finds it necessary to construct a car house, four considerations will be found to embrace the whole subject, namely:

(1) The selection of a location.
(2) The study of the track layout.
(3) The design of the building.
(4) The study of the details.

These may be subdivided in the order of their importance, as follows:

Selection of Location—
- Fitness.
- Size.
- Convenience and economy of operation.
- Fire risk and water.
- Economy of construction.
- Drainage.
- Sewers.

Layout of Tracks—
- Grade of tracks.
- Convenience of operating.
- Best utilization of lot.
- Clearances.
- Spacing of tracks.
- Transfer-ways.
- Cross-overs.

Design of Building—
- Local ordinances.
- Fire protection.
- Insurance regulations.
- Standpipes.
- Sprinklers.
- Convenience of operating and working.
- Maintenance and repairs.
- Quarters other than operating.

Details—
- Foundations.
- Walls.
- Roofs.
- Floors.
- Lobbies.
- Toilets.
- Pits.
- Apparatus.
- Stock room.
- Blacksmith shop; paint shop.
- Wash room; oil room, sign room.
- Sand; salt.
- Heating; lighting.
- Road and line department.
- Express accommodations.
- Posting; trolley troughs; bumpers; doors.
- Fire exits.

Your committee has followed the above order in its report.

SELECTION OF LOCATION

Fitness.—Before the actual purchase of the lot is accomplished, its fitness should be determined, as far as discretion will allow, by consulting those parties best qualified to judge:

a. As to the most satisfactory size in view of probable future requirements.

b. As to the proper location for economy of operation.

c. As to suitable shape for a proper and economical layout of tracks.

d. As to possible restrictions that might hurt its use for railway purposes.

e. As to whether there is an ample supply of water available and facilities for the disposal of sewage at hand.

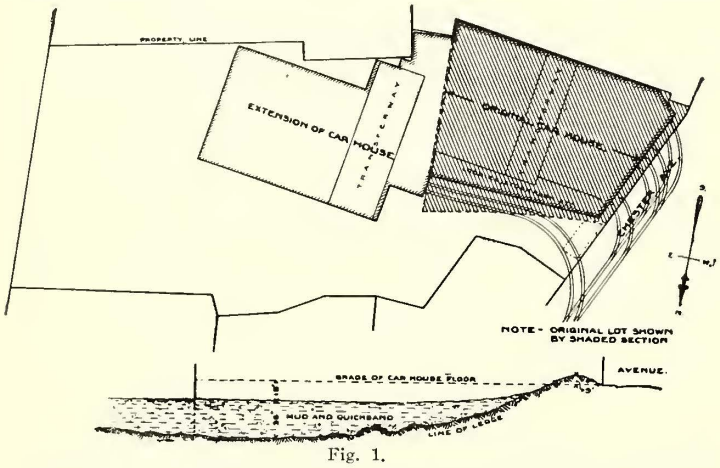


Fig. 1.

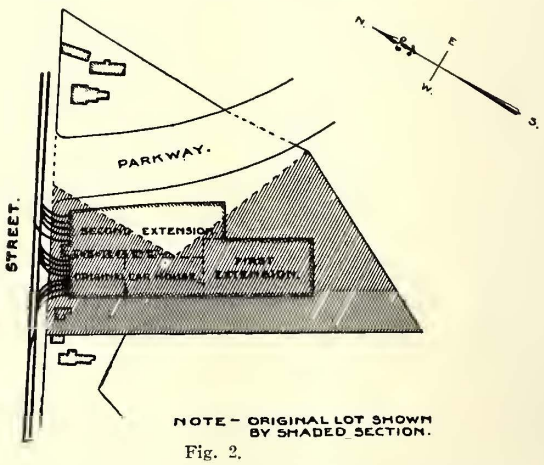


Fig. 2.

Figs. 1 and 2—Illustrating the Result of Building an Extension on Land Purchased After the Original Building was Planned

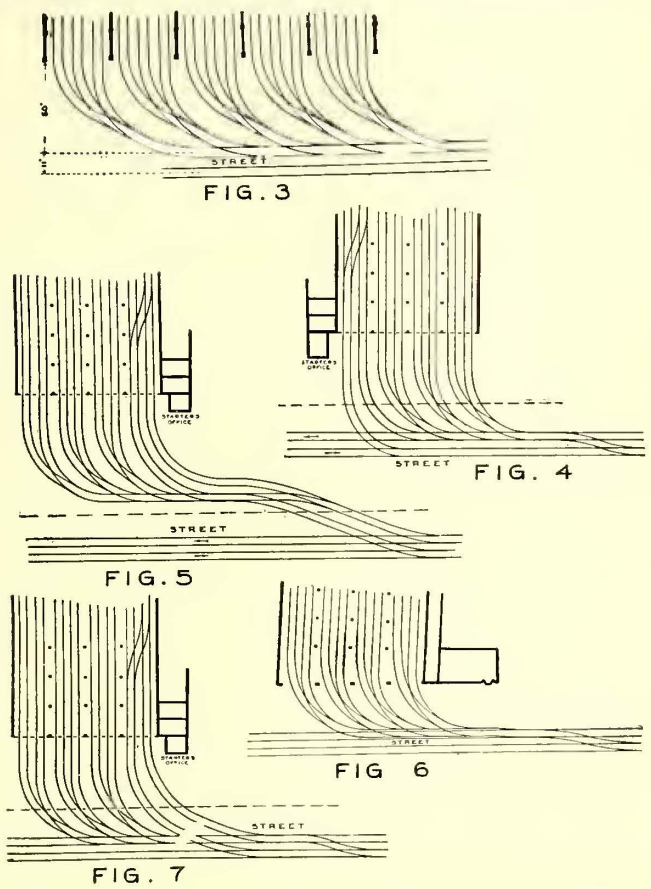
*Read before the American Street & Interurban Railway Engineering Association, Atlantic City, N. J., Oct. 12, 13, 14, 15 and 16, 1908.

f. As to the possibility of obtaining track privileges from the city or town governments. (It is often safer to obtain an option on the land—its purchase to be provisional upon being granted satisfactory entering track privileges.)

Size.—Your committee advises caution in the purchase of a lot, so that the common error of choosing one too small may be avoided. Figs. 1 and 2 illustrate the result of building an extension on land purchased after the original building was planned.

Fig. 1 shows the difficulty of obtaining an ideal lot in populated districts. The cross-section shows the unevenness of the lot. The irregular outline of the second lot purchased and its position in relation to the original building combine to make difficult the problem of increasing the size of the car house. If the entire lot had been purchased in the first place, a differently planned building would undoubtedly have been laid out.

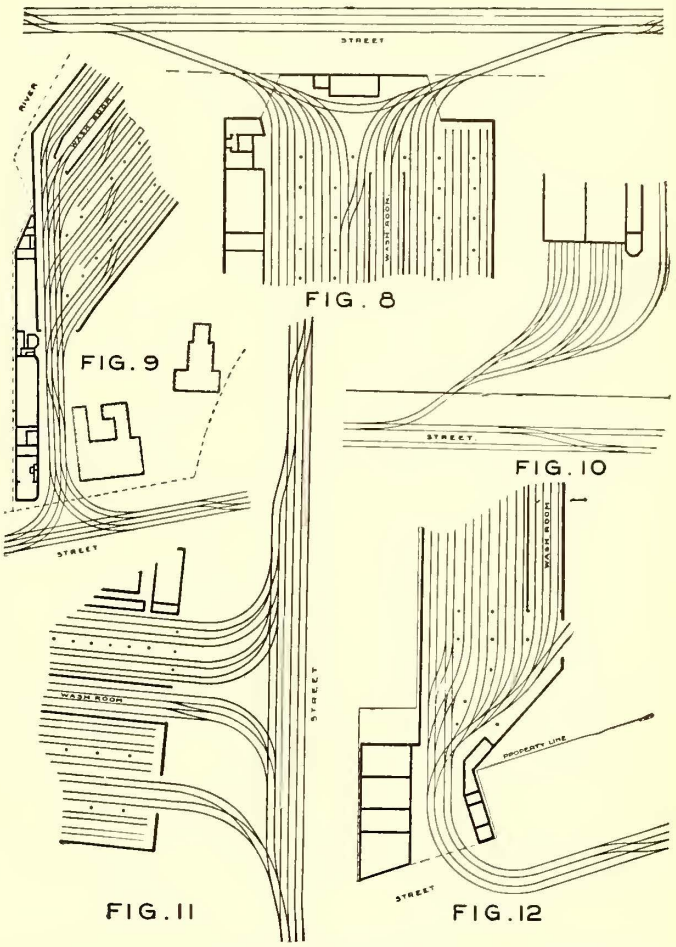
Fig. 2 shows the plan of a car house belonging to an Eastern road. The original lot is shown hatched. It is evident that the car house as originally planned was intended to admit of additions at the rear and west side, but, in the interval between the building of the first and second additions, a parkway was laid out through the adjoining property. This left a peculiar triangular-shaped piece of land, which the road purchased, as it was of little value to any one else. Owing to this newly acquired piece of land the second addition was built on the east side, which resulted in a poor arrangement of the entire layout, as the



Figs. 3, 4, 5, 6 and 7—Special Work Designed to Meet Certain Conditions

pits, lobbies, stock room, blacksmith shop and the working portion of the house are in the center of the buildings with only overhead light. This would not have happened if conditions could have been foreseen or a lot of ample size purchased in the first place.

Convenience and Economy of Operation.—Due consideration should be given to fitness for convenience and economy of operation and the minimizing of dead mileage. If the road lies between two populous terminals, the provision of a house at both ends may have these advantages:



Figs. 8, 9, 10, 11 and 12—Special Work Designed to Meet Certain Conditions

possible loss by fire reduced; dead mileage lessened; improved freight and express accommodations afforded; a better opportunity for employees to find homes nearby created; another road may find it of advantage to locate at a junction point. The lot surrounded by streets often proves ideal, there being the greatest possible area for light and air, flexibility of track layout and large reduction of fire risk.

Fire Risk and Water Supply.—The fire risk from surrounding buildings and an adequate water supply are two important considerations in the choice of a lot. These will be taken up further on in this report.

Economy of Construction.—A lot requiring a minimum amount of excavating or filling generally helps to keep down the cost of construction, but a certain amount of fill outside a building site is frequently desirable for the disposal of ashes and other waste material if the land is within easy reach of a power station; moreover, to be obliged to excavate is not objectionable if the material taken out is sand or gravel suitable for track or building work.

Drainage.—The surface and sub-soil of the lot should have good natural drainage; without this it is difficult to keep a car house free from dampness arising from interior as well as outside causes, such as water from washing, melting snow and dripping rain from cars. The presence of dampness will injure the health of the men and cause cars

and buildings to deteriorate more rapidly than they would normally.

Sewers.—In the absence of public sewers it is important to locate the house where sewage can be disposed of without its being a nuisance to the adjoining property owners.

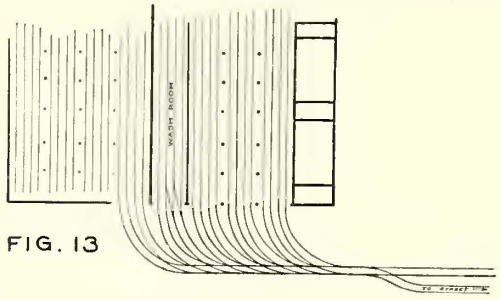


FIG. 13

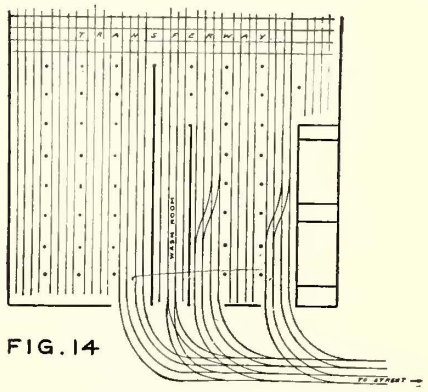


FIG. 14

Figs. 13 and 14—Special Work Designed to Meet Certain Conditions

LAYOUT OF TRACKS

Grade of Tracks.—The grade of tracks in the car house should be somewhat above that of the tracks in the street to prevent the entrance of water into the house.

Convenience of Operating.—In an operating house the saving of time is of paramount importance, and the special work should be so planned that the incoming and outgoing cars will not interfere with each other. The tracks should be constructed in the best manner, preferably with girder-rail construction having hardened centers. In a storage house, on the other hand, inconvenience and loss of time may be tolerated, and here, for the sake of safety on the main line, trailing switches are preferred by many roads.

Figs. 3 to 14, inclusive, illustrate special work designed to meet certain conditions. Where convenient to have it, a "Y" incorporated in the special work will permit the operation of cars from one end, as is necessary with cars of some designs and is useful when operating service and other cars in tandem. This same object can be attained by a loop, which is more convenient, but not always feasible, owing to a lack of room.

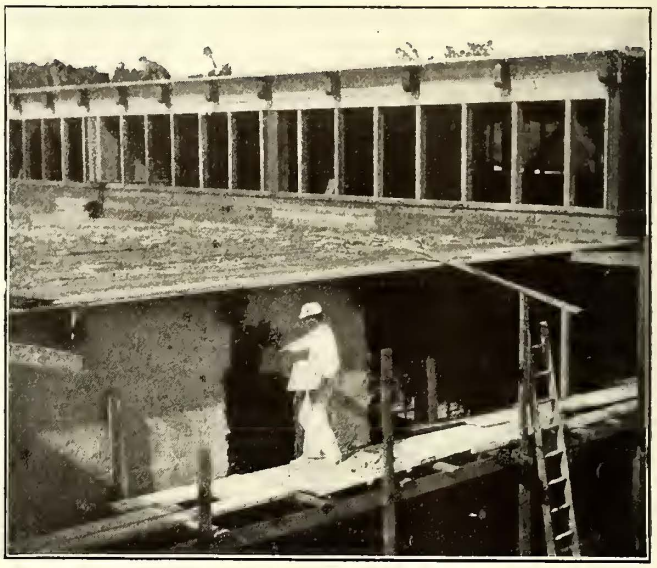


Fig. 16—Method of Applying Cement Plaster to Outside Wall

Fig. 3 shows a track layout where the car house is built on the street line and it is desirable to introduce as few frogs and switches in the main line as possible. The three-track bay arrangement is objectionable on account of the

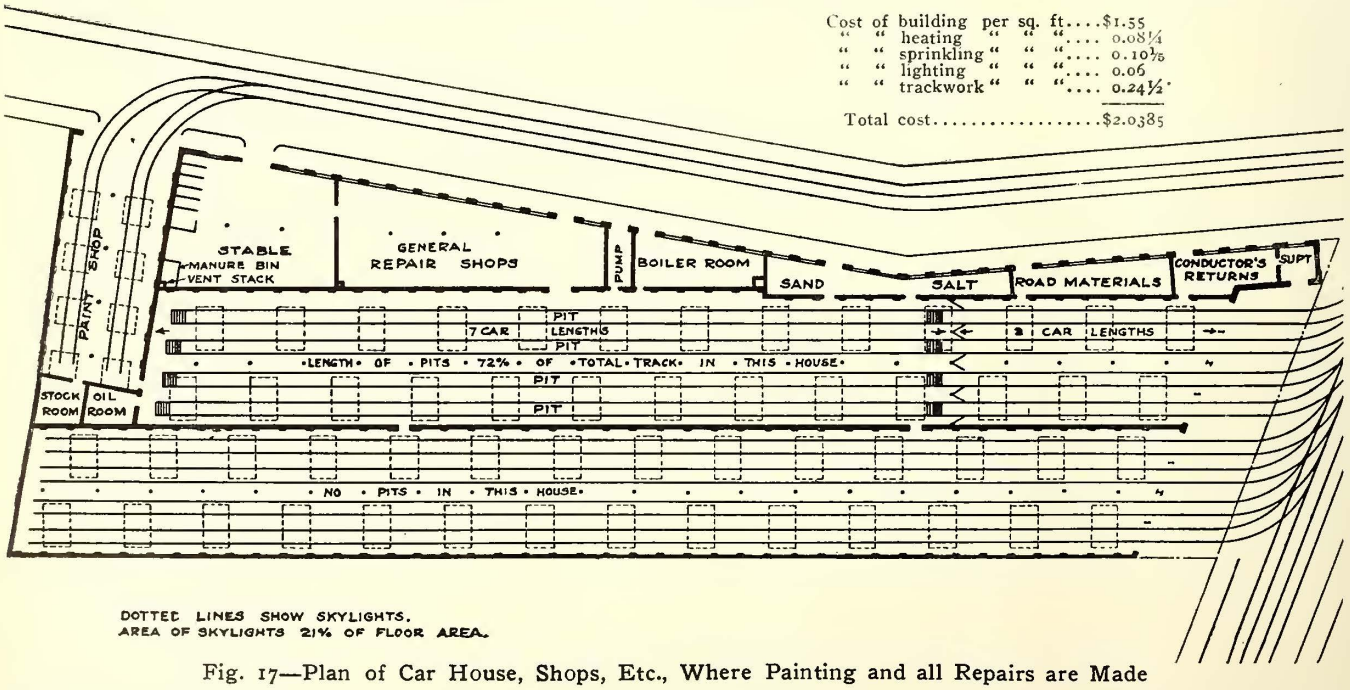


Fig. 17—Plan of Car House, Shops, Etc., Where Painting and all Repairs are Made

roof span, which would require trussing. Fig. 4 shows a track layout which will permit frequent operating on one pair of tracks. Operating on the other tracks requires the use of a cross-over in the street. Fig. 5 shows a layout for an operating house which introduces a minimum amount of

special work in the street. Fig. 6 shows a gauntlet track layout beside the main track, to minimize frogs and switches in the main track. Fig. 7 shows a similar layout to Fig. 4 except that the operating tracks are on the right-hand side of the house.

Fig. 8 shows a layout for a house on a through line operating in either direction. The Y is formed by a cross-over on the two center tracks. Fig. 9 shows a large operating house which calls for a long, narrow track approach. Fig. 10 shows a track layout for a storage house which is built well back from the street. Fig. 11 shows a third track approach to a car house, a layout which requires a wide street. Fig. 12 shows a track layout where the approach to the lot is restricted at the street.

Fig. 13 shows a common type of terminal layout. The special work was built with 4-in. 48-lb. T-rail. Inside of three years the mates were all renewed and within six years the special work was entirely worn out and was replaced with 4¼-in. rails with hardened centers according to the layout shown in Fig. 14. The car house has a capacity of 127 cars, and there are operated from it 336 cars daily on five different lines, or one car every 90 seconds during rush hours.

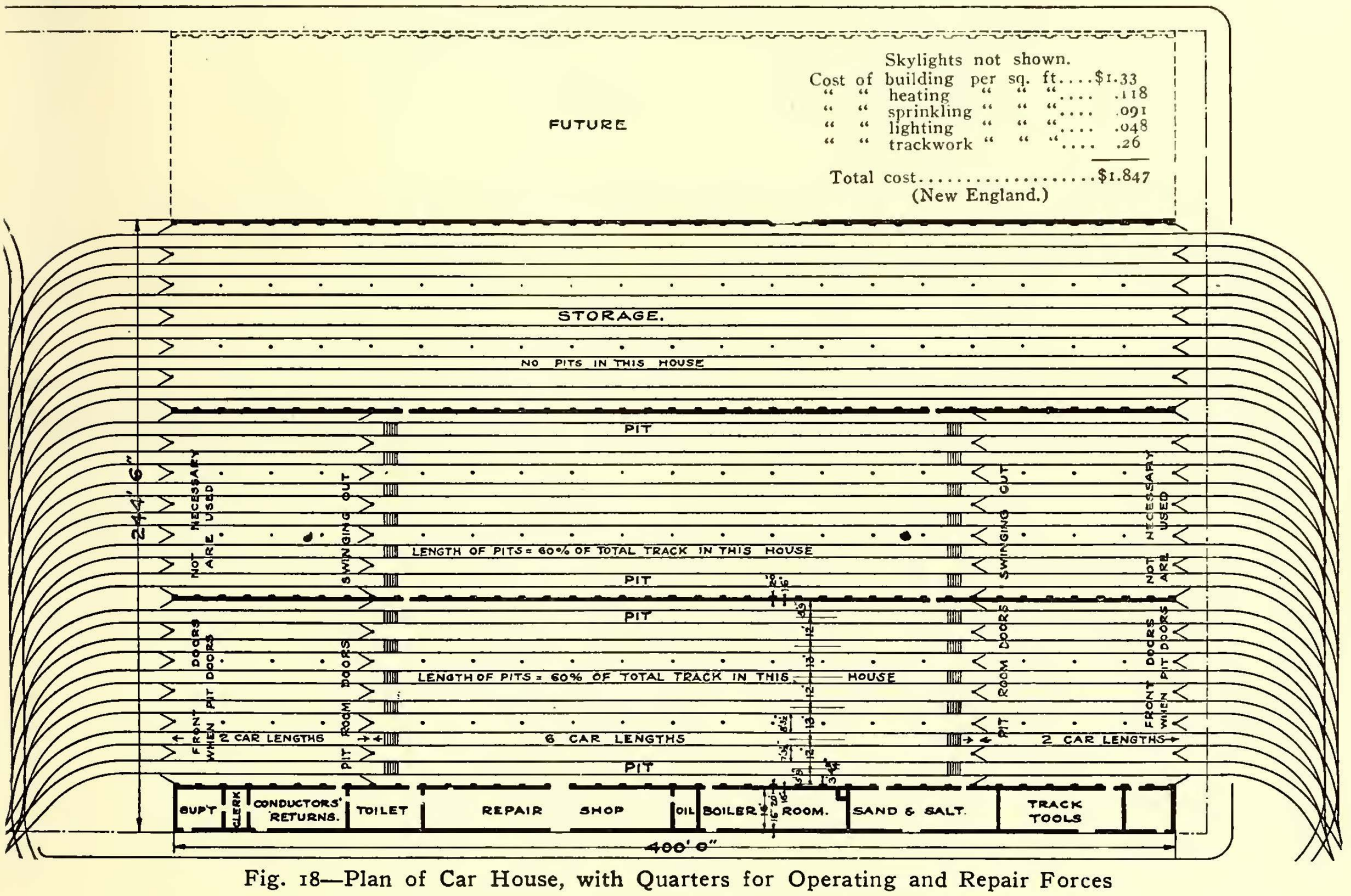


Fig. 18—Plan of Car House, with Quarters for Operating and Repair Forces

Best Utilization of Lot.—The tracks should be laid out so as not to prevent the unoccupied part of the lot from being used for other purposes. On account of the unexpected growth of business in another direction, it may be financially advantageous to dispose of the balance of the lot and build elsewhere. On the other hand, a good layout should not be sacrificed on account of some fancied advantage to be gained by holding part of the lot, or the buildings bought with it, for speculative purposes or indefinite use.

Clearances.—Frequent accidents have shown the necessity of establishing proper clearances between cars and between cars and posts, walls and other fixed portions of the building. Your committee believes that the minimum clearance should be 2 ft.; on curves it is well to increase this on account of the constantly increasing size of cars.

Spacing of Tracks.—Clearances also determine the minimum spacing of tracks. Eleven ft. center to center is satisfactory for a storage house, with 2 ft. additional if posts occur between tracks. This spacing will also do for the inspection section of pit room in an operating house, but where a great amount of work is to be done it is desirable to increase this distance.

Transfer-ways.—In populated districts where it is not feasible to have all tracks entering ones, it is necessary to install a transfer-table, as shown in Fig. 15. This is equally necessary in a house from which a large number of cars are operated, and where there is constant shifting from closed to open cars and vice versa. For convenience, it should be located centrally. Its position inside the building, however, if it passes through party walls (even though fire doors be used in the openings), adds to the fire risk and is likely to affect the insurance rates. For this reason some engineers advocate that the table be placed outside the building and at the rear. When so placed, however, it requires the passage of cars through the pit room when being shifted, and often the movement of a large number of cars—more than if placed near the center of building. The objection that a transfer-table within the house causes a loss of storage space can be overcome by a flush table.

Cross-overs.—While generally desirable to omit all special work within the house on certain types of layout, cross-overs are necessary within the building for the convenience of operating. A right-hand cross-over is preferred to a left-hand one, as being the more convenient.

DESIGN OF BUILDING

Local Ordinances.—In places where strict building laws exist, but do not particularly cover a building of the car-house type, it will be found desirable to obtain a permit be-

fore awarding the contract, rather than after, as is the common practice, otherwise expensive extras may result from the demands of the building commissioners.

Fire Protection.—The importance of providing fire protection should not be underrated, and at no time should it be forgotten. In selecting the location for the house, prox-

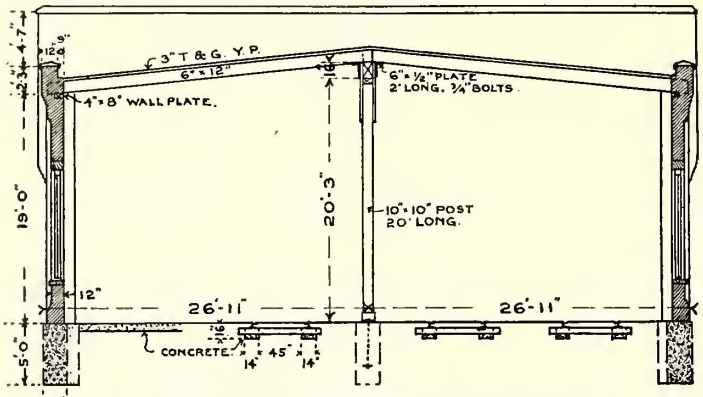


Fig. 19—Cross-Section Through Repair Shop

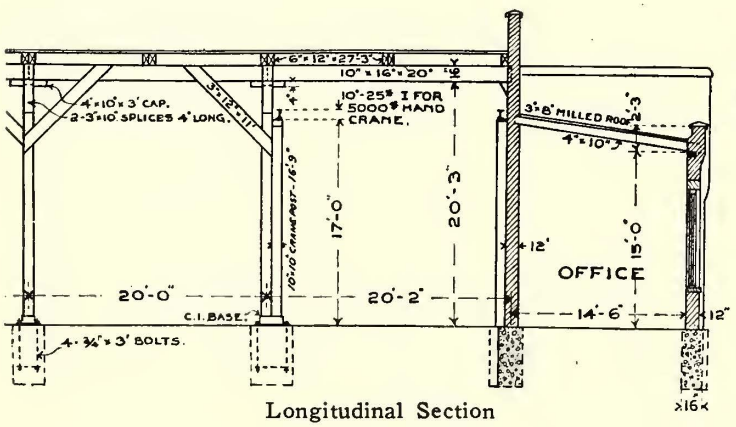
imity to buildings of inflammable material or having contents that burn easily should be avoided. Car houses should also be located where a good hydrant service is obtainable, and as near to a fire station as possible. If this is not done a private service with ample supply of water must be installed. Provision must also be made for a secondary supply of water, either in reservoirs under floor, or outside of building, or in elevated tanks.

expensive changes. While the underwriters stipulate that no section of the house shall contain more cars than amount to the value of $200,000, your committee believes that no road should expose more than a certain per cent of its rolling stock to the risk of destruction by any one fire, as the loss of cars means the loss of revenue. Divide the house by party and curtain walls where it is practicable to do so without interfering with the operation of cars or increasing the cost of the building to a prohibitive extent. The omission where possible of combustible material is recommended, especially below the grade of top of rails. Its use should be avoided on outside walls and cornice work. Sheathing partitions inside are undesirable, and floors and roof, if they are to be of wood, should be mill construction, with heavy timbers and planking.

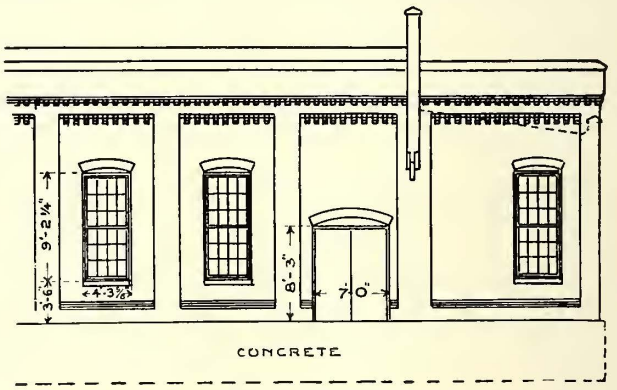
Fig. 16 shows the method of applying cement plaster for outside wall construction; the scratch or first coat is being applied to the wire laths. Other coats are applied both inside and outside and the wall finished 2 in. to 3 in. thick. The cut also shows the omission of all superfluous woodwork from roof line and also the sloping of roof away from edge to avoid gutter.

Standpipes.—Fire hydrants, with sufficient hose attached to reach every point in the car house in case of fire, and a sufficient number of same on roof to enable wetting down in case of a neighboring fire, should be provided. Suitable provisions should be made for installing sand and water pails throughout the house.

Sprinklers.—The matter of sprinklers should be consid-



Longitudinal Section



Side Elevation

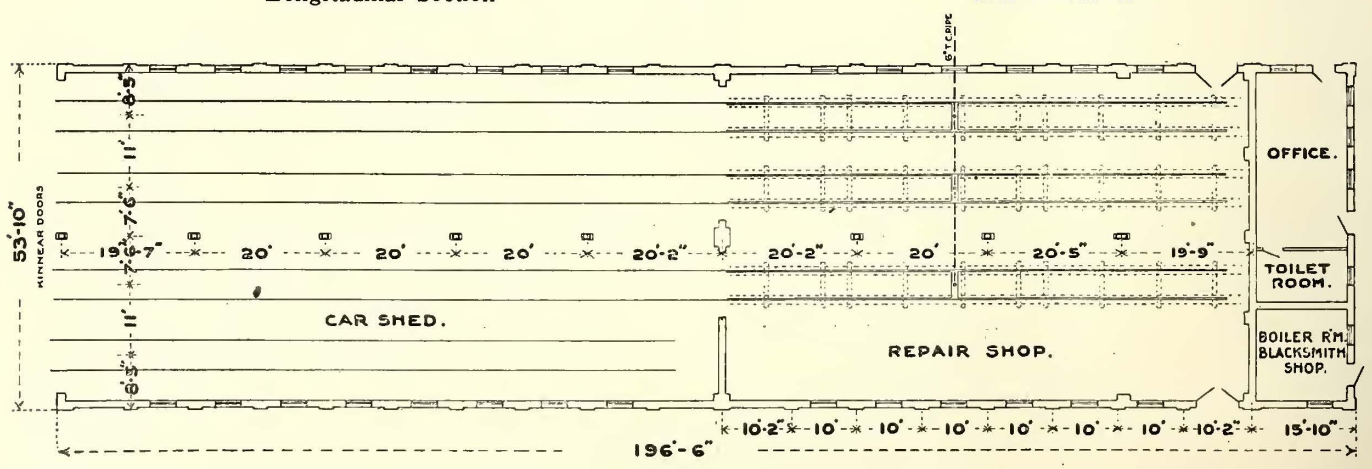


Fig. 19—Plan of Car House, with Quarters for Operating and Repair Forces

Insurance Regulations.—It is recommended that the designer familiarize himself with the regulations of the fire underwriters and adopt their suggestions as far as practicable. Insurance requirements are important factors in determining many details of construction, and a consultation with the underwriters when planning may save many

ered by the designer of a car house, whether they are to be installed at the time or not, for the cost of construction will not be increased by providing for them. Your committee feels that aisle sprinklers are an added protection, but that a line in every other aisle, or two lines of sprinklers where the aisle is over 4 ft. wide, is all that is required.

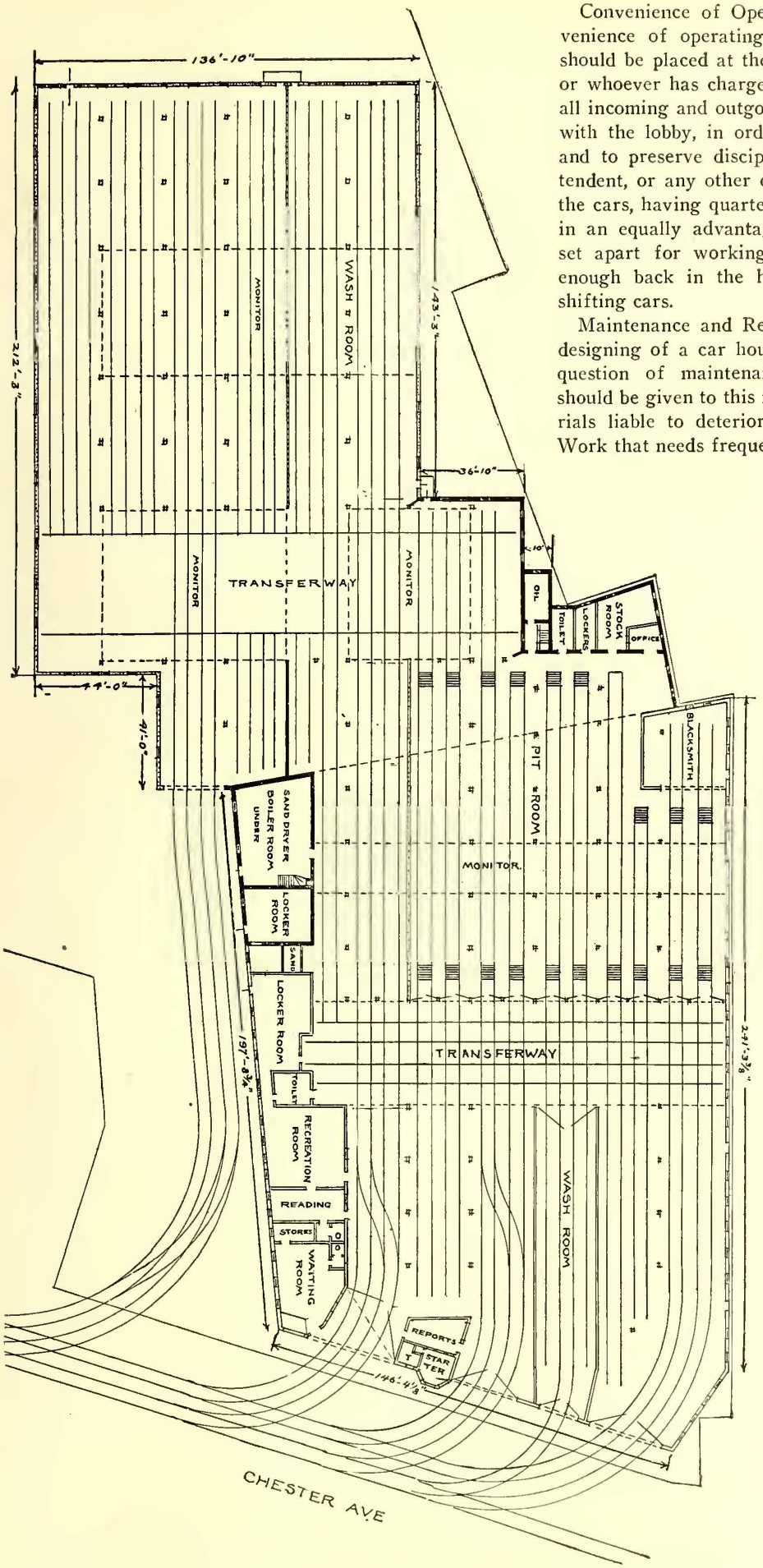


Fig. 15—Plan of Car House, Built Parallel to and on Street Line. Transverse Pits and Blacksmith's Shop at End of Track

Convenience of Operating and Working.—For the convenience of operating and working, the operating force should be placed at the front of the building. The starter, or whoever has charge, should be placed where he can see all incoming and outgoing cars; he should be in close touch with the lobby, in order to call the men assigned to duty and to preserve discipline among the men. The superintendent, or any other official interested in the operation of the cars, having quarters at the car house, should be placed in an equally advantageous position. That portion to be set apart for working and repairs should be placed far enough back in the house to prevent interference from shifting cars.

Maintenance and Repairs.—It is a common fault in the designing of a car house to give but little attention to the question of maintenance, whereas considerable thought should be given to this matter. In the construction all materials liable to deteriorate should, if possible, be avoided. Work that needs frequent painting should be sparingly used, as painting is nearly always neglected where it is most needed.

Quarters Other Than Operating.—Besides the quarters for operating and repair forces, which are found connected with almost all car houses, some roads desire to provide quarters for such departments as machine shop, blacksmith shop, paint shop and road and line departments, as shown in Figs. 17 to 20. If a power station or substation is to be located on the premises it is better to have them in separate buildings from the car house. Some substations, however, are built as part of the car house, but they are of fireproof material. It is sometimes found necessary to provide a stable under the same roof as the car house (see Fig. 17), but in such a case it should be shut off from the car house by fire walls, and the penetration of odors and ammonia to the storage portion should be prevented. Where operating houses are located away from populous centers it is often desirable for the road to provide some place (a separate building, on account of fire risk) for employees to obtain meals, or interest other parties in providing accommodations of this kind. In similar locations quarters for sleeping are also desirable for men who have to be held for work on snow or night duty. These quarters may be located in the car house.

DETAILS

Foundations.—If the soil is of good bearing capacity little study need be given to the matter of foundations. A car house is not a heavy structure, the walls being light, and the load of cars being

well distributed by track work. The materials to be selected for foundations are largely determined by the supply near at hand. Concrete is probably as common and as satisfactory as any. Where soft, yielding soil is encountered and piling found necessary, concrete piles have been

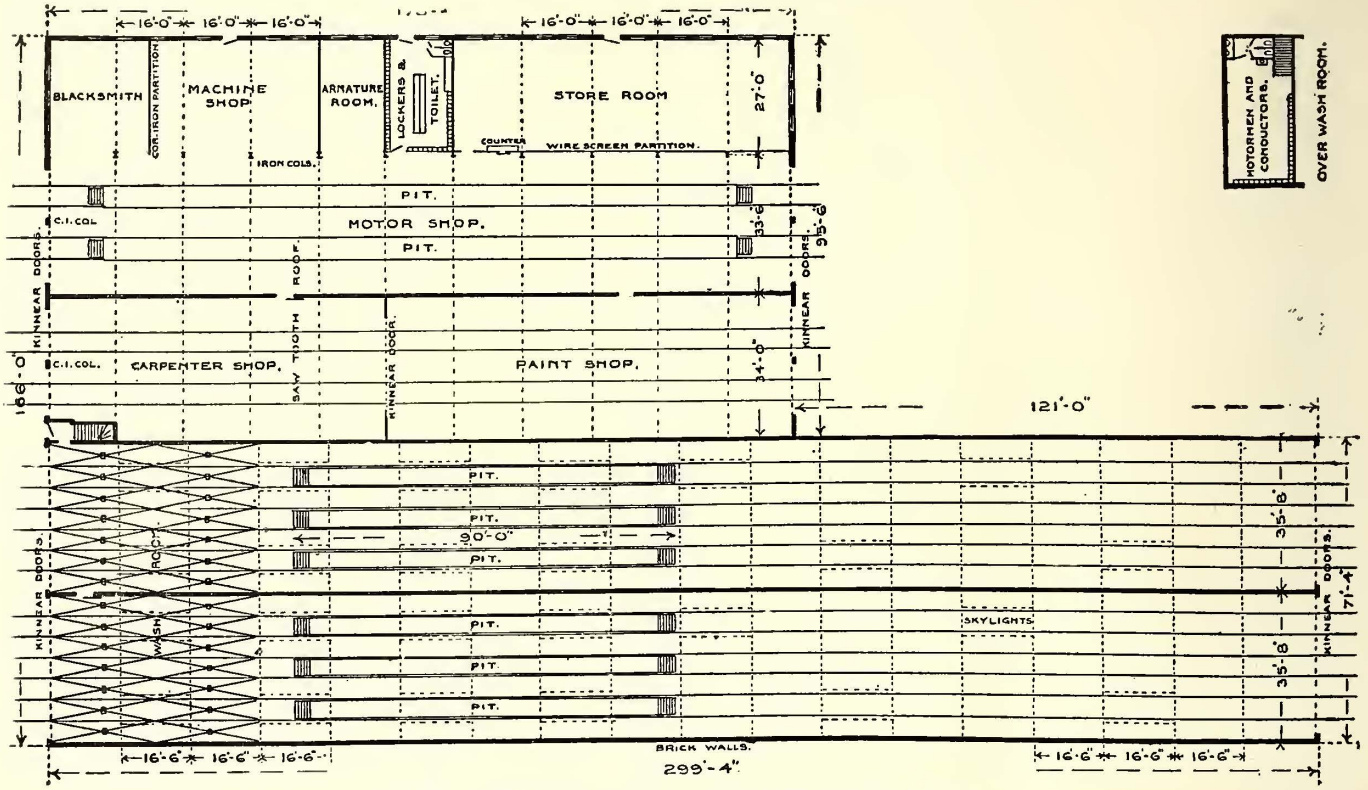


Fig. 20—Plan of Car House with Repair Shops

used. In such cases and under certain conditions they undoubtedly prove more economical than wooden ones.

Fig. 1 shows as poor a situation as one would expect to encounter, and Fig. 15 shows the plan of the building constructed thereon.

Fig. 21 shows the concrete piling used for the foundation of this building. The pile being lifted by the derrick is 36 ft. long. In the foreground can be seen the tops of some of the piles already driven.

Walls.—As was said before under "Fire Protection," your committee advises against the use of combustible material for the walls of car houses. Concrete blocks do not appeal to us as entirely satisfactory. Brick masonry or concrete monolith, in our opinion, seems to be the most suitable material. The constant attention necessary during the construction of concrete work makes it a less desirable material than brick. If a cheaper form of wall is wanted than either brick or concrete monolith, a heavy mill frame with a 2-in. cement plaster curtain makes a good fire-resisting scheme and one which is inexpensive to maintain (see Fig. 16). Corrugated iron is sometimes used, but is not recommended. There are in the market several forms of asbestos boards,

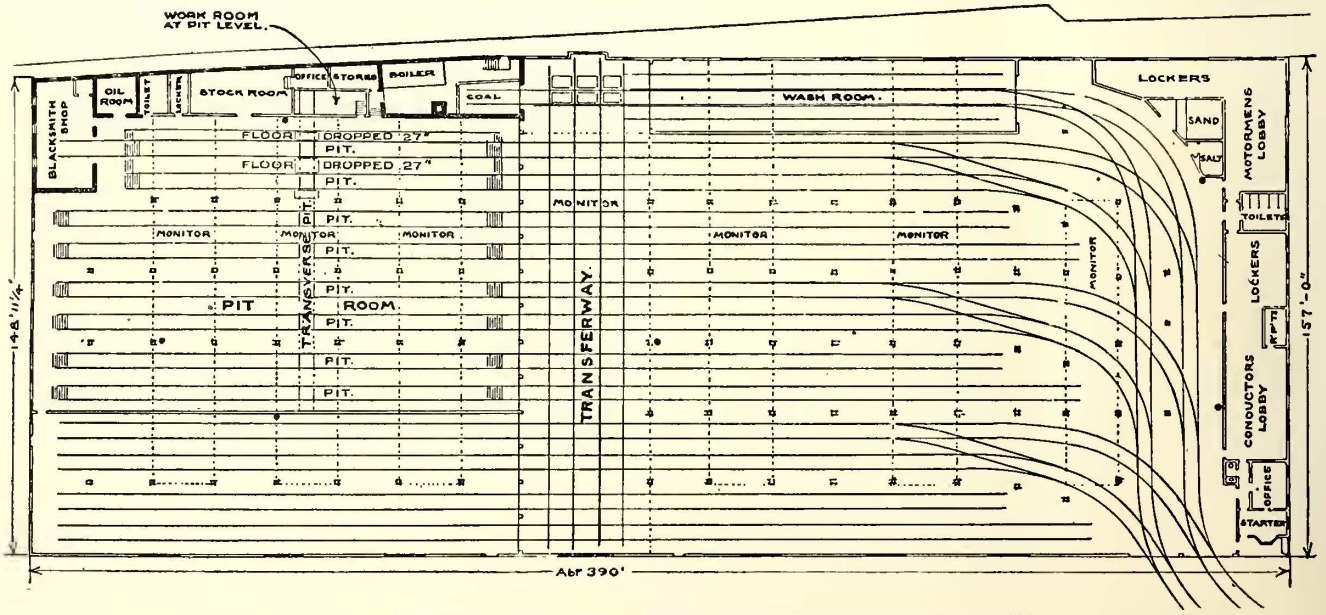


Fig. 29—Plan of Car House Built Parallel to and on Street Line

Roofs.—A flat type of roof is the only suitable one for a car house. It should be as close to the trolley wire as possible. Light can be brought through the roof by means of

skylights or monitors. Skylights are preferred by many, but the experience of others has shown that a properly designed monitor is preferable (see Fig. 22). Your committee strongly favors a mill type of heavy construction for the roof (see Fig. 23), and advises against the use of steel (see Figs. 24, 25 and 26).

Fig. 21—36-Ft. Concrete Pile Used in the Foundation of Building Shown in Fig. 15

Fig. 22 is a view of a roof showing wire glass skylights with metal frames and ridge ventilators, vitrified tile coping, plumbing vent stacks and boiler stack. Particularly note, on the right-hand side of the cut, the valleys at the edge of the roof in place of gutters.

Fig. 23 shows the general type of mill construction for roofs. The light through the roof is by means of skylights occupying 21 per cent of total roof area. The figure also shows types of floor and rail shown by Fig. 33 in detail.

Fig. 24 shows a car house constructed with steel roof framing and steel posting. Fig. 25 shows the same view as Fig. 24, taken after a fire. It can be plainly seen how the

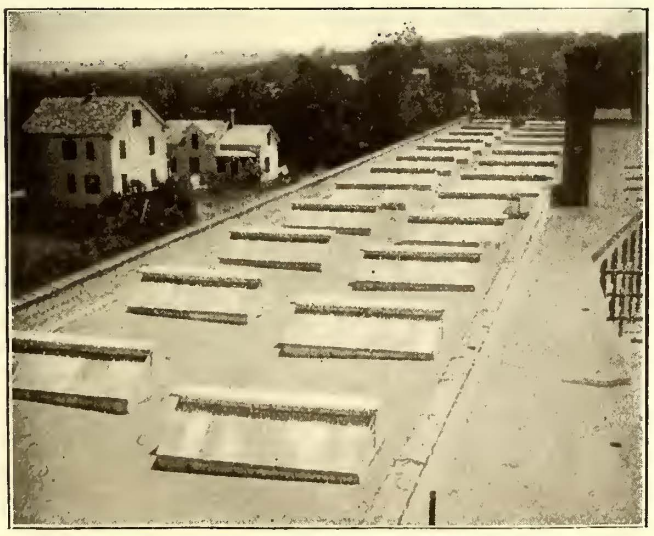


Fig. 22—View of Roof with Glass Skylights

roof, in falling, made it impossible to save much of the building or contents. Note the unconsumed roof planking. Fig. 26 shows the ruins of the same house as is shown in Fig. 24 and further illustrates the objection to the use of steel construction. Evidence taken after the fire proved that the roof fell within 10 minutes after the fire started, holding together in a solid mass and completely covering the burning cars, 47 of which were consumed, so that when the

Fig. 23—General Type of Mill Construction for Roofs

fire department arrived it was unable to reach the fire with a stream until the roof planks had burned through. Unconsumed portions of the roof are shown in the lower left-hand corner and at the rear of the building. Had the entire roof been of mill construction it would not have fallen so quickly and covered the cars: the firemen could have reached the fire, and the property loss would undoubtedly have been much less.

Your committee believes that the use of concrete is often ill-advised, and that any advantage it has over wood is offset by the additional cost and the liability of getting an unsatisfactory roof through poor design or faulty workmanship. Water should be taken off by valleys rather than

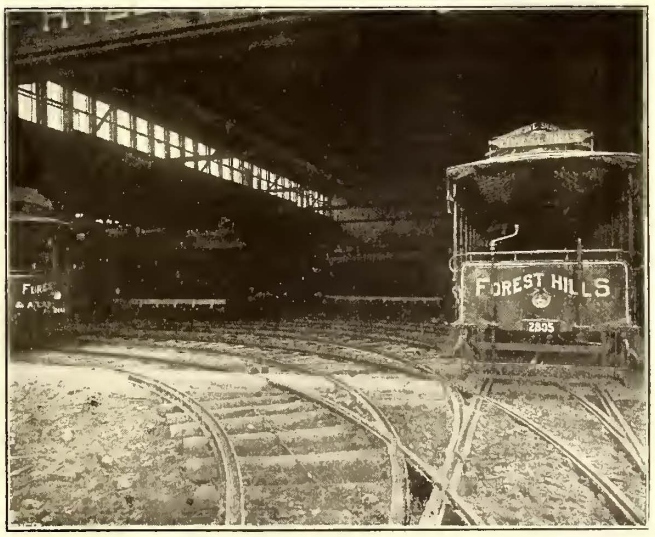


Fig. 24—Car House Constructed with Steel Roof Framing

by gutters (see Fig. 22), and taken down within the building. For the covering of the roof there are a number of materials, all of which have some merit, but none of them are any more satisfactory than a tar and gravel roofing well laid with first-class materials.

Floors.—Assuming that the tracks have been laid (preferably with 4¼-in. or 4⅝-in. T-rails on properly creosoted ties), the question of floor depends on the amount of money

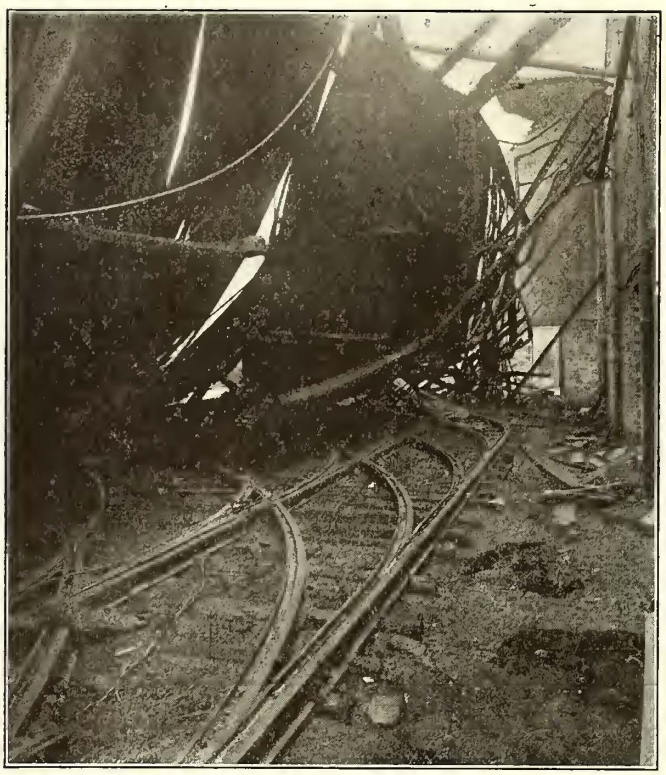


Fig. 25—Same View of Building Illustrated in Fig. 24, After a Fire

one wishes to spend. Except for cleanliness, it is only necessary to level up with coarse gravel. A tar concrete floor usually improves conditions and will answer every purpose of the more expensive granolithic for storage sections or other places where its surface will not receive hard usage. Brick pavement, with common brick laid flatwise, while quite a little used, cannot be teamed over and is further objectionable on account of its roughness, making cleaning difficult.

Plank laid on nailing strips is a form of floor that is unsatisfactory, because it rots and becomes loose and is unsanitary. For cleanliness and reduction of fire risk concrete is, without doubt, the proper material for floors. If absolutely necessary to cut down expense, the main floor of the pit room can be of wood. This is more satisfactory to work on, but increases the fire risk and is harder to keep clean.

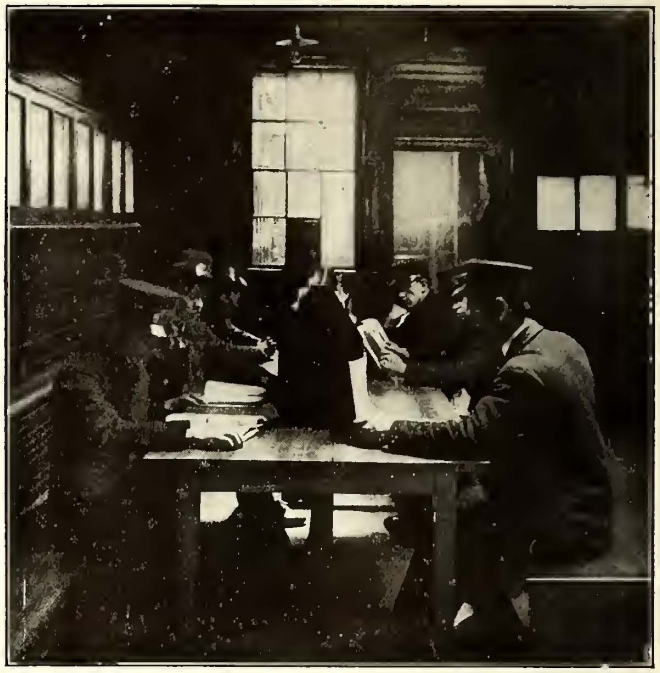


Fig. 27—Lobby, Showing Table, Seats, Wall Cases and Cases for Reading Matter

Lobbies.—As already stated, the lobby should be under the eyes of a supervising official; and any plan by which the men are left to themselves is undesirable. The lobby should be provided with seats, tables, bulletin boards and the like (see Fig. 27); counters should be arranged for the filing of time sheets and other papers requiring the signatures of conductors. All seats are better attached to the wall for the sake of cleanliness. Metal lockers should be provided directly in the lobby or in an adjoining room. For those men who are of a quiet disposition a separate room should

Fig. 26—General View of Ruins of Building Illustrated in Fig. 24, After a Fire

be provided, where reading and the playing of quiet games (such as checkers) can be indulged in. This room should have a table for letter writing. Separate rooms are also advisable for making out time sheets, reports and accident blanks. All parts of the lobbies and toilets should be so designed as to suffer as little as possible from the destructive work of idle hands. Adjoining the lobby should be ample toilet facilities, with provisions to keep the same in sanitary condition. The floor should be such as to admit of flushing; partitions should not run to the floor; as little wood as possible should be used; sharp corners should be avoided, and there should be good provisions for light and air. In the larger houses there should be equally well planned toilets adjoining the pit room, and possibly a private toilet for the officials. If the house is small a central toilet with one or two water closets under lock and key may answer for all employees.

Pits.—The pit room, one of the most important parts of the house, should be placed well back, and the area should represent a capacity of at least one-third—or, better, one-half—of the car storage. It should be well lighted, to save artificial light, and amply heated for the sake of the comfort of the men and for the melting of the snow around the trucks. Pits should have an average depth of 4 ft. 6 in. from the top of the rail. Preferably, the floors of the pits should be of concrete and slightly crowned to shed water. The main floor on one or more tracks should be dropped next to the rail on each side of the pit to facilitate working about the truck and the running boards. Fig. 28 shows a drop floor at the side of the pit. This floor is 27 in. below the top of the rail. It can be less if preferred, and with some equipments 12 in. proves satisfactory. The figure also shows portable lighting for the pits, lights being placed on one side only, about 18 ft. on centers. The natural lighting for the pit room shown is through the monitor of sawtooth type with vertical glass. A cross, or transverse, pit, with the floor slightly below the main floor and terminating in a room at the side, as shown in Fig. 20, is a convenience for moving material from pit to pit. The room can be used for storage or, if well lighted, for a work room. An opening can be provided so that material can be lifted to the floor above. By referring to Figs. 30 to 35, several schemes of pit construction will be found illustrated. A form of construction that utilizes the rail for the support of the floor, as well as taking the cars, will be found simple and economical. It also does not pocket the heat under floor and gives greater clearance for working and for passing from pit to pit.

Apparatus.—While the apparatus for the handling of the cars is not a matter of car-house design, still there must be provision made for the installation of the same. Supports sufficient to take cranes and body hoists must be provided, as well as provisions made for motor and wheel hoists.

Stock Room.—The stock room should be placed convenient to the pit room and should be of sufficient size to contain all the stock. It should not be so large as to make the care of stock difficult, but should be a well-lighted, neatly designed room which will inspire the keeper with neatness (and neatness means economy where there are a large number of small parts to be kept in stock). Broad benches with lockers beneath them; drawers for screws and small parts, and bins neatly lettered and painted, will be an object of pride as well as an incentive to saving.

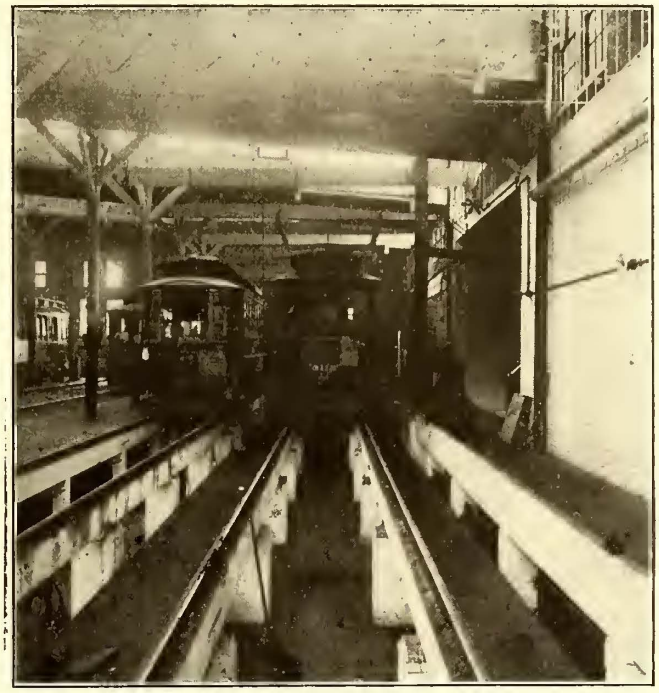


Fig. 28—Drop Floor at Side of Pit

Blacksmith Shop.—If any repairs are contemplated it will generally be found necessary to provide a place for blacksmith work. This place should be at the end of a track, as shown in Fig. 29, so that trucks can be run in. The small type of blacksmith shop will require a work bench and an opportunity to install a few hand-drilling machines, etc. As the amount of work and the size of the house increases, more machinery is required. With small roads a fully equipped machine shop is maintained for doing all the work of the road, including a small but well-equipped foundry for brass work.

Paint Shop.—A small paint shop for the renovating of cars is provided as a part of the car house on some roads (see Figs. 17 to 20).

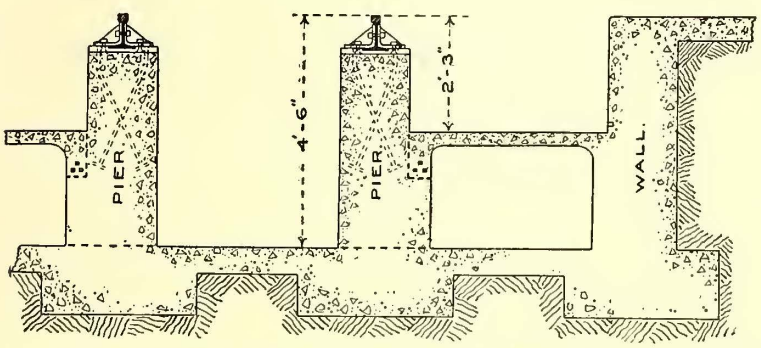


Fig. 30—Section Showing Drop Floor Beside Pit

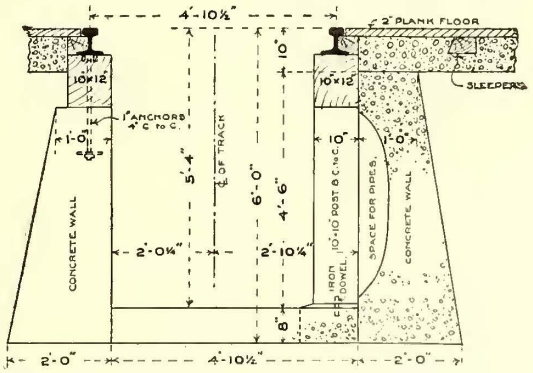


Fig. 31—Pit Construction, Deeper than Generally Used, and Probably More Expensive to Construct

Wash Room.—The use of the wash room and the washing of cars with the hose is being abandoned by many roads; instead, the entire floor is drained, and with hose bibbs at frequent intervals the cars are washed at any point by the use of pail and brush.

Oil Room.—While some (especially insurance people) prefer a separate building for the oil storage, it can be made a part of the car house if properly designed. The floor should be dropped below the outside floors, dished to the center and properly drained. There should be barrel racks, shelves for small vessels and waste receptacles, all of incombustible materials. Proper provisions should be made for heating the oil so that it may be fit for use in the winter. There are tank systems, having the tanks buried outside in the ground and the oil piped into the house, which form a neat method of caring for oil and one not liable to much waste.

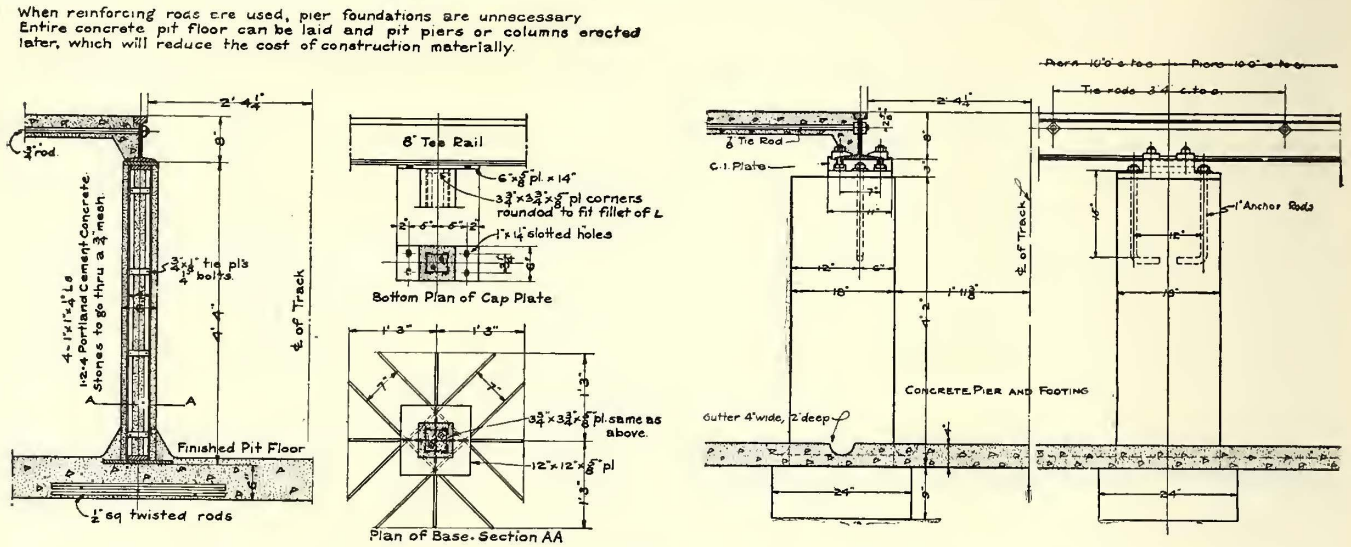
Sign Room.—It is convenient to have racks for the storage of signs used on cars, and they should be handy to the operating section, so that the shifting of signs can readily be made. There should be facilities for the posting of signs for dashers. This work can be done in a room set apart, as the work is untidy at the best.

Sand.—It is important to provide for the storing and drying of sand. The apparatus for the drying should be placed close to the operating end of the house and should allow circulation of air as well as of heat. The process of drying is slow at the best, so that it is well to have a large storage space adjacent to the heater. This space should be filled with air-dried sand in the summer, and, with the assistance of the heater, an ample supply can be kept on hand during the winter. Fig. 36 shows a type of sand drier economical to construct. The planks shown are laid louvre fashion, with open joints, and crossing over each tier of pipes are 3-in. x 3-in. angles laid with angle upward to permit free circulation of air through the sand.

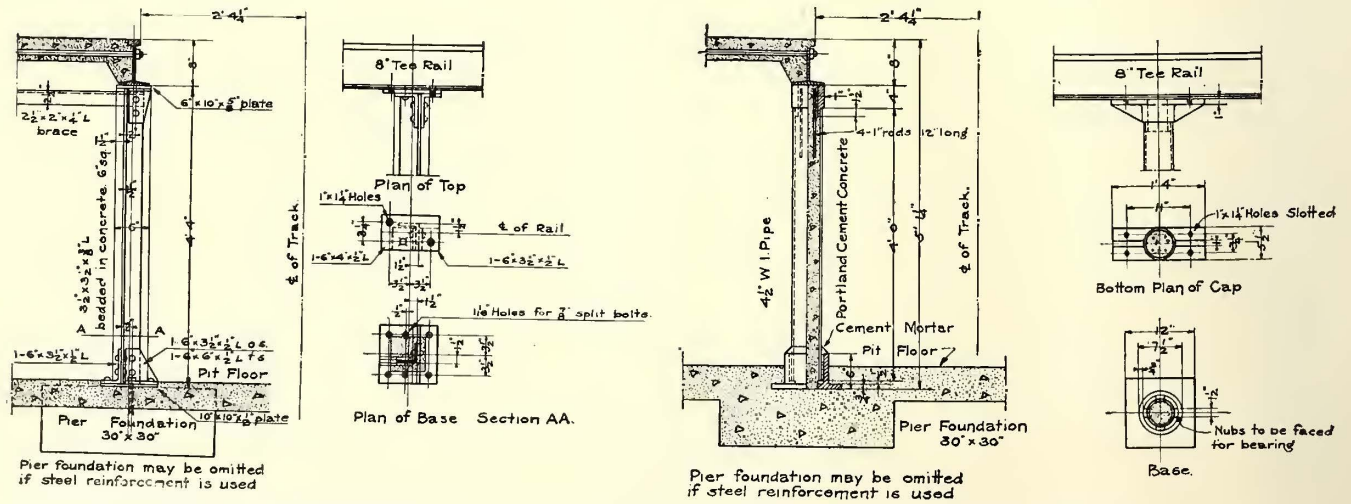
Salt.—Less space is required for the storage of salt; but full provision for its handling is just as necessary.

Heating.—The principal methods of heating car houses are by direct steam, hot water and hot air. The first method is largely used and is in great favor; the second is used to a great extent and is especially meritorious with forced circulation; and the third, while being an ideal heat for the pit room, is the most expensive for maintenance. The heating apparatus should be placed in a room cut off from the remainder of the house by fireproof walls, and it should be located centrally with regard to the places to be heated, but not so placed as to interfere with future additions to the building. The grade of the boiler room should be low enough for a gravity return and also to permit the supply of coal to be dumped direct from either coal cars or from carts.

Lighting.—While the lighting of a car house should be ample, it is a mistake to think that the current for the same



Figs. 32 and 33—Types of Pit Construction Using 8-in. T-Rail with Pier or Column Supports



Figs. 34 and 35—Types of Pit Construction Using 8-in. T-Rail with Pier or Column Supports

costs nothing and that it is unnecessary to keep down the number of lights, as it has been demonstrated that a five-light cluster of 16-cp lamps costs, for continual use, $35 per year.

The pit room should be well lighted, but a proper disposition of lights will make their number comparatively small. One satisfactory and economical arrangement is to place lamps on one side of pit about 18 ft. on centers (see Fig. 28). Each lamp is portable and enables the inspector to place it close to any desired point, and a hook attached to the lamp allows of its being hung up. Sufficient light should be provided in those places where trolleys are usually shifted.

For the sake of the eyes, light should not be stinted in the reading, report and other rooms attached to the lobbies. All interior wiring should be installed in conduits.

Road and Line Departments.—When quarters for the road and line departments are to be furnished, they should be placed so as to have yard room adjoining. The headquarters themselves should be of ample size to take the more or less bulky materials that are used. Proper provisions should also be made for the locking up of copper and other valuable portions of the stock.

Express Accommodations.—Companies doing or contemplating doing an express business may wish to establish a terminal at the car house. In such cases the room should be so situated that the express cars and teams receiving and delivering shall not interfere with the operation of the regular cars, and will not be in the way of future improvements to the house. It should also be placed so that the clerk in charge could, if he had spare time, do other duties connected with the general routine.

Posting.—Your committee favors the adoption of posts for the roof supports in preference to trusses. In the pit room they provide a means for supporting the car-handling apparatus; they are convenient for holding the aisle sprinkler pipes (see Fig. 37) and also the standpipes and hose. They can also be used to support brackets for the fire pails. Where there are posts it is easy to introduce curtain walls, either the entire height of building or dropped down 6 ft. or more from the ceiling. Plaster concrete partitions along lines of roof posts make excellent fire curtains. Fig. 38 shows a method of constructing curtain walls with 1-in. channel, wire laths and Portland cement plaster. The upper portion of the partition is finished ready for plastering.

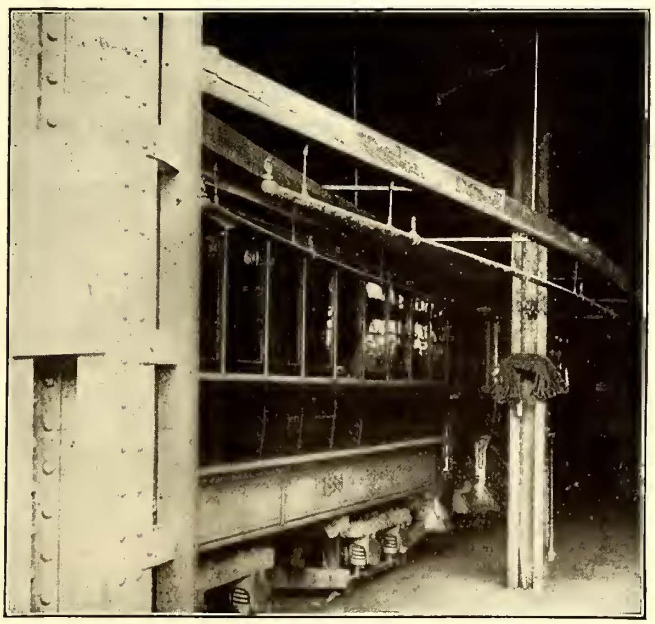


Fig. 37—Arrangement for Supporting Aisle Sprinklers by Attaching 4-in. x 6-in. Timbers to Sides of Posts

Trolley Troughs.—One of the most satisfactory ways of holding up the trolley wire is by a suspended plank. The plank serves not only this purpose, but also when the trolley pole leaves the wire, prevents the grounding of current through contact of pole with sprinkler pipes, etc., in the ceiling.

Fig. 36—Sand Drier, Economical to Construct

Bumpers.—At the dead end of every track, and 3 ft. from the wall, there should be a stop to prevent the cars doing damage. There are several kinds of stops, such as the common cast-iron shoe bolted to the rail or fastened with clipping blocks, and the bumping posts, consisting of hard pine timber buried in the ground or concrete. There is also the post secured with bolt and straps to the rail.

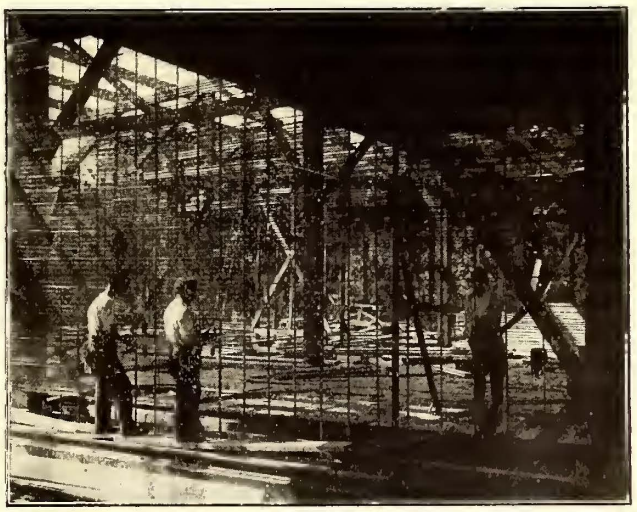


Fig. 38—Plaster Concrete Partition Serving as Fire Curtain

The common shoe has much in its favor, principally that

it does not interfere with the car fender. In these days of heavy cars, however, a bumper stop is preferred to a wheel stop. Fig. 39 illustrates several forms of bumper.

Doors.—Doors are necessary for those portions of the house which have to be heated and those storage portions that are seldom used. They are less necessary on other parts of the house and may be omitted if one is satisfied that there is no fear of intrusion by those bent on thieving, setting fire or malicious mischief, and no danger from the destructive inclinations of persons during labor troubles. It is desirable to have the doors swing out. Both swinging and roller types of doors are being used. The former has many points in its favor, and the latter is a great convenience where room will not permit the use of swinging doors.

Fire Exits.—In a car house of any size there should be small exit doors at frequent intervals in all outside walls. Lives have been lost through the absence of such doors.

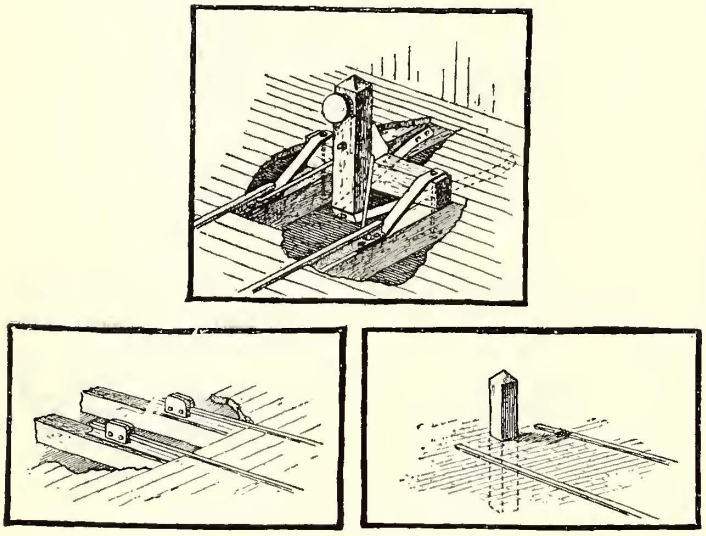


Fig. 39—Types of Bumpers

Other Details.—Your committee believes that some will think it should have considered more details, or considered more fully those that have been included, but the committee feels that an attempt to include the almost innumerable details of a car-house equipment (many of them quite important in their way) would not only make too long a report, but would, perhaps, encroach on subjects that could be better treated in separate papers.

Conclusion.—Your committee trusts that the treatment of the subject of this report may be of assistance to those who may be interested in the solution of the problems involved in car-house construction and maintenance, and aid them in obtaining for their houses facility and economy of operation, with a minimum expense of maintenance, maximum fire protection and regard for the health and safety of employees.

The *Elektrotechnische Zeitschrift* gives some account of the developments in electric traction in Sweden. It appears that conversion will take place shortly on all the lines north of Stockholm, except from Laxa to Charlottenburg, Orebro to Svanta, and that from Gothenburg to Stramstad. The system will be fed from five power stations, the current being stepped down at 35 substations 30 miles apart along the lines. The total length of line so supplied will be 1310 miles, of which 1230 miles will be single and the rest double track. The transmission voltage will be 50,000, and that at the trolley wires 15,000. The feeders are in duplicate and approach the line by different routes.

REPORT OF THE COMMITTEE ON ECONOMICAL MAINTENANCE*

BY F. H. LINCOLN (CHAIRMAN), W. H. COLLINS, JOHN LINDALL, FRED. HECKLER, W. H. M'ALONEY, TERRENCE SCULLIN, SYLVESTER POTTER.

In the appointment of a Committee on Economical Maintenance, the executive officers of the association were, no doubt, influenced by the fact that business conditions at that time were such as to necessitate the universal adoption by railroad companies, of stringent measures to reduce expenditures, and that this was an opportune time to look carefully into the question of economical maintenance of car equipment, and, as your committee understands, to determine as nearly as possible the following questions: What is economical maintenance? Where can enforced curtailment best be made? What lines should be followed to effect permanent reduction in maintenance costs?

The "economical maintenance" of a railway property involves many and various subjects, but your committee felt that it could render the best service by limiting the field and devoting its energies to the subject of car equipment maintenance.

It is appreciated that your various committes on "Standardization," "Maintenance and Inspection of Electrical Equipment," "Car and Car-House Wiring," etc., are working along lines which objectively are very largely for economical maintenance of car equipment; therefore, this committee has treated the subject rather broadly and has endeavored to take up only such matters as were not covered by other committees. To this end your committee respectfully submits the following report:

The objects of car maintenance are:

1. To prevent accidents due to defective equipment.
2. To prevent failures of service due to defective equipment.
3. To prevent excessive depreciation of equipment.
4. To maintain equipment comfortable and attractive to patrons and public.

Therefore, it is economical to spend as much money on maintenance as will produce results of greater value in any or all of these items, and in order to determine just how far maintenance should be carried and how frequently cars should be inspected, painted and overhauled, it would be necessary to determine the aggregate monetary value of the items mentioned above. However, as it is impossible to obtain accurate values for them, we must be governed very largely by judgment in the matter. A careful comparison of the various conditions, practices and results obtained are the best guides we have in forming our opinions.

CAR BODY MAINTENANCE

It is the opinion of your committee that under average conditions the practice of shopping car bodies for general overhauling yearly is most economical, and is recommended.

Table I shows an estimated comparison of work to be done and its cost when 25-ft. car bodies are shopped yearly and bi-yearly. This, of course, does not include repairs made necessary by accidents. It will be noted that the total costs for car-body repairs for a period of 10 years is $585 for the car shopped yearly, and $554.49 for the car shopped bi-yearly, and that the lack of that "stitch in time" is manifested in the increased costs of some of the items when the car is sent to the shop every second year. The cost of

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

hauling a car to and from the shop is given as $1.25 in each case. Where repair shops are located at terminals, this charge would be eliminated, and this would make the comparison show a little less favorably for the car shopped bi-yearly. On the other hand, it will be noted that the car shopped yearly, at the end of 10 years will have been in the shop 40 days in excess of the car shopped bi-yearly. Where both summer and winter equipments are used, this will make no material difference, but where it is necessary to take a car out of service for shopping, allowance must be made for equipment to take its place; also since the car is in the shops a longer time, proportionately larger shops must be maintained. The advantage of the yearly shopping and maintaining cars in the same condition each year are as follows:

A.—Less liability of accidents due to defective equipment.
B.—Less labor for car cleaning.
C.—Cars more attractive and comfortable to passengers.
D.—Less depreciation of car body.

TABLE I.—COMPARISON OF COST OF MAINTENANCE WITH CARS SHOPPED YEARLY AND BI-YEARLY.

Estimate of work to be done.	Cars shopped yearly. Time in shop, days.	Cost.	Total.	Cars shopped bi-yearly. Time in shop, days.	Cost.	Total.
First year	10					
Stripping trimmings, etc		....				
General woodwork repairs and tightening up		$5.00				
Cleaning and rubbing		10.20				
Touching up		2.70				
Painting		2.18				
Painting roof		2.95				
Varnishing		3.40				
Polishing trimmings, etc		.50				
Cleaning and renov., upholstering and curtains		1.00				
Hauling to and from shop		1.25				
			$29.18			
Second year	14			18		
Stripping trimmings, etc		$10.75			$10.75	
General woodwork repairs and tightening up		8.00			15.00	
Cleaning and rubbing		10.20			12.46	
Touching up		3.30			5.00	
Painting		9.56			15.10	
Painting roof		....			2.95	
Varnishing		12.18			13.45	
Polishing trimmings, etc		3.75			5.50	
Cleaning and renov., upholstering and curtains		2.50			5.00	
Hauling to and from shop		1.25			1.25	
Totals		$61.49	$90.67		$86.46	$86.46
Third year	14					
Stripping trimmings, etc		$5.00				
General woodwork repairs and tightening up		8.00				
Cleaning and rubbing		10.20				
Touching up		3.30				
Painting		9.56				
Painting roof		2.95				
Varnishing		12.18				
Polishing trimmings, etc		1.00				
Cleaning and renov., upholstering and curtains		1.50				
Hauling to and from shop		1.25				
Totals		$54.94	$145.61			
Fourth year	14			18		
Stripping trimmings, etc		$10.75			$10.75	
General woodwork repairs and tightening up		8.00			25.00	
Cleaning and rubbing		10.20			12.46	
Touching up		3.30			6.00	
Painting		9.56			15.10	
Painting roof		....			2.95	
Varnishing		12.18			13.45	
Cleaning and renov., upholstering and curtains		2.00			4.50	
Polishing trimmings, etc		3.75			6.00	
Hauling to and from shop		1.25			1.25	
Totals		$60.99	$206.60		$97.46	$183.92
Fifth year	14					
Stripping trimmings, etc		$5.00				
General woodwork repairs and tightening up		8.00				
Cleaning and rubbing		10.20				
Touching up		3.30				
Painting		9.56				
Painting roof		2.95				
Varnishing		12.18				
Polishing trimmings, etc		1.00				
Cleaning and renov., upholstering and curtains		7.00				
Hauling to and from shop		1.25				
Totals		$60.44	$267.04			
Sixth year	14			20		
Stripping trimmings, etc		$10.75			$10.75	
General woodwork repairs and tightening up		8.00			35.00	
Cleaning and rubbing		10.20			12.46	
Touching up		3.30			....	
Sandpapering and recoloring		....			7.00	
Painting		9.56			15.10	
Painting roof		....			2.95	
Varnishing		12.18			13.45	
Polishing trimmings, etc		3.75			5.50	
Cleaning and renov., upholstering and curtains		1.00			8.00	
Hauling to and from shop		1.25			1.25	
Totals		$59.99	$327.03		$111.46	$295.38
Seventh year	14					
Stripping trimmings, etc		$5.00				
General woodwork repairs and tightening up		8.00				
Cleaning and rubbing		10.20				
Touching up		3.30				
Painting		9.56				
Painting roof		2.95				
Varnishing		12.18				
Polishing trimmings, etc		1.00				
Cleaning and renov., upholstering and curtains		1.50				
Hauling to and from shop		1.25				
Totals		$54.94	$381.97			
Eighth year	14			20		
Stripping trimmings, etc		$10.75			$10.75	
General woodwork repairs and tightening up		15.00			45.00	
Cleaning and rubbing		10.20			12.46	
Touching up		3.30			5.00	
Painting		9.56			15.10	
Painting roof		....			2.95	
Varnishing		12.18			13.45	
Polishing trimmings, etc		4.00			4.00	
Cleaning and renov., upholstering and curtains		1.50			6.00	
Hauling to and from shop		1.25			1.25	
Totals		$67.74	$449.71		$115.96	$411.34
Ninth year	14					
Stripping trimmings, etc		$5.00				
General woodwork repairs and tightening up		8.00				
Cleaning and rubbing		10.20				
Touching up		3.30				
Painting		9.56				
Painting roof		2.95				
Varnishing		12.18				
Polishing trimmings, etc		1.00				
Cleaning and renov., upholstering and curtains		2.00				
Hauling to and from shop		1.25				
Totals		$55.44	$505.15			
Tenth year	14			20		
Stripping trimmings, etc		$10.75			$10.75	
General woodwork repairs and tightening up		15.00			60.00	
Cleaning and rubbing		10.20			10.00	
Touching up		3.30			....	
Burning off		....			8.00	
Painting		9.56			15.50	
Painting roof		....			2.95	
Varnishing		12.18			13.45	
Polishing trimmings, etc		3.75			6.75	
Cleaning and renov., upholstering curtains and new hand straps		14.00			14.50	
Hauling to and from shop		1.25			1.25	
Totals		$79.99	$585.14		$143.15	$554.49
Total time in car shops	136			96		

While it is a very hard matter to fix a definite value on these items, it will be agreed by all that when a car is thoroughly overhauled every year, there is less liability of accidents due to defective steps, flooring, traps and windows, door and seat mechanisms, than where such overhauling is done every second year. If such accident claims are made, the fact that the car had been carefully overhauled inside of a year would greatly improve the railway company's case in court, and it would seem that two cents per car per day would be a conservative estimate of its value.

It will also be conceded that a car which is kept well varnished can be kept clean with less labor than is the case where the lustre is gone and the paint exposed. This would amount to at least 10 per cent of the cost of keeping the woodwork clean, but as it would not affect the sweeping, dusting and cleaning of glass, 5 per cent of the total car cleaning is taken as a fair value.

A clean car excites pride in car crews, tends to make them more attentive to their personal appearance, their work more pleasant and, in consequence, they will render better service to the company. An attractive and comfortable car goes a long way toward making a satisfied passenger and well-disposed public. Schedules may be well arranged and carried out, and equipment may be ample, but without clean and attractive cars, the service will not be pronounced satisfactory, and, as many passengers ride for pleasure, to have cars attractive is one of the ways of increasing the business, and your committee considers 10 cents per car per day is a very conservative estimate of the value of improved appearance of cars.

Very few electric car bodies have been abandoned on account of deterioration. Many have been retired on account of being obsolete and unprofitable to operate. Therefore, the proper value for ordinary depreciation is hard to determine, but it is a well-known fact that where wood is exposed to moisture it will deteriorate rapidly; that paint and varnish will crack at joints if they are not kept well covered and the varnish elastic, and that floors and sills will rot if they are not kept well painted. Therefore, it is safe to estimate that the life of a car body which has received proper attention each year will be 10 per cent greater than one receiving attention every second year.

Assuming cars are used both winter and summer, allowing for charges occasioned thereby which have been already referred to, and for credits accruing from cars being maintained in better condition, we have a further comparative tabulation shown in Table II.

TABLE II.—SUMMARY OF COSTS AND CREDITS

	Cars shopped yearly. Costs.	Cars shopped yearly. Credits.	Cars shopped bi-yearly. Costs.
Car body maintenance (for 10 years)	$585.14		
Interest, depreciation, taxes and insurance (for 10 years) on additional equipment on account of being in shops 4 days per year more than when shopped bi-yearly	44.40		
Interest, depreciation, taxes and insurance (for 10 years) on additional shop room required when cars are shopped yearly	10.40		
Reduced liability of accidents (for 5 years at 2 cents per day)	....	$36.50	
Five per cent saving in cost of car cleaning for 5 years	....	84.65	
Value of car being more attractive and comfortable to passengers (at 10 cents per day for 5 years)	....	182.50	
Decreased depreciation or longer life of car body (10 per cent)	....	61.50	
Totals for 10 years	$639.94	$365.15	$554.49
Average per year	63.99	36.51	55.44

The averages per year in Table II show that while the cost per year for shopping the car yearly is $8.55 greater than when shopped bi-yearly the value to the railway company in maintaining cars in better condition amounts to $36.51 per year, making a net gain to the company of the difference between $36.51 and $8.55, or $27.96 per car per year. It should be understood that these figures are only approximate, the estimates being made after careful study and under different conditions may vary to some extent, but your committee feels that they point very definitely to the conclusions reached.

TRUCKS

In considering economical maintenance of trucks your committee would call attention to the importance of keeping trucks square, and free from excessive lost motion in pedestals and brake rigging. It is frequently thought that if trucks carry the car body properly, brake fairly well and do not derail, they must be in good condition. This is not always true, as a truck which is out of square may run a long time without derailment, but it is run at the expense of excessive flange wear, rail wear, power consumption and motor maintenance. Moreover, the truck which has excessive play between journal boxes and pedestals or lost motion or spring in brake rigging will of necessity have its brake shoes adjusted close to the wheels in order properly to brake the car. This means that the brake shoes are constantly dragging on the wheels and prevent the car from accelerating or coasting freely, requiring the motors to carry heavier currents and for longer periods. With motors normally worked to their full capacity, this is "the straw that breaks the camel's back" and results in flashovers, excessive motor temperatures, burn-outs, etc. Those having to do with maintenance of equipment are well aware of the fact that where motors are worked beyond their capacity both trouble and expense multiply very rapidly.

Wheel maintenance being an important item, your committee has given this matter careful consideration and is of the opinion that for ordinary city service, and with cars weighing less than 17 tons, the cast-iron chilled wheel is the most economical; and while it is not prepared to say that chilled wheels cannot be made safe and economical for interurban or elevated service, past experience of the committee leads it to believe that such a proposition is unsafe. Therefore, the choice of wheels for such service must lie between:

Steel-tired wheels,
Rolled-steel wheels,
Fused wheels, and
Cast-steel wheels.

Your committee has endeavored to obtain from representative member companies comparative data on the service and costs of such wheels, and while the data received were not sufficient to justify the drawing of definite conclusions, the committee does not hesitate to recommend that in the replacement of steel tires or steel-tired wheels the rolled-steel wheels be given careful consideration, and also to suggest that where track and special work is particularly severe on flanges, and where conditions permit the material reduction in the diameter of wheels by wear, the rolled-steel wheel may be found to be more economical than the cast-chilled wheel.

The cost of brake shoes on a large system is a very considerable item, and while the type and quality of shoes required are dependent to some extent on the equipment and service, your committee respectfully suggests that this is a point where economical maintenance can be studied to very good advantage, particularly with reference to reduction of scrap weights of brake shoes. On a system operating 2000 cars, the reduction of 2 lb. per shoe in scrap weight will effect a net annual saving of $1,200.

ELECTRICAL EQUIPMENT

This field being so well covered by the Committee on Maintenance and Inspection of Electrical Equipment, whose valuable work is all tending to economical maintenance, this committee will refer but briefly to that part of the car equipment. Your committee, however, recognizes the fact that the cost of motor maintenance is a very important item and one in which economical maintenance may well be sought for. But in considering ways and means for improving old equipment and reducing cost of repairs it is also well to consider the question as to whether or not it is more economical to dispose of old equipment and replace it with new, up-to-date equipment, better suited to the service and conditions.

One company last year replaced a large number of motors (which had been in service 15 years) with new motors of

larger capacity at a cost of $385,000. This effected a reduction in the cost of motor maintenance for one year, amounting to approximately 12½ per cent on the cost of new motors, and it is estimated that a further saving of $4,750 per year is made in the operating department on account of the reduction of failures in service.

Your committee has endeavored to determine at what age it is economical to scrap motors. However, after giving the matter careful consideration, it is unable to make a definite report, as this depends to a very large extent upon conditions and cost of maintenance, because motors that are ample for the service or that are not in continuous service can be operated economically for a much longer period than motors that have been overworked.

SUPPLIES

In the purchase of supplies your committee would call attention to the fact that the lowest-priced material is not necessarily the most economical, and may, indeed, prove to be the most expensive. A failure of brakes due to the use of a poor grade of iron may cost the railway company many times the price of the high-grade iron. Likewise, while the substitution of inferior insulating material, bearing metal, lubrication, car-body varnish, etc., may show decreases in the cost of those items, a higher maintenance cost on the whole undoubtedly will result. Without question the proper method of purchasing material in large quantities is in the open market and, on large systems, this must necessarily be done by persons not in actual touch with the use of the material. In this case your committee would suggest the importance and need of active co-operation between the purchasing and mechanical departments. The latter should furnish, so far as is possible, suitable and complete specifications for the materials required and should be prepared to test and report promptly upon such materials when received. This may require the services of a testing department, including a chemist.

Your committee feels that there is a general need of better knowledge on the part of persons responsible for the use of material, as to the most suitable material for the purpose required and the checking of such material to determine its quality. The lower grades of materials, such as iron, steel, bearing metal, etc., may be economically used in certain parts of the equipment and under certain conditions. This necessitates specifications for different grades of the same material.

Your committee respectfully suggests that this Association could do very valuable work in the preparation of suitable specifications for materials, and recommends for your consideration the appointment of committees for this work. The work should be divided so that committees would be composed of individuals directly interested in the respective materials; that is to say, the committee on specifications for car-body paints, varnishes, etc., should be composed of master painters; the committee on specifications for insulated wire and insulating materials should be composed of electrical engineers; the committee on specifications for iron and steel should be composed of men having to do with such material, etc.

ACCOUNTING

Believing that the cause of economical maintenance of equipment would be advanced and the railway companies profit thereby if your committee could include in this report some figures showing minimum, average and maximum costs of maintenance for various classes of equipment and service, the committee perpared a form which was sent to 300 companies with requests for such data; 255 companies made no reply, 24 companies replied with no data, 11 with data incomplete and 10 with data fairly complete. The committee regrets that, owing to the incompleteness of the data, the figures are not sufficiently representative to be of value, and would suggest the need of greater attention along this line.

The paucity of replies received and the very evident absence of consistency in shop and maintenance costs accounting impresses the committee very forcibly of the need of a uniform method of detail shop accounting by means of which accurate records of current shop and maintenance costs on car-mile or ton-mile basis may be maintained and quickly and intelligently compared with similar figures of other roads.

The committee is so thoroughly convinced of the necessity of such a method of accounting that it recommends the appointment of a committee jointly with a committee from the Accountants' Association for the purpose of giving this subject thorough consideration.

In conclusion the committee takes this opportunity to express its thanks to those who have so kindly given consideration to its efforts in preparing this report.

REPORT OF COMMITTEE ON WAY MATTERS*

BY C. H. CLARK, CHAIRMAN; T. K. BELL, C. A. ALDERMAN, E. O. ACKERMAN, G. L. WILSON, C. B. VOYNOW AND MARTIN SCHREIBER

Owing to the fact that great difficulty was experienced in getting concerted action by the members of the committee, it was at length found to be impossible to submit a report embodying the results of collective investigation, and as a substitute the several members were delegated to secure papers on various topics from authorities in the several lines, to supplement the opinions and recommendations of the committee. As a result of these efforts the following papers have been secured and form parts of this report:

"Proposed New System of Street Railway Construction," by C. B. Voynow, assistant engineer, Philadelphia Rapid Transit Company, Philadelphia, Pa.

"Life of Manganese Steel Rail On Curves—Its First Cost and Cost of Maintenance Compared with Commercial Bessemer Rail, from Service Tests," by H. M. Steward, roadmaster, Elevated Division, Boston Elevated Railway Company, Boston, Mass.

"The Open Tank Method of Preserving Timber," by Howard F. Weiss, chief, Section of Research, Office of Wood Preservation, U. S. Department of Agriculture, Washington, D. C.

On the subject of the preservation of timber it was the committee's desire to secure some statistics on the life of buried ties as against those in open track, as well as a comparison between ties that were treated and those that were not, but in this it was not successful.

The question of the use of T-rail in city streets, which is receiving the attention of many engineers, is one that should be investigated more fully. It is pleasing to note that the use of T-rail has advanced considerably in the last year, not only in the Western States, but also in the State of New York. During the present summer it has been laid in Syracuse and Utica, the Rochester, Syracuse & Eastern Railroad Company having laid it on all the important centers through which the road passes between Rochester and Syracuse.

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

While it is the unanimous opinion of the committee that this type of construction is the best for the purpose, it recognizes there are two sides to the question, and suggests that next year's committee be requested to investigate the conditions existing in the large cities in this country and make a full and comprehensive report at the 1909 convention. This report should cover the foundation, paving, joints, and best type of rail; also the cost of maintaining track and pavement.

The matter of standardization of high T-rails was taken up by the Southwestern Electrical & Gas Association at its annual meeting at El Paso, Tex., in May. A paper on this subject, read before that association, appeared in the Electric Railway Review of May 16, the *Electric Traction Weekly* of May 21, and the Street Railway Journal of May 23, and with the sentiments contained in that paper the committee is in hearty accord.

On the question of the comparative values of tie rods and brace chairs, the committee is of the opinion that while under certain conditions and with certain designs chairs might possess distinct advantages over rods, it is not prepared to make definite recommendations, and suggests that this subject be given more study and be more fully discussed before a decision is reached.

The question of rail corrugation has been so thoroughly discussed in previous reports and papers that the committee decided to leave it open for discussion on the floor of the convention, together with the question of track work in general.

PROPOSED NEW SYSTEM OF STREET RAILWAY CONSTRUCTION*

BY C. B. VOYNOW, ASSISTANT ENGINEER, PHILADELPHIA RAPID TRANSIT COMPANY

In view of the fact that the question of general adoption of T-rail for track construction in city streets is at present agitating many electric railway managers and engineers, especially with a view of inducing municipalities to permit its use, it is hoped that the proposed construction which is here presented will be considered timely and will be found worthy of serious and earnest consideration by this association. For, I think, it practically not only solves the question of T-rail construction, but also contains so many other advantages to city life, such as avoidance of noise, addition to the beauty of street, permanence of structure in street, etc., that it may in many cases help the granting of concessions from municipalities where under other conditions it would be refused.

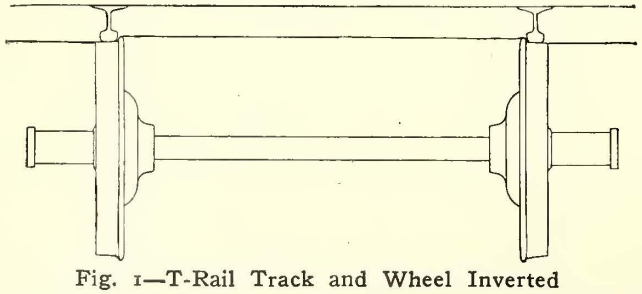


Fig. 1—T-Rail Track and Wheel Inverted

In essence the proposed system consists of a flangeless wheel and of a track built of a T-rail with a projecting flange above the tread which would guide the car. In other words, let us imagine the present wheels and T-rail track placed upside down and the proposed rail be made in the present shape of the wheels, while the proposed wheels to be made in the present shape of the tread outlined of the T-rail. Therefore the proposed construction would then be the exact reverse, as shown in Fig. 1. Converting the rail into a wheel and the wheel into a rail, the track would look as shown in Figs. 2 and 3.

Let us first analyze the doubts and objections that may be raised against this system, and which may be enumerated as follows:

1. Will the wheels stay on the track?
2. Dirt on the head of the rail.
3. Coning of wheels.
4. Why was it not introduced before?
5. Difficulty in changing the present system.

1. WILL THE WHEELS STAY ON THE TRACK?

The cause of the cars staying on the track may be stated as follows: When the present wheels travel along a railway the flanges of the wheels striking either gage line and projecting below the latter prevents them from running off the rail. Or, conversely, the head of the rail projecting into the L-shaped form of wheel tread and flange and striking against the flanges as the latter move along hold the wheels on the rail. In other words, the underlying principle may be announced as follows: Two peripheral projections rolling along and entering two stationary guides hold the wheels on the track. In the proposed construction exactly the same principle is involved, only with a reversion of terms. In the new construction the entire tread or rim of the wheel performs the functions of the present wheel flanges, and represents the two movable peripheral projections, while the upwardly projecting guards in the new rail act as the two stationary guides. Further down I shall analyze the questions of dirt, obstruction, sharp movable flanges as compared with the proposed thick wheel, etc., and in what respect the two systems vary; but, as far as the relations of the wheel flange to the gage surface of the rail are concerned, as a function of holding the cars on the track, the present and proposed constructions are entirely identical.

In connection with wheels and rails and in so far as their relations affect the present subject, there are four general cases when cars may be derailed.

a. Breaking of flanges.
b. Mounting of flanges on the vertical side of the rail.
c. Obstructions under the flanges of the wheel.
d. Obstructions under the tread of the wheel.

a. *Derailments due to breaking of flanges.*

The fundamental principle in all engineering design and construction is to distribute the material in all parts of the

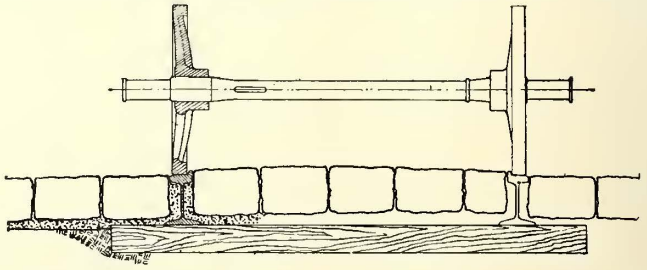


Fig. 2—Cross-Section of Street, Showing Proposed Track and Wheels

structure or system in such a way that the strength of each part shall be proportional to the stresses that it will have to bear. In the case of wheels on rails, especially on street railways, this law is disregarded; therefore there is a fundamental weakness in the system. The flanges of the wheels being not only under constant shear by the head

*Read before the American Street & Interurban Enginering Association, Atlantic City, N. J., Oct. 12, 13, 14, 15 and 16, 1908. Presented as part of the report of the committee on way matters.

of the rail, but when the track is not in perfect alignment and when going over special work, they are subjected to all kinds of stresses in all possible directions. Nevertheless, due to defects in the system itself, not because the condition is not understood by engineers, they are made almost infinitely weaker than the head of the rail; yet the latter, as far as holding the wheels on the track is concerned, is subjected only to a direct shearing stress by the flanges. The consequence is well known. A large proportion of the derailments is due to broken flanges, and the expense of maintenance of car wheels is tremendous, on some roads amounting from 20 per cent to 30 per cent of the expense of the maintenance of rolling stock. In the proposed system this fundamental weakness does not exist, the design of rail and wheels can be made in accordance with engineering laws as applied to other structures, since the shear caused by the traffic will be borne by the entire width of the wheel tread. Therefore, case "a" of derailments is entirely eliminated.

b. *Derailments due to mounting of flanges on rail.*

When the car in its travel swerves from side to side and the flanges press against the gage side of the rails, the friction between the flanges and the rails produces a tendency of the wheels to climb or mount the rail. But as the inclined surfaces of the flanges form a narrower wheel gage at the lower line than at the tread line, the downward pressure of the weight of the car prevents the wheels from actually mounting the rail. In the new system, as seen in Fig. 2 and in the enlarged view of the wheel and rail in Fig. 4, while this tendency of mounting and the causes opposing this tendency remain the same, nevertheless it must be considered that this tendency at its maximum

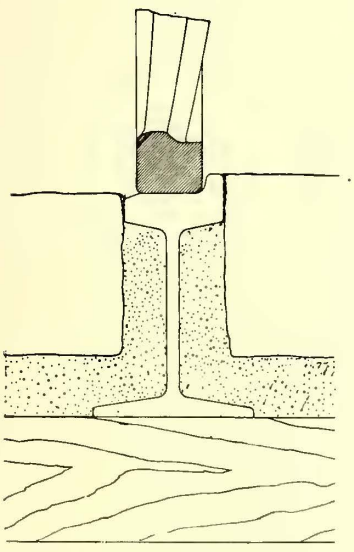


Fig. 3—Detail Section of Wheel, Rail and Street Shown in Fig. 2

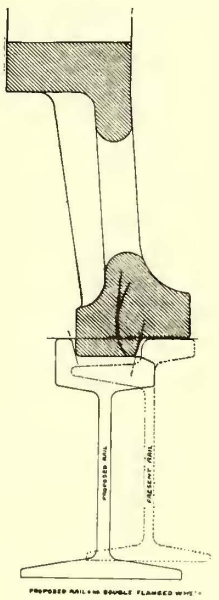


Fig. 4—Proposed Rail and Double-Tread Wheel

condition produces a tremendous shear in flanges, and, in case they have been either previously weakened by wear or originally having bad flaws, they give way at this critical moment. This danger is also entirely eliminated by the proposed construction.

c. *Obstructions under the flange of the wheels.*

In the construction as at present, and especially in special work, in traveling over narrow grooved rails or Trilby style rails, or in cases of widening of gage in tram rail construction—should there be an obstruction under the flange, it causes the wheel to mount, and should the car at that point swerve to the side where the obstruction lies, it may cause derailment. Such condition cannot exist in the system proposed.

d. *Derailments due to obstructions under tread of the wheel.*

In case there is an obstruction under the tread of the wheel and the car swings toward the side of the obstruction, a condition would be presented which is identical in both the present and proposed constructions, when the cars may be derailed. Should the car, at the time it strikes such an obstruction, swing away from it, under the present system the flange of the opposite wheel would press against the rail and prevent derailment. With the new rail and wheel, should the car swing toward the obstruction the flange of the opposite rail would act in a similar manner, so that the condition under which a derailment may occur is practically identical.

After this analysis of the four possible cases of derailment in the present system, it will be evident that in the new system cases "a" and "c" are entirely eliminated, case "b" greatly so, and only "d" retains the same features as at present, and, therefore, as a matter of fact, that the new track would be comparatively safer than the present one. In case a car does go off the track on account of unavoidable causes, it will run on broad-tired wheels instead of the thin flange, which breaks and cuts and destroys everything in its path, so that even in such an emergency it is more economical and safer.

2. DIRT ON THE RAIL

In cities the accumulation of dirt in the streets—which is due to abrasions of the paving, sand and other material working out from under paving, refuse from horses, wagons and houses—should cause the rail head to be covered with this refuse, yet we notice that the head of the rail is perfectly clean. Hence the question may be raised, which at first sight seems valid and reasonable, "How about dirt on the track?" The inference is that the cause of the rail being clean of dirt is due to certain inert particularities of the present construction. This fallacy is due principally to the psychological fact that when we meet with phenomena every day we are getting so used to it that we accept it as a matter of fact, without analyzing the causes that produce such phenomena. Further, one may have in mind the open tie T-rail construction as used in steam railroads, and also the idea that in street railway track the head of the rail is at the highest level, and therefore the dirt falls down to the lower level of the paving and tram. But neither of these is correct. In the uncovered tie T-rail construction, where the right of way is used exclusively by the trains, refuse does not accumulate except as regards dust, which is insignificant, and therefore under such conditions the question of dirt is not involved, and, in general, at least for the present, it is not proposed to supplant such open T construction on private right of way. In street railways it will be found that the paving on the outside of the rail head is from one-quarter to one inch higher than the head of the rail and tram, and therefore not only the dirt from the shoulders is dropped on the tread, but wagon wheels lift up the dirt from the tram and drop it on the head. The cause of the head of the rail being clean of dirt is solely due to traffic over the rail, and the comparative cleanliness is proportionate to the amount of the traffic. The wheels, with the weight concentrated upon them, clean

the rail principally by causing the dirt to be pressed out sideways, while that part of the dirt which, after being pressed down, adheres to the rail, is lifted up and partially thrown to the sides by the friction and rapid peripheral movement of the wheels, and what the first wheel fails to clean the successive ones accomplish. This is true of car as well as wagon traffic, except that the car wheels have the advantage of heavier weight, rapid movement, more concentrated traffic, and less space to clean, as the head of the rail is two-thirds as wide as the tram, and, further, to the fact that car wheels by their nature are kept cleaner than wagon wheels, which have in front of them the animals, a constant source of refuse, and which turn into the gutters and shelters and may carry slime, pitch and dirt. This is the reason that the head of the rail is apparently cleaner than the tram. But even with all the disadvantages cited, on very heavily wagon traveled streets, such, for instance, as Second and Third Streets, in Philadelphia, the fact is that the tram of the rails is just as clean as the tread of the rails in all kinds of weather. This is in spite of the fact that between the rails there is a maximum accumulatoin of dirt due to an increased abrasion, animal and freight refuse, and, further, that the two rails form a continuous trough in the center of the street which prevents the accumulated dirt from reaching the gutters and inlets, and therefore is proportionately distributed on the trams. This proves very conclusively that the cleanliness of the rail from dirt is due to traffic, and to that alone. That a difference of level has anything to do with this phenomenon is only a fanciful idea. It will now be superfluous to point out that in the proposed construction the track will be incomparably less subjected to dirt than at present, for it will be evident that not only will the wagons and cars travel in the same paths, and thus have a double cleaning effect, but from the cross-section of the street (Fig. 2) it will be seen that a continuous trough between the rails is avoided, the street having the highest level in the middle, with a uniform gradual slope toward the gutters, which will cause the refuse to work gradually to the sides.

Snow and Rain

So far as snow and rainwater are concerned, the proposed construction is ideal, and cannot be approached by the present railway construction. When snow plows go over the present trough-like track, it is a physical impossibility for them to get below the head of the rail, and sweepers are little better. The consequence is that the trough between the rails, or between the paving at the head of the rail and that of the tram, is left filled with snow, which has to be cleaned by the traffic. When the snow begins to melt these troughs form continuous canals filled with water and slush, and as the snow is piled up on the shoulders, the track drains are the only means of carrying off this water. But as the track drains are insufficient to carry off the water, even in case of heavy rains with clean streets, they are entirely inadequate to the task when blocked and partially frozen at the time of a thaw. The consequence is that the traffic proceeds through these watery canals, sputtering and splashing, injuring the wheels and car, sometimes burning out the motors, and causing in general a great loss of power. To a great extent the same condition prevails during rainy weather. In the proposed track, the paving between the rails being at the highest level in the street, the snow plow may be lowered close to this point of the pavement, and will practically leave no snow between rails; and after the sweepers pass over the track it will be left perfectly clean of snow and slush. With melting snow or during a rain the rails would be the driest part of the street, for the water, having no place to lie, will run off crosswise to the gutter instead of hundreds of feet along the tracks. And the most remarkable feature is the fact that absolutely no track drains will be required.

3. CONING OF WHEELS

Three reasons are advanced for the coning of wheels: first, to effect a slight gain of speed of the outer wheel over the inner on curves; second, to facilitate the adjustment of the speed difference of the wheels on the same axle having slightly different diameters; third, to facilitate the manufacture of wheels, in that they may be more easily withdrawn from the chills. The first two reasons are more of a theoretical than practical value, even for steam railroads, which have longer radii curves and in which the difference of wheel and track gages is much larger. To gain speed on curves the radius of the curve should bear a fixed relation to the coning of the wheels and the clearance of the flanges, and then there would be a gain only when the train moves at a certain speed. Both first and second reasons apply only with new wheels. But as this coning soon wears off, the wheel soon acquires a reverse coning; that is, becomes larger in diameter on the back of the tread, and acquires what are called false flanges. As to the question of withdrawing the wheels from the forms—most of the new wheels are ground before they are used, and this grinding can be applied to get cylindrical wheels without any extra expense. In electrical traction, where good contact between wheel and rail is of great importance for electrical as well as for tractive reasons, because the wheels have a grinding instead of a rolling action, this cylindrical wheel has a decided economical advantage.

4. WHY WAS IT NOT ADOPTED BEFORE?

Some foremost engineers, after the subject was described to them and all objections discussed, have concluded with the question, "Why was it not adopted before?" While this very question is an indirect admission that the proposition is good and practicable, and that the question is only a method of evading the issue, yet, due to the very high regard I have for the opinions of the engineers that have put this question, and because this very question has also worried me before I have broached this subject to others, I shall attempt to answer it.

In all human pursuits, whether sociological, industrial or engineering, there is a well-ascertained fact that once a certain system has been thoroughly established, it is accepted as a matter of course. All thoughts are directed on lines parallel to such systems, and it survives even after the conditions that brought it about have entirely changed or disappeared and the system has become obsolete. The majority of people become so firmly accustomed to the established ways that they are afraid of and will even resist the introduction of anything new. This is the cause of the Chinese backwardness, why the English industries are on the wane, and why Philadelphians have been so vehement against the introduction of electric traction. This, in a general way, can be given as the answer to the question of "Why was it not adopted before?" Going into particulars, it may be stated that in the early stages of railroad development of 130 or so years ago, engineering and manufacturing industries being in embryonic state, the simplest construction was naturally adopted. Rolled sections were unknown, iron forgings were very expensive, and even castings, which were the only irregular shaped iron available that was not of prohibitive expense, were of

the simplest construction. To build a track of considerable length with L-shaped short castings would have been extremely more expensive than one with flat strips of iron. While the latter required the wheels to be cast with flanges, the number of these irregular castings were so few compared with the long stretch of track, it was natural that flanged wheels and flat track, with a straight edge for a gage should be used. When the iron industries were developed and rolled sections were introduced, again the simplest form was the one first adopted; it was very easy to roll a flat right-angular shape, and it was the cheapest to spike to the longitudinal stringers. Irregularly shaped rolled sections were of a considerably later development, but then the idea of flanged wheels was firmly rooted in the engineer's mind. Of course, the traffic and equipment were so light that the question of special work was not involved. By the time that the iron industries, motive power construction, traffic and engineering were developed to such a state that the old idea could have been avoided, another and very serious obstacle appeared in the way, and that was the change from one system to another. This latter obstacle must have been the most serious to overcome, and, in combination with the old idea, probably created those barriers which prevented the thoughts of the engineering fraternity being directed in another channel. Although horse railways were the first to be built, nevertheless modern horse street railways, as compared with steam roads, were inaugurated much later, and as at that time irregularly shaped rolled sections had been considerably developed, the ideal conditions presented themselves for a change to a system which is here described. But right here was a striking example of the truth that the human mind is not revolutionary in its development. Instead of building a track that would suit the new innovation of horse tramways in cities, the tracks of which were laid in paved streets, and therefore presented entirely distinct and new features, the old experience of steam roads was adopted. A similar example of obsolete idea prevailing, but of more recent date, occurred when the horse lines were converted into electric ones. Here the reverse took place. Almost all the standards of horse car operation were embodied in the new construction, while, as a matter of fact, more steam railroad practice should have been applied. All this briefly is an answer to the question stated above.

5. DIFFICULTY IN CHANGING THE PRESENT SYSTEM

The most valid objection that may be raised to the proposed system is that, being so radically different from the present method, it would either require the partial suspension of traffic or would represent such formidable difficulties and would involve such an expenditure of money in changing over from the present to the proposed construction that it would practically preclude its adoption. This would be true. With all the advantages the new construction possesses, it could probably never be employed for reconstruction purposes were it not for the change-over method by means of the double-treaded wheels, as described below, which makes the conversion of present systems to the new as simple as the usual track reconstruction, but with the additional advantage of immediate financial returns in the large curtailment of the maintenance expense in special work and rolling stock.

In reconstruction, a division could be selected where the rails are worn out and require rebuilding. This division would be equipped with the crossings of the new construction over the guards of which the present flanged wheels could run. In the meantime a complement of cars equal to the number of cars required by this division would be equipped with the double-treaded wheels (as shown in Fig. 4). This could very easily be done, as there are always a number of cars in the shops. The curved special work of the new construction in this division would be put in during the night preceding the final change. After this the double-treaded wheels may be run on the tracks and the straight tracks may be reconstructed as usual. In some few cases compromise special work may be necessary to use, but this would form a small percentage, and generally this compromise work could be used for other locations of future reconstruction.

Having gone over all the possible objections that may be raised against the proposition, and having proved that they have no foundation, and that the new track in almost every case is vastly safer and is more practicable and better in every respect, I shall endeavor to show the great advantages the new construction represents in the enormous savings in maintenance and construction, its excellent appearance in the street, and the comfort it will give to the riding public and to the neighborhood.

ADVANTAGES

In going over the objections I have already mentioned some advantages the new system presents. In general they are as follows:

(a) Ideal Special Work.

1. Long life; most of the special work as permanent as the straight track.
2. No "bumps." The entire system will be "unbroken main line."
3. Extreme simplicity of manufacture. Manganese hard-steel centers, if any. No casting of intersections together is required.
4. Most of the special work will be built of the same rail as straight track. No special rails to carry in stock.
5. Cost at least 25 per cent less than at present.
6. No possibility of car derailments on account of tongue kicking; no riding on movable tongue.

(b) Ideal Rail Section.

1. Easy to roll.
2. Long life of head.
3. Long life of joints; as the rail is center bearing for both car and wagon traffic, the distribution of the stresses at the joints will be central.

(c) Ideal Roadbed.

1. Long life, on account of rail advantages cited, and also, as there are no side strains, the rails will stay permanently spiked to the ties.
2. Permanent paving, since the paving blocks have deep vertical sides to rest against and no cross vibrations, they will not heave up or sink, nor does the paving require any grooves.
3. Less metal exposed through the paving.
4. No track drains; the paving at the center of the street is at the highest level and the water will drain crosswise to the gutter.
5. No channel in the center of the street to collect water or slush.
6. Easy and thorough sweeping of snow bteween the rails.
7. Cleaner head on account of the traffic of cars and wagons (where municipalities so require) being concentrated on the same head, therefore a saving in motive power.
8. Wagons can turn out more easily.

(d) Ideal Wheel.

1. Long life; the wear can be through the entire chilled surface, and the chill may be made deeper.
2. No breakage.
3. Simplicity of manufacture, so far as casting, grinding and finishing are concerned.
4. Universality of use, whether city or suburban. In high-speed suburban transit the flanges of the wheels have

to be deep. In Massachusetts for speeds of more than 15 m.p.h. the flanges are required by law to be not less than 1⅛ in. deep; this means that the suburban cars cannot enter the city. In the proposed system the rails for high-speed running may be made with higher flanges, which will secure safety, while the cars may enter the heart of the city.

(e) General.

1. Avoidance of noise.
2. Comfort to passengers.

Each of the above mentioned advantages will give direct or indirect financial returns.

In conclusion, it should be stated that the foregoing describes a system proposed and worked out by Dr. George B. Taylor, assistant engineer of way, Philadelphia Rapid Transit Company, and the author.

THE OPEN-TANK METHOD OF PRESERVING TIMBER*

BY HOWARD F. WEISS, CHIEF, SECTION OF RESEARCH, OFFICE OF WOOD PRESERVATION, U. S. FOREST SERVICE, WASHINGTON, D. C.

The purpose of this paper is to discuss briefly the history, theory and practical application of the open-tank or non-pressure process of preserving timber.

The successful impregnation of wood with preservatives without pressure was first brought before the public in 1867 by Prof. Charles A. Seely, a citizen of New York. The principles which Prof. Seely then described are in a large measure the same as those now accepted and employed. The general impression at that time that our timber supply was inexhaustible, coupled with the comparatively low price of lumber, caused Prof. Seely's process to attract very little attention. In fact, records show no trace of its commercial application, and practically no progress was made with it until the Forest Service carried on a series of tests at the Louisiana Purchase Exposition at St. Louis, in 1904. At the exposition a number of different kinds of wood were treated by the open-tank process, and many efficient results were secured. These led to its more extensive study—a study which the Forest Service is still actively developing. A similar series of tests was carried on at the St. Louis Fair by the promoters of the Guissani process. The principles involved were in a large part identical with those of Seely. I believe there are two commercial plants in Italy in successful operation treating wood by the Guissani process. The Forest Service has carried on a large number of tests in various parts of the United States to develop the open-tank method. Different kinds of timber have been treated in co-operation with telephone, mining, lumber, railroad companies, etc., and enough information has been obtained to place it on a sound practical basis.

All wood is more or less porous and contains various amounts of air and water. If the wood is thoroughly saturated with water, no preservative can be forced into it. It is essential, therefore, in any preservative process to reduce the amount of moisture to a point where a satisfactory treatment can be obtained. In the open-tank method this is accomplished chiefly by air seasoning. The same means are also employed in a number of processes where pressure is applied. There is no doubt but that air-seasoned wood is in a better condition for treatment than green wood. The chief drawback to air-seasoning is that it necessitates a large storage yard and a tied-up stock which is subject to a fire risk and accumulating interest. Moreover, demands of business sometimes make it imperative to cut the timber in the woods and ship it to the preserving plant for immediate treatment. In such a case no recourse can be had to air-seasoning. Again, if the timber is not properly piled and is held for a long period in a seasoning yard it is liable to decay, especially in certain portions of the South, where the atmosphere is warm and damp. It is frequently necessary to devise some means whereby the wood can be quickly seasoned, and the following methods are practised: steam seasoning, oil seasoning. Saturated steam is practically the only kind now used. Superheated steam is so difficult to regulate properly that the wood is in great danger of being charred, and its use has now been largely abandoned. The chief objection to saturated steam is that it does not dry out the wood; it is effective only as a heating medium, and a vacuum must be subsequently applied in order to get the moisture out of the wood. If seasoned wood is subjected to saturated steam it will take up water. When green wood is heated in oil at a temperature above the boiling point of water, it decreases in weight, because the sap and water which it contains are vaporized and driven off. Its effect as a heating medium, therefore, is directly opposite to that of saturated steam. Few plants employ oil as a heating medium, but it seems highly probable that it will come into more general use. The chief difficulty at present is to drive out the moisture without affecting the physical properties of the wood. Oil-drying is used in the open-tank method to prepare green timber for the reception of the preservative. It takes considerably longer and it is more expensive to dry out wood containing 80 per cent moisture than it is to dry out that containing only 20 or 30 per cent. Seasoned wood, therefore, is recommended for the open-tank process whenever possible.

Wood is made up of a mass of united bodies called "cells." These vary in number, size, composition, form, density, etc., according to the character of the wood, or, more properly, the character of the wood depends upon these factors. The cells are bounded by cell walls composed chiefly of cellulose. All tests made thus far fail to detect the presence of creosote in cell walls. If this is the case, it can occur only in the cellular and intercellular spaces of the wood. In the open-tank process impregnation with a preservative is accomplished by heating the air and moisture in the wood and then cooling them. The cooling causes a vacuous condition, which is destroyed by the entrance of the preservative. An illustration in which the figures are all approximate may serve to show this more clearly. A cubic foot of air-seasoned loblolly pine weighs approximately 35 lb. This is made up of a solid (cellulose), liquid (sap), and a gas (air). Assume now that the air and sap are driven out of the wood by heating. The cubic foot of wood then weighs 30 lb., and will be made up of 30 per cent solid matter which cannot be impregnated; 70 per cent, however, will be cellular and intercellular space, which, if completely filled with creosote, will give an absorption of 45.7 lb. This may be termed the maximum theoretical absorption. In practice all of the air and water cannot be driven out of the wood by heating. Neither can a perfect vacuum be obtained by cooling. The maximum practical absorption, therefore, is always less than the theoretical absorption. An absorption of 38 lb. of oil per cubic foot, or an efficiency of 83 per cent, based on a theoretical absorption, has been obtained by the open-tank method with the species mentioned.

The resistance offered by the cell wall to the entrance of the preservative is a problem of great practical impor-

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

tance, and one which is not at present well understood. Sap wood can almost without exception be far more easily treated than heartwood. This resistance appears a distinct problem altogether from the density of the wood, and may be due to the liquification of the cell walls. Heart red gum, subjected to a pressure of 800 lb. per square inch, could not be penetrated, although this wood is by no means of a dense structure. In such cases, therefore, it seems very probable that the application of pressure alone will assist the treatment to any appreciable extent.

It is safe to state that the sap wood of practically any species can be completely impregnated by the open-tank process. The amount of preservative injected per cubic foot can be varied without affecting the penetration. In other words, a "full" or "empty" cell treatment can be easily obtained. Tests made on loblolly mine props showed a penetration of 3½ in., while the absorption of the creosote varied in amount from 6 to 18 lb. per cubic foot. The amount of absorption is controlled largely by the degree and duration of the heating and cooling periods. If held for a long time in hot oil and then submerged in cold oil until no further cooling takes place, the wood will be thoroughly saturated. If heated in hot oil and then submerged in cold oil for only a short period, the cells of the wood will be only partially filled with the preservative. A similar result can be obtained by heating, cooling and then reheating the oil and wood.

When it is desired to impregnate the wood with an aqueous solution, such as zinc chloride, it is first heated in oil and then submerged in the cold water solution. Poles cut from Western yellow pine were treated in this manner in California, and the zinc chloride penetrated to a depth of 4 in. The absorption of dry zinc chloride varied from ½ lb. to 2 lb. per cubic foot. The amount of absorption was controlled by the strength of the solution and the duration of the hot and cold baths.

It can be seen that the open-tank process admits of a wide range of successful treatments for round timbers, such as posts, poles, props, etc. A mistake commonly made with sawed or hewn timbers, especially with cross ties, is that heartwood or some species unadapted to treatment is specified. It happens at present that the more abundant and cheaper woods are almost always the ones best suited to preservative treatment. In a great many cases these can be more advantageously used than the more expensive varieties. Tests made in Louisiana without pressure on heart long leaf pine ties showed the creosote had penetrated ½ in., which is a good treatment for this class of material. The heartwood of practically all species is very difficult to treat by any process, and in some it cannot be treated at all.

In all pressure processes all portions of the timber are given the same treatment; thus the top of a telephone pole or fence post gets as much preservative as the butt. It is well known that in many parts of the United States a top treatment is not necessary. In the open-tank process the whole pole, or only a portion of it, can be treated. This saves very materially in the cost of the preservative. Fence posts were treated in Alabama in which the butt portion was penetrated with creosote to a depth of 1½ in., while the top was given only ½ in. There is no good reason why the top of a post should be preserved longer than the butt. The open-tank process enables the treatment to be adapted according to the conditions to which the wood will be subjected. This must, in many cases, be acceded to be a distinct advantage over any pressure process.

There are at present two general types of open-tank plants in use. In one the wood is moved during the baths, while in the other the preservative is moved. The former is the simpler type and the one best suited to the treatment of fence posts and other small timbers, where a cheap plant is desired, or when only a small amount of timber is to be treated. These plants may be built for as little as $5. Those commonly used by the Forest Service cost from $35 to $180 each, and have a capacity of from 50 to 200 posts per day. When large, heavy timbers, such as cross ties, mine props, poles, etc., are to be treated, it is cheaper to build a more expensive plant and to move the liquid rather than the wood. These plants are largely patterned after the pressure plants, but can be built at a much less cost on account of the lighter material and machinery used in their construction. A plant, including a treating cylinder 50 ft. long and 6 ft. in diameter, will cost about $8,000. Plants of this type consist of a horizontal cylinder of ¼-in. steel, with swinging doors locked by bolts. A small dome is fitted on the top of the cylinder and connected with a surface condenser. The vapors which pass off from the wood and oil during the hot bath are run through the condenser and can be turned back into the treating cylinder or into a waste. The cylinder is fitted with a track for running the cars in and out, with steam coils for heating the oil, and with thermometers for recording its temperature. One or more closed measuring tanks are built either directly over or to one side of the treating cylinder, so that the preservative can flow by gravity. These tanks are fitted with a gage which shows the absorption of the preservative. A receiving tank is built in a pit so that the oil may run from the treating cylinder into it by gravity. It is then pumped back into the measuring or storage tanks.

To recapitulate: Practically all kinds of wood adapted to preservation can be satisfactorily treated by the open-tank process in a wide variety of forms, such as ties, poles, piles, posts, shingles, props, etc. The process can be varied so that the cells of the wood can be thoroughly or only partially filled with the preservative, thus giving what is called the "full" and "empty" cell treatments; it is adapted to the use of oils or salts or combinations of the two; it enables a variation in the treatment of the same stick, thereby economizing in the absorption of the preservative and concentrating it where it is most needed; and lastly, the absence of high pressure enables the construction of plants relatively low in cost.

The practical development of this process is very recent, and there are a great many problems remaining to be solved. The latter is also true of the various pressure processes, and in order to test all thoroughly and impartially, and to determine the best use to which each is adapted, the Forest Service is erecting a laboratory in Washington that will be the most complete of its kind in existence. This laboratory will have retorts capable of withstanding pressures up to 500 lb. per square inch, and will have a complement of force, air and vacuum pumps so that a wide range of methods may be tested. It is the policy of the Forest Service to encourage the preservation of timber just as vigorously as its means will permit, and it will welcome all criticisms and suggestions tending to advance the work, and by so doing aid in its endeavors to conserve our forest resources.

The St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo., has just completed and placed in operation an extension of its street railway system from Krug Park to the Industrial Development property, 1½ miles north.

LIFE OF MANGANESE STEEL RAIL ON CURVES—FROM SERVICE TESTS MADE ON THE ELEVATED DIVISION OF THE BOSTON ELEVATED RAILWAY COMPANY*

BY H. M. STEWARD, ROADMASTER, BOSTON ELEVATED RAILWAY COMPANY, BOSTON, MASS.

Within a few months after the elevated division of the Boston Elevated Railway Company was opened for traffic (June, 1901) it was found that the rails on the curves were wearing out at an unprecedented rate. As about 40 per cent of the entire length of the line is curved, the question of maintenance and the cost of rail renewals became, and still is, a serious problem.

The tracks on the elevated division were first laid with Bessemer rail having a low carbon element (about 0.45 per cent) and the life of the outer rail on the sharp curves was very short, averaging about 60 days. On account of this excessive rail wear, the railway company determined to make a trial of manganese steel rail, and a curve in the subway near Park Street station, having a center radius of 82 ft., was selected for the trial. In 1902 the outer rail of the curve was relaid with manganese rail. These rails were cast in 20-ft. lengths, conforming as nearly as possible to the A. S. C. E. 85-lb. section, and were purchased of William Wharton, Jr., & Company, Inc. The Bessemer rail which was in the track immediately preceding the installation of the manganese rail wore down 0.065 ft. in 44 days, as shown in Fig. 1. The manganese rail remained in service up to August, 1908, when it was removed on account of an accident. It will, however, be replaced in the track within a short time and will be allowed to wear out completely. Fig. 2 shows the result of this experiment after the manganese rail had been in service 6 years, 3 months and 7 days, or 2291 days. The amount worn from the top to the rail, only 0.046 ft., is certainly remarkable and illustrates the great resistance this metal offers to rolling friction. The comparative wear of ordinary as against manganese steel for a period of 2291 days is graphically shown in Fig. 3.

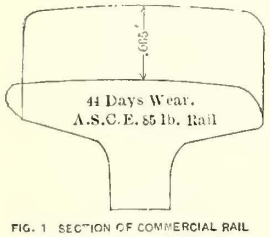


FIG. 1 SECTION OF COMMERCIAL RAIL LAID MARCH 13TH AND REMOVED APRIL 20TH 1902.

FIG. 2. SECTION OF MANGANESE STEEL RAIL, LAID APRIL 26TH 1902. ABOVE SECTION TAKEN AUG. 3RD. 1908. RAIL IN SERVICE 2291 DAYS, OR 6 YEARS. 3 MONTHS 7 DAYS.

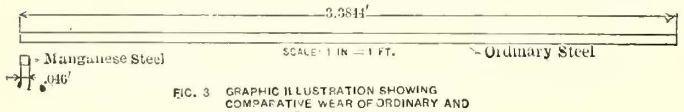


FIG. 3 GRAPHIC ILLUSTRATION SHOWING COMPARATIVE WEAR OF ORDINARY AND MANGANESE STEEL FOR 2291 DAYS.

The traffic over this piece of track in 1902 was, of course, much less than at present, averaging probably 1000 cars, or 36,000 tons, per day, as against 1700 cars, or 62,000 tons per day, as present. Consequently the manganese rail, on account of the constant increase in traffic, has given even better service than the comparative results show. Other instances could be cited, but in these cases the manganese rail has not been in service such a long period of time, although the comparative results are equally as good. This one example, however, is probably sufficient to illustrate the long life and value of rails made from this metal.

In 1902 and 1903 the railway company purchased about 700 ft. of manganese rail at an average cost of $5 per lin. ft. The cost of Bessemer rail, to this company, averages about 0.39 cents per lin. ft.

From time to time we have made other experiments with special rollings of Bessemer, nickel and open-hearth rails. In 1903 the Cambria Steel Company furnished us with some Bessemer rail having a carbon element of about 0.78, the wearing qualities of which were very satisfactory when compared with ordinary Bessemer rail and were far better than the nickel and open-hearth rail which we have obtained up to the present time. None of these rails, however, approached the manganese rail in length of life.

COMPARATIVE LIFE OF SEVERAL KINDS OF STEEL RAILS ON TYPICAL SHARP CURVES. SPEED OF TRAINS FROM 8 TO 10 M.P.H.

Location of curve.	Radius.	Ordinary Bessemer Rail. Mo.	Ds.	High carbon Bessemer Rail. Mo.	Ds.	Nickel Rail. Mo.	Ds.	Manganese Rail. Mo.	Ds.	Open Hearth Rail. Mo.	Ds.
Park St., S. B., (subway).	82 ft.	2	3	8	18†	3	12†	76	4*	1	11
Adams Sq., N. B. (sub'y).	89 ft.	2	17	10	15	4	4†	80	10†	1	27
Park St., S. B. (subway)..	90 ft.	2	16	10	11†	4	3†	66	15*	1	20†
Haverhill St., N. B.....	100 ft.	4	3	11	13	6	19	128	9†	2	21
Sullivan Sq. loop.....	106 ft.	3	7	13	8	5	7†	101	5†	2	7

*Still in service. †Estimated life from actual results on curves of similar radii.

As it is of interest to compare the life of different brands of rails under the same conditions, I have selected five curves of short radii and have prepared a tabulation showing the comparative life of five different kinds of rail.

We have not been able actually to test all of these rails on each of the curves, but from the actual results obtained on curves of similar radii we are able closely to estimate the life of the rails. In the preceding table these comparisons will be found.

The general use of manganese steel on tangents does not seem to me to be advisable. Even under the severe traffic of the elevated division ordinary rail has given fairly satisfactory service for over seven years. Our tangent rail does not, of course, receive such hard usage as that on steam roads, and the joints do not suffer from the pounding of heavy locomotives. Manganese steel, while offering great resistance to grinding friction, will not, in my opinion, offer as great resistance to heavy blows on account of its ductility. Under heavy locomotive service I should say that the joints would batter and bend down some time before the rail would otherwise wear out. Its high cost also prohibits its use for this purpose.

In our service we find that manganese rail will not withstand side wear equally as well as top wear. The grinding friction from the flat of the tire does not seem to have the same effect on manganese steel as the cutting action of the flanges, and we have found it advisable to protect the side of the head of manganese rail, holding the flanges away from it by means of a check or guard rail fastened securely to the inner rail of the curve. As the guard rail can be readily lubricated, it does not wear out particularly fast and we can afford to allow it take the side wear and in this way protect the manganese rail.

On account of the excellent results obtained from manganese steel, the railway company purchased during the last two or three years about 4700 lin. ft. of this rail at an average cost of $6.70 per ft.

All the manganese rail used by the company up to the present time has been cast in lengths not exceeding 20 ft. On account of its having been necessary to cast the rail, the

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

cost has been exceedingly high, due not so much to the cost of the metal as to the labor involved in making the patterns, casting, and especially in finishing the rails. As it is not possible to machine the metal, the only way it can be finished to form is by grinding.

Recently the question of rolling manganese rail has been taken up by two companies in this country, and at least one in England. It is proposed to roll manganese rail in lengths up to 33 ft. and of any section desired. The Boston Elevated Railway Company has not as yet obtained and made a trial of rolled manganese rail, but is about to do so, and has already placed orders for a limited quantity. When the rolled manganese rail is received the company proposes to make a comparative test with cast manganese rail of the same quality as was used on the Park Street curve. If the rolling of manganese rail is found to be successful and the metal is equally as good as when cast, the cost ought to be very much less than at present and the use of the material for track purposes should increase.

We have also used manganese steel extensively in frogs, switch points, etc. The difference in life, between manganese steel and and rolled rail frogs and switch points, is great enough to warrant its use and will more than pay for the difference in first cost alone, while if the cost of maintenance is taken into consideration manganese steel is the cheapest metal that can be used.

As to the comparative cost of maintenance, the general mantenance of track, outside of rail renewals, should not vary appreciably whether the track, be laid with manganese rail or bessemer rail. Taking the curve at Park Street as a basis, and assuming that the life of manganese rail at this point would be eight years and that of bessemer rail about two months, I should say that the following figures would be a fair estimate of the comparative cost of maintenance per linear foot of single rail for a period of eight years:

Cost of manganese rail per foot	$6.70
Bonds, spikes, etc	.09
Labor	.22
Total cost of maintenance	$7.01

Cost of bessemer rail per foot (50 renewals)	$19.50
Spikes, bonds, etc	3.25
Renewal of ties, account "spike killing"	2.90
Labor	15.50
Total	$41.50

This comparison, you will understand, is made from one specific case in which the costs can be very closely estimated. The same proportions might or might not apply in other instances.

The results we have obtained from the use of manganese rail on the elevated division have been very satisfactory, and our experience would seem to show that railways operating under similar conditions should make liberal use of this material.

REPORT OF THE COMMITTEE ON CAR AND CAR HOUSE WIRING*

BY G. W. PALMER, JR., C. B. KING, L. P. CRECELIUS, HUGH HAZELTON AND S. M. COFFIN

Your committee on car and car house wiring respectfully submits the following report:

Prior to the convention held in the latter part of 1907 there was in existence a committee on car wiring appointed by and reporting to the American Street & Interurban Railway Association. This committee had certain matters committed to its charge concerning which it reported to the American Association at the last convention. In this report the suggestion was made that further consideration be given to matters which had not been satisfactorily settled at the date of the report. Subsequently the American Association thought it advisable to transfer its committee on car wiring to the Engineering Association, and President Simmons therefore appointed the present committee, requesting that it consider the matters suggested by the committee of the American Association last year, together with such other matters as might properly come before it.

The 1907 edition of the "National Electrical Code" of the National Board of Fire Underwriters contained in the sections providing for wiring and equipment of cars and car houses certain provisions which were thought to be unduly severe and capable of modification without hardship to any of the interests involved. The provisions referred to related to the method of installation of heaters, the size of bonds required for rail joints in car houses, and the lighting of cars, and were as follows:

Rule 32f, Lighting and Lighting Circuits, Paragraph 1. "Each outlet to be provided with an approved porcelain receptacle or an approved cluster. No lamp of over 32 cp to be used."

Rule 32g, Heaters and Heating Circuits, Paragraph 2. "Panel heaters to be so constructed and located that when heaters are in place all current-carrying parts will be at least 4 in. from all woodwork.

"Heaters for cross seats to be so located that current-carrying parts will be at least 6 in. below underside of seat—unless underside of seat is protected by not less than ¼-in. fire-resisting insulating material or 0.04-in. sheet metal with 1-in. air space over same, when the distance may be reduced to 3 in."

Rule 33e, Car Houses, Paragraph 3. "Must have all rails bonded at each joint wth a conductor having a carrying capacity at least equivalent to No. 00 B. & S. gage annealed copper wire, and all rails must be connected to the outside ground return circuit by a not less than No. 00 B. & S. gage copper wire or by equivalent bonding through the track.

"All lighting and stationary motor circuits must be thoroughly and permanently connected to the rails or to the wire leading to the outside ground return circuit."

On the subject of modification of rules covering heaters and heater circuits, several conferences were had with the representatives of various heater manufacturing companies, the motive power departments of railway companies and the representative of the Underwriters' National Electric Association.

As a result of which the electrical committee of the Underwriters' National Electric Association, at its meeting held in New York City, March 25 and 26, of the current year, adopted the recommendation of their sub-committee that a new sentence be added to Rule 33g, Paragraph 2, reading as follows:

"Truss-plank heaters to be mounted on not less than ¼-in. fire-resisting insulating material, the legs or supports for the heaters providing an air space of not less than ½ in. between the back of the heater and the insulating material."

There were also adopted at the same time the following recommendations of the sub-committee:

Rule 32f, Paragraph 1, to be changed to read as follows:

"Each outlet to be provided with an approved porcelain receptacle, or an approved cluster, no lamp consuming more than 128 watts to be used."

Rule 33, Section e, Paragraph 3, change "No. 00 B. & S. gage," in third and seventh lines of paragraph, to "No. 0 B. & S. gage," the revised rule being as follows:

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

"Must have all rails bonded at each joint with a conductor having a carrying capacity at least equivalent to No. 0 B. & S. gage annealed copper wire, and all rails must be connected to the outside ground return circuit by a not less than No. 0 B. & S. gage copper wire or by equivalent bonding through the track. All lighting and stationary motor circuits must be thoroughly and permanently connected to the rails or to the wire leading to the outside ground return circuit."

These recommendations of the electrical committee were adopted by the Underwriters' National Electric Association, and will be printed as adopted in the new edition of the "National Electrical Code."

During the consideration of the matters connected with heaters and heater circuits it appeared that attention might well be given to a redesigning of car heaters, particularly of the panel type, with benefit to all the interests concerned. It appeared that a change in the design could be made which would result in a revision of the requirements of the underwriters for installation which could be more easily satisfied in the construction and the equipment of cars.

Your committee has been unable to give proper consideration to the question of whether it is possible to construct standard specifications for car and car house wiring. The types of equipment and differences in construction of car houses, and also the diverse opinions in relation to requirements for lighting and equipment seem, however, to render it doubtful as to whether anything could be accomplished in this line. A further consideration of this matter, however, might lead to a contrary determination.

MR. SIMMONS AS A PRESIDING OFFICER

The experience of President Simmons in way matters was undoubtedly of great assistance to him in keeping good track of the program and in maintaining the speakers in alignment with the subjects under discussion—two necessary qualities in a chairman. Seriously, Mr. Simmons made an excellent presiding officer for the Engineering Association. He is not only thoroughly conversant with all branches of railway engineering, but also has the happy faculty of eliciting and elucidating the important facts in the topics being considered. The engineers had arranged a long program with committee reports upon nine technical subjects, not to speak of the Question Box. The delegates soon demonstrated that they had no union cards in their pockets, however, for they started promptly and worked overtime. In fact, everyone present seemed to enjoy the meeting—that is, all except the official stenographers, who had to work in relays to keep up with the discussion.

Theodore P. Shonts, president of the Interborough-Metropolitan Company, of New York, at the meeting of the Gulf Deep Waterways Association, in Chicago, on Oct. 9, declared that because of hostile legislation and fear of owners of railroad securities that they will not be allowed to manage their own properties, the railroad development of the country is at a complete standstill. Mr. Shonts spoke of the political operation of the transportation lines by commission in New York State, and told of the broad powers that it has. State regulation under such a statute, he said, is in effect State prohibition of new enterprises and State operation of existing railroads. The solution of the problem of continuing railroad development and creating additional facilities which should now be under active construction, Mr. Shonts said, rests in giving the railroads a square deal.

QUESTION BOX OF THE ENGINEERING ASSOCIATION*

KEY TO REPLIES TO QUESTION BOX.

No. Name.

1. Akron, Ohio, Northern Ohio Traction & Light Company; William Roberts, superintendent of motive power.
2. Augusta, Ga., Augusta-Aiken Railway & Electric Company; J. H. Adams, electrical engineer.
3. Austin, Tex., Austin Electric Railway Company; W. J. Jones, president and manager.
4. Baltimore, Md., United Railways & Electric Company; William A. House, president.
5. Boston, Mass., Boston & Northern Street Railway Company; E. W. Holst, superintendent of equipment.
6. Boston, Mass., Massachusetts Institute of Technology; Prof. Dugald C. Jackson.
7. Boston, Mass., Massachusetts Institute of Technology; Prof. George C. Shaad.
8. Clinton, Iowa, Iowa & Illinois Railway Company; P. P. Crafts, general manager.
9. Columbus, Ohio, Columbus Railway & Light Company; E. O. Ackerman, engineer of maintenance of way.
10. Connellsville, Pa., West Penn Railways Company; G. R. Folds, general manager.
11. Connellsville, Pa., West Penn Railways Company; G. M. Wells, master machanic.
12. East St. Louis, Ill., East St. Louis & Suburban Railway Company; M. M. Lloyd, master machanic.
13. Evansville, Ind., Evansville & Southern Indiana Traction Company; F. M. Durbin, general manager.
14. Fort Wayne, Ind., Fort Wayne & Wabash Valley Traction Company; C. D. Emmons, general manager.
15. Fort Wayne, Ind., Fort Wayne & Wabash Valley Traction Company; H. L. Weber, chief engineer.
16. Framingham, Mass., Boston & Worcester Street Railway Company; M. V. Ayres, electrical engineer.
17. Harrisburg, Pa., Central Pennsylvania Traction Company; A. F. Rexroth, master mechanic.
18. Minneapolis, Minn., Twin City Rapid Transit Company; Willard J. Hield, general manager.
19. Minneapolis, Minn., Twin City Rapid Transit Company; G. L. Wilson, engineer of maintenance of way.
20. Philadelphia, Pa., Philadelphia Rapid Transit Company; F. H. Lincoln, assistant general claim agent.
21. San Antonio, Tex., San Antonio Traction Company; J. J. King, general manager.
22. Schenectady, N. Y., Schenectady Railway Company; B. Penoyer, engineer of maintenance of way.
23. Steubenville, Ohio, Tri-State Traction Company; J. F. Flood, general manager.
24. Syracuse, N. Y., Syracuse Railroad Construction Company; Thomas H. Mather, chief engineer.
25. Washington, D. C., Capital Traction Company; J. H. Hanna, chief engineer.

POWER HOUSES.

1. *Does it pay to install a synchronous motor, running with or without load, to raise power factor? If so, when should it be installed and what ratio should its rated capacity bear to the connected load?*

The instances in which it pays to install a synchronous motor for the special purpose of raising power factor are relatively few. Where a motor of relatively large size is required for use in furnishing power in connection with lines upon which it is desired to improve the power factor, the use of a synchronous motor is then advisable. It should have sufficient capacity to carry, in addition to the load to be driven, the compensating current in quadrature with its load current without the resultant armature current exceeding the current of normal full load, and should be capable of adequate over-excitation. (6.)

I do not believe it will pay to install a synchronous motor for the purpose of raising power factor, except in very unusual cases. It would, of course, never pay to do so in the usual street railway plant involving merely generators and rotray converters. The only case in which such a procedure would be indicated would be where the plant supplies a great many induction motors or a vast number of underloaded transformers. Even in such a case the proposed remedy would be unnecessary if the generator were properly designed for the work. If it is possible to maintain the desired voltage by over-exciting them, this is the better and more economical solution. The use of the synchronous machine is bound to involve more electrical and magnetic loss and greater complication. It is more expensive and merely forces the generator to do the work required of it. (16.)

No. (4).

Synchronous motors pay when used with a combined light, power load and railway load. For straight railway work the power factor can be taken care of with rotaries. The size of the synchronous motors would depend on how low a lagging power factor it is necessary to overcome. (10.)

This depends entirely on the nature of the connected load, the generating and transmission system and the operating conditions. There are cases where the installation of such motors is desirable. Synchronous motors are installed for the purpose of raising the power factor on account of the improved regulation thereby obtained to reduce the kilovolt-ampere load on the generators, lines and transformers; or to increase the watt or energy component for a given kilovolt-ampere load. On a system fully loaded, operating at a low power factor, additional load can be carried for the same apparent load on the electrical apparatus if the power factor of the load be raised. Synchronous motors should be installed for raising the power factor of the system only when a balancing of the charges against the synchronous motor and the charges against the increase in generator, transformer and line capacity to accomplish the same result, as far as operating conditions are concerned, shows in favor of the motor. Again, the synchronous motor should not be installed unless it can be properly looked after in operation, as such a motor may be operated to reduce the power factor instead of raising it. In general, it is desirable to use a synchronous motor carrying some load, as in that case the relative value of the motor capacity installed merely for the regulation of the power factor is reduced. Usually it is not advantageous to attempt to raise the power factor.

There is no fixed ratio between the rated capacity of the synchronous motor and the connected load, since this depends upon: (a) the load carried by the motor, (b) the original power factor, (c) the desired power factor, (d) the characteristics of the apparatus.

The following rule may be used to determine the rated capacity of a synchronous motor installed for power factor regulation:

The kilovolt-ampere load on the system without the synchronous motor

*Presented and discussed by the American Street & Interurban Railway Engineering Association, at Atlantic City, N. J., Oct. 12, 13, 14, 15 and 16.

is equal to the square root of the sum of the squares of the actual kilowatts as indicated by the wattmeter and the wattless component of the load in kilovolt-amperes. If the synchronous motor is to be run idle and the power factor is to be raised to unity, then the rated capacity of the synchronous motor in kilovolt-amperes should be equal to the square root of the sum of the squares of the load in kilovolt-amperes and the motor losses in kilowatts. The losses in the motor should be added to the original load to obtain the new load on the transmission line of step-down transformers.

If the motor is to be loaded, then its load in kilowatts should be added to the motor losses in determining its rated input. If the power factor is not raised to unity, then the wattless component to be used in determining the motor capacity by the above method is the difference between the wattless component of the load at the lower power factor and the wattless component of the load at the new power factor.

Examples:

To show the improvement in regulation due to raising the power factor, the following figures are given:

A three-phase system operating at 60 cycles and delivering 9000 kw over a line 22 miles in length at 40,000 volts, assuming wires 0.38 in. in diameter and spaced 40 in. apart at the corners of a triangle, reactance of step-up and step-down transformers 3 per cent, will require an equivalent voltage of approximately 46,000 at the generator for a load of unity power factor. For power factors of 95 per cent, 90 per cent, 80 per cent and 60 per cent the generator voltages would be 49,100, 50,300, 52,400 and 54,300 respectively.

Assume a load of 1600 kw at a power factor of 80 per cent. The load in kilovolt-amperes will be 2000 kw.

$$2000 = \sqrt{1600^2 + (\text{wattless component})^2}$$

$$\text{Wattless component} = 1200 \text{ kv-amp}$$

If a synchronous motor is to be installed to bring the power factor of this system up to unity and the motor is to be run light, then, assuming its losses to be 120 kw, its rated capacity should be

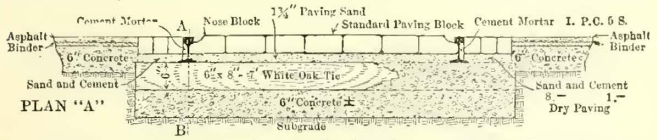
$$\text{Capacity of motor in kv-amp} = \sqrt{1200^2 + 1200^2} = 1206 \text{ kv-amp.}$$

By assuming mechanical loads of 100, 300, 500, 750 and 1000 kw on the motor and taking the motor losses in about the same proportion as above, we find the required rated capacity of the motor to be 1221, 1282, 1373, 1527 and 1718, respectively.

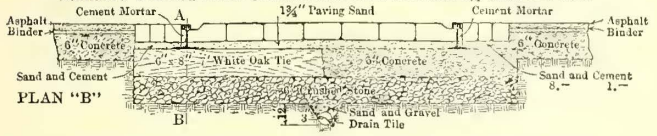
In case it were desired to raise the power factor to 95 per cent only, the value to be used for the wattless component in obtaining the synchronous motor capacity would be obtained as follows:

Wattless component when operating at 80 per cent power factor	1200 kv-amp
Wattless component when operating at 95 per cent power factor	526 "
Watless component to be used in determining motor rating	674 " (7.)

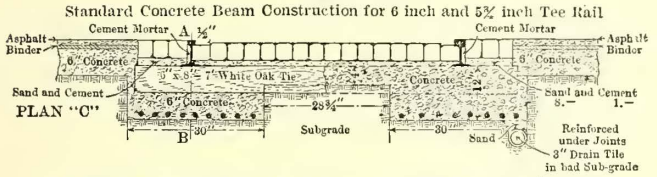
Having a power house with both electric light and power as well as railroad load, synchronous motors would not be of advantage to us. (14.)



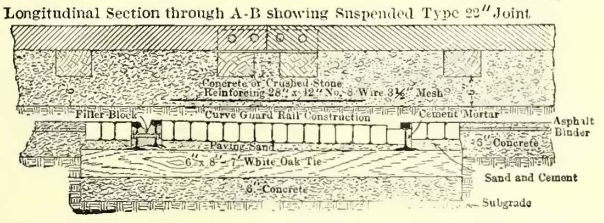
Standard Crushed Stone Construction for 6 inch and 5¾ inch Tee Rail



Standard Concrete Beam Construction for 6 inch and 5¾ inch Tee Rail



Longitudinal Section through A-B showing Suspended Type 22" Joint



Question 5—Standard Concrete Track Construction for 6 in. and 5 3-4 in. rail.—Fort Wayne & Wabash Valley Traction Company.

2. *Have any of the association's members had experience with plants where superheaters were operated in some of their boilers, while the other boilers in the same plant were delivering saturated steam into the same pipe system? If so, was any trouble experienced with cast-iron valves, fittings or engine cylinders? Kindly state nature of trouble.*

About one-half of our boiler plant is equipped with superheaters. The boilers so equipped deliver steam into the same header as the old boilers without superheaters. This arrangement gives us an average of 50 deg. superheat at the throttle. We have had no trouble with cast-iron valves, fittings or engine cylinders. (25.)

TRACK.

3. *Will the cost of maintaining track be greater with single truck or double truck cars of approximately the same seating capacity?*

Single truck. Allowance to be made for the additional weight of double truck. (1.)

The cost to maintain the tracks is greater under double truck than under single truck cars of the same seating capacity. (4.)

Less with double truck cars. (21.)

In my opinion, it will be less with double truck than with single truck cars. (23.)

Yes. On account of the additional weight of double-truck cars. (25.)

Single truck, on account of longer wheel base. (22.)

We believe that the cost of track maintenance would be less with double-truck cars of approximately the same seating capacity than with single-truck cars, for the reason that the load is distributed over a greater rail space; that the car bodies ride more steadily with double trucks and that the double truck is more fixable, thereby saving considerable impact on the track. (24.)

The greater maintenance will be required on track upon which single-truck cars are operated; understanding the same weight car and same traffic as there would be on double-truck cars if operated. (9.)

Much greater with single-truck cars of same seating capacity. (8.)

Greater with single-truck cars. (2.)

Maintaining track will be less with ordinary size double-truck cars than with the extraordinarily large single-truck cars, both cars having approximately the same seating capacity. (14.)

It is believed that with single-truck cars the cost of maintaining the track would be greater than with double-truck cars, for the reason that there would be a greater weight on each wheel passing over the track, and with a lesser weight per wheel it is believed that the wearing of rails and special work will be less. (19.)

It is assumed that the double and single-truck cars are of approximately the same weight and seating capacity, and that the tracks to be maintained under each are of the same class of construction. It is our opinion under these conditions the cost of track maintenance will be less under the double-truck cars on straight track, and no greater over special work and curves, for the reasons that with the double-truck cars there are eight points of contact with one-half the load at point of contact; you will have a shorter wheel base, therefore less friction between flanges and rails. (15.)

4. *What is the average cost per square yard and annual cost of maintenance of brick paving between and outside of rails?*

The average contract price per square yard for brick paving on a concrete base is $2.35. As there is very little vitrified brick paving laid in Baltimore, the amount we maintain is almost negligible (the most of it being still under the pavers' guarantee), and we can give no accurate estimate at this writing of the cost of maintenance. (4.)

With brick at $18 per 1000, new pavement, with foundation already prepared, costs us $1.75 per square yard; maintenance, including cost of new pavement every six years, 33⅓ cents per annum. However, the maintenance varies greatly, according to quantity of traffic, quality of brick, etc. (21.)

Average cost of brick pavement, $2.25 per square yard, estimated. (22.)

Average cost of brick pavement, $1.05 per square yard. As the annual cost for maintenance being contingent on foundation, track construction, vehicular traffic, etc., it is impossible to give a fair figure. (9.)

Contract price per square yard brick paving laid down, including grouting and 1-in. sand, $1.40. Contract price for 6-in. concrete, 84 cents. Paving that has been down for four years has never had to have any repairs. No extremely heavy traffic, but plenty of light. (3.)

We have no figures on the average cost of maintenance of brick paving. (19.)

In Fort Wayne the average cost of a first-class brick pavement constructed, as shown in the accompanying diagram, is $1.95 per square yard, or $1.46 per lineal foot of track, which includes between the rails and one foot outside the rails. This cost is made up of the following items:

	Cost per sq. yd.
One-half excavation from original street surface to 12 in. below top of rails	$0.30
Concrete foundation, 6 in. deep	.52
Sand cushion, 2 in. deep	.05
Paving block, brick, 4 in. deep	.72
Shape block	.23
Grout filler	.13
Total depth of pavement, 12 in.	$1.95

The cost to maintain a properly constructed brick pavement in Fort Wayne, or any other city, depends on the traffic. In Richmond, Ind., I laid a brick pavement on N. E. Street in front of the Pennsylvania Railroad depot and freight house in 1895; it is in first-class condition to-day (July 28, 1908) and has not cost one cent for repairs to either tracks or roadway since it was laid. We expect equal results from the work we are doing in this line in Fort Wayne, as we are doing our own paving and doing it "just as well as we can." (14.)

5. *(a) Have you any T-rail in use in city streets, and if so, of what type? (b) What is the type of paving? (c) How many miles are in use? (d) Is your T-rail laid on ties or on concrete stringers? (e) Do you find T-rail objectionable from the city point of view?*

The rail used in all the mileage of this company is T-rail; that laid in recent years is 7 in., 70 lb.; that laid previously was 6 in., 72 lb. We believe this very satisfactory for city service. On tracks over which interurban cars are to be operated we believe the rail should be 7 in., 91 lb.; with this rail should be used brick paving, and the flangeway should be provided by laying nose brick. We find this to be easily maintained. The rail is laid on oak ties, 6 in. x 8 in. x 7 ft. We cannot recommend too strongly the use of T-rail, from the city point of view. (13.)

(a) Yes, 7 in., 80 lb. No. 335, L. S. Co. (c) 3 to 4 miles. (d) Laid on ties. (e) No. (1.)

I have had relations with electric railways successfully using T-rails in cities of small size, and particularly in streets laid with macadam paving. Under these circumstances the rails may advantageously be 7 in. high. When in macadam paving they ought to be laid on ties. T-rails make the best form of track for use where the streets are laid with macadam paving in cities of populations up to 100,000 and probably in larger cities wherever macadam paving is used. At Madison, Wis., several blocks of track were laid with T-rail in asphalt paving. Here the rails were laid on concrete stringer and were edged with a toothing composed of formed granite blocks. Suitable brick could be used in place of the blocks. This construction has given good service. This track is in the heart of a city of about 30,000 inhabitants. (6.)

All T-rail; 15.6 miles; 1.15 miles paving; 6 in., 72 lb.; T-rail in paving laid in concrete; no ties, using tie rods. T-rails are very satisfactory. (3.)

(a) 5⅛ in., 81 lb. T-rail. Dudley Section. (b) Brick (special nosed). (c) 0.11 mile. (d) Ties (concrete ballast). (e) No. (22.)

My experience with T-rail in city streets has been very satisfactory. The city, however, was not very large, about 25,000. Shanghai T, oak ties and limestone ballast were used. About five miles of it were in use, paved with fire brick. I know of no objection to it, from the city point of view. This work was done 12 years ago (1896) and is still in good condition. (23.)

On the Auburn & Syracuse Electric Railroad Company and on the

Syracuse, Lake Shore & Northern Railroad Company we have laid a 90-lb. T-rail on a portion of both railroads in the city of Auburn and in the city of Syracuse. This rail is A. S. C. E. section, which provides a base of a width equal to the height of the rail. This has been paved with both macadam and brick and has proved more satisfactory, both to the railroad companies and to the traveling public, than the girder rail of the tram type. The special brick used next to the head of the rail has been merely the ordinary paving brick, with the corner cut off in the form of a triangle, whose base measurement is 4 in. on the top and perpendicular 1¾ in. on the side. In the accompanying diagram are illustrated the special block and the general construction, showing room for a ⅞-in. wheel flange. T-rail is laid on ties 6 in. x 8 in. x 8 ft. of long leaf Southern pine, spaced 24 in. on centers, 16 in. on centers at joints. In Auburn there are about four miles of single track of this T-rail construction, and in Syracuse one block has been laid on the line of the Syracuse, Lake Shore & Northern Railroad Co. The city engineers of both cities find this construction perfectly satisfactory. (24.)

Do not at present have any T-rail, but have laid and operated several miles. Believe the high section T, with brick paving in track section, the best. I also believe that laying the rail on ties gives better results. T-rail should not be objectionable, from the city's point of view. In fact, I was able five years ago to win over the Board of Public Work of Saginaw, Mich., to the T-rail, and I have ascertained that there has been no objection on the part of the city since. (8.)

T-rail is used on several streets, types being mostly Lorain sections, 70-264 and 74-265; a small amount of a lighter rail is in use. Pavements where this rail is used are of either brick or stone block. We do not think T-rail is objectionable where pavements are kept in repair. City officials take exception to this view, however. Total miles of T-rail in Columbus, 38.3, on single-track basis. (9.)

(a) We use T-rail in city streets, standard type being 6 in., 72 lb. (b) Brick paving. (c) About 20 miles in all. (d) Some on ties and some on concrete stringers. (e) We do not find T-rail objectionable, from a city point of view. (14.)

We have T-rail in use in the city streets in both St. Paul and Minneapolis. There are 120 miles in Minneapolis and 115 miles in St. Paul. The type of T-rail that is used is partly the Lorain Steel Company's Section 375 and Pennsylvania Steel Company's Section 254. These sections are in use where the streets are paved. We have asphalt, brick, granite and creosoted block paving with rails of the above type. Generally speaking, the rail is laid on ties, with concrete between the same. A considerable amount of track has been laid on concrete stringers, but it has not given as satisfactory results as the track laid with ties. Our paving is very carefully laid, and in all cases we have a granite or a brick block along the rail, forming a flangeway. This style of construction has been approved by the municipal authorities of both Minneapolis and St. Paul and meets with general favor from the public. (19.)

(a) Yes, 4 in. A. S. C. E. rail section, 55 lb. per yard; 5¾ in.; 6 in. 60 lb.; 6 in., 72 lb.; 6 in., 73 lb.; 7 in., 70 lb. (b) Brick, asphalt, boulders, gravel, macadam and mud roads. Brick is the most satisfactory of the pavements and macadam the most satisfactory and economical for road, and it is a question if not so for moderate heavy traffic street. (c) We have 75 miles of track laid with T-rail in city streets. (d) T-rails are laid on both ties and concrete stringers. The concrete stringer construction is a failure, due to several causes. (e) We do not find the T-rail objectionable, from a city's point of view, and in heavy traffic streets, if the pavement is properly laid, for all practical purposes is the best form to adopt. (15.)

6. *What is the shortest radius curve you use, and type of rail, where M. C. B. freight cars are moved through city streets?*

One hundred feet. (1.)

Fifty ft. c. r. (2.)

No M. C. B. freight cars are moved through the city streets, except where 5-in. 80 lb. rail is used. The shortest radius is about 150 ft. (19.)

Forty-five ft. radius with T-rail and a T guard rail of same section. At Logansport, Ind., we have hauled four ballast cars with M. C. B. trucks and wheels with our electric work car around a curve 90 deg. central angle switch and mate of 100-ft. radius and curve 50-ft. radius. (14.)

7. *What is the best paving for street railway tracks in city streets under heavy vehicular traffic?*

We believe the best paving for street railroad tracks in city streets under heavy vehicular traffic is the sandstone or granite block. (24.)

Granite blocks. (21, 22, 4.)

We believe that brick is the best paving for city railway track; it is easily removed and replaced without affecting the appearance of the street; it gives strength to the track, and if of good quality and well laid, should last at least 15 to 20 years. (13.)

Stone. (1.)

Consider vitrified brick the best paving for any kind of travel. The brick in this city is laid on 6 in. of concrete. (3.)

We consider granite block the best pavement to be used under heavy vehicular traffic. (9.)

Belgian block. (4.)

Vitrified brick. (8.)

The best paving for street railway tracks on city streets where there is heavy traffic is believed to be well cut and carefully laid granite blocks. (19.)

We believe brick paving gives best satisfaction to both city and company. (14.)

Brick paving gives the best satisfaction to all parties concerned, and is the most economical to use in Fort Wayne, Ind. (15.)

8. *What are some of the types of pavement in use along and in tracks on city streets?*

(a) Asphalt with scoria block stretcher course on both sides of the rail. (b) Granite block throughout. (c) Asphalt without stretcher. (d) Treated wood blocks. (25.)

Granite block, brick and asphalt block. (22.)

Asphalt, brick. (1.)

Belgian blocks, wooden blocks and vitrified bricks. (4.)

Only brick in our experience. (8.)

We have in use largely granite block, Medina stone block, brick and asphalt. (9.)

We have both brick pavements entire width of street and brick pavements the width of the track and 1 ft. on the outside of the outside rail, balance asphalt, and some pavements with brick 9 in. on each side of the rail, with balance of sheet asphalt. (14.)

This company has along its track asphalt paving on concrete foundation, brick paving on concrete, creosoted blocks on concrete, sandstone and granite, all on concrete. (19.)

9. *What is the best method of caring for excessive expansion in open track with numerous curves and hills?*

By proper spacing of joints and keeping rail from running ahead. (22.)

The best plan I have found is to fill the track on top of rail, both inside and outside, with ballast. This is effective and not expensive, as cost is that of the ballast and placing, and a little additional labor handling material when making track repairs. (23.)

Lossen plates certain distance apart. (1.)

Probably the best thing is a bolted joint which will permit the rail to expand and contract; such, for instance, as the Weber joint. (9.)

As we have all of our girder rail track construction paved, we have no trouble with the question of expansion. (4.)

We find it necessary in extremely hot weather, when the track is first laid, to cut the track at sharp curves. After the first hot usmmre the joints take care of the excessive expansion. (10.)

If the track has not been properly laid, the rails should be cut out and driven. Where the track runs, use angle bars that have notches for spiking to the ties and use a good anti-creeper device. You will find the Atlas one-piece angle bar a good thing to prevent running of rails. (14.)

It is believed that on open track it is neccssary to allow sufficient space at the joints to provide for the expansion. (19.)

10. *What is the relative efficiency of tie rods and rail braces in 7-in. girder construction? Give spacing and details.*

We believe that tie rods are preferable to rail braces for 7-in. T-rail; we have had no experience with rail braces in 7-in. girder rail; tie rods should be placed every 10 ft. (13.)

Neither is necessary with 7-in. rail in paved streets. (23.)

(a) Prefer tie rods. (b) Spacing 5 ft. (22.)

The efficiency of the rail brace with tie plate, if spaced equal to the rods, is practically the same. The rolled steel rail brace, without tie plate, is practically worthless, as it will bend over very readily. The spacing ought to be about every 15 ft. (10.)

We use ties made 7 ft. 6 in. center. We use braces every third tie. Prefer braces. (1.)

We much prefer tie rods to rail braces in girder track construction. Our tie rods are spaced every 6 ft. (4.)

Tie rods are the best, as they do not depend on the wood tie to hold the track to gage. Spacing ordinarily 10 ft. (9.)

Where wooden ties are used we would use nothing but a good form of rail brace. One in which the bottom of the brace extends in under the rail and forms tie plate. With cedar, chestnut or other soft wood ties, use on every tie, with oak or other hard wood on every other or third ties, according to height of rail, assuming that the ties are laid 2 ft. on centers. The tie rod, as we understand its purpose, is to keep the rails from spreading, the rail brace from spreading and turning over. If this assumption is correct the relative efficiency is apparent. (14.)

11. *Is it advisable to use portable crossovers and divert traffic from one track in reconstruction?*

I believe it is advisable to keep cars moving by any means at hand; one of the best being portable crossovers. (13.)

It is advisable in most cases, and absolutely necessary where concrete foundation is being put in, that cars be kept off the concrete till it has set sufficiently. (21.)

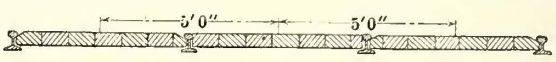
It depends upon the density of the traffic. It is advisable, if the traffic can be satisfactorily taken care of, on single-track sections. (25.)

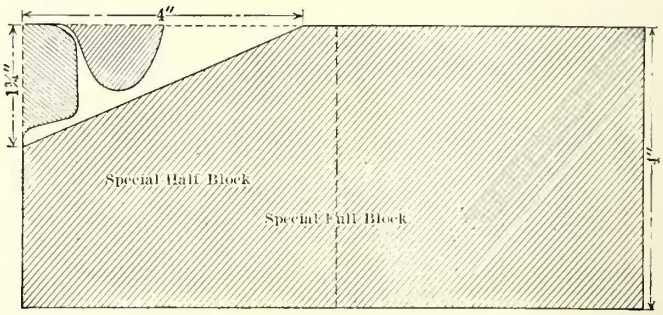
We are not using concrete track construction, and consequently do not find it desirable or necessary to use portable crossovers to direct traffic during our reconstruction work. (4.)

We think it advisable to use portable crossovers as suggested. (9.)

This depends altogether upon what kind of material you are using in your reconstruction. If wet concrete, yes; dry, tamped up concrete, no. Crushed stone or any other tamped up foundation, no, because the traffic will help to bed your ties. (14.)

In the construction work of the Twin City Rapid Transit Company it is necessary to use portable crossovers, as the traffic is maintained with-





Question 5—Standard T-Rail Construction, Showing Special Blocks. Auburn & Syracuse Railroad.

12. *To what extent does it pay to grease curves on city streets paved or unpaved?*

out interruption on one track during the time that the other track is being reconstructed. (19.)

We consider it absolutely necessary; to avoid criticism, if for no other reason. (25.)

On paved streets with clean groove, greasing reduces friction; result, minimum wear on wheel flanges and rail. In unpaved streets, on account of dirt, etc., being drawn on rail from wagon traffic. Consider greasing a detriment rather than an advantage. (22.)

I believe it invariably pays to grease all short-radius curves. (8.)

We grease all curves; saves cost many times over. (1.)

Curves should be oiled once each day except where there is extremely heavy and frequent traffic, when it should be oiled twice per day. (9.)

Relative to greasing curves—first, it prolongs the life of track work; second, it considerably lessens the chances of derailment; third, it reduces to a minimum the noise made by cars in rounding curves, and hence prevents complaints from property owners in the near vicinity. (4.)

We are of the opinion that all short-radius curves should be well greased in city streets. It prevents cars from climbing the rails, lessens the friction, therefore prevents wear of rail and wheels and costs less to operate. (14.)

It is our belief that it is necessary to use grease on city streets on

curves to a sufficient amount to not only assist the cars to pass the curves easily, but also to make them pass as quietly as possible. (19.)

13. *What is the best foundation for special work at intersections?*

Concrete. (22, 1, 8, 3.)

Concrete of sufficient depth and strength to carry the load. (21.)

We think the best foundation for special work is stone ballast. (4.)

Special work should be laid on white oak ties imbedded in concrete. At intersections or crossings, particularly with the steam railroad, 10-in. by 16-in. timber should be laid parallel under the steam line rail, with framework of 6-in. by 12-in. white oak between the timbers and 1 in. round road securely bolting the whole together. This should be laid on a bed of concrete 1 ft. thick. (9.)

The best foundation for special work has been found to be oak ties of standard size with broken stone filling to a depth of 1 ft. or more under and between the ties. (19.)

Full length ties on concrete and completely bedded in concrete. (14.)

14. *What is the value of a degree of curvature per car (single and double trucks)?*

The value of curvature equals 0.56 lb. per ton per degree of curve. (22.)

15. *Does this value depend on the radius of curvature, or is it the same for any given central angle regardless of the degree of curve?*

It depends on the radius of curvature. (22.)

16. *What is the best form and best mixture for concrete ties?*

We don't know what is the best form and don't know if this point has been settled, but we offer the idea shown by the accompanying diagram illustrating a reinforced concrete tie, and recommend a mixture in which there is a sufficient cement to fill the voids in the sand and form a coating over same and form a mortar with which to fill the voids in the aggregate. Ordinarily this is accomplished in the proportion of one part cement, two and one-half parts sand and three parts stone. (15.)

17. *What type of trolley wire hanger is most economical, the solid body type or that type in which the insulated bolt is renewable? Give cost of renewals of hangers and parts per year per mile of single track.*

We have found the solid body type of trolley wire hanger more economical than the cap and cone type. Cannot give exact cost, but the repair bill is much less for the former, both in labor and renewed parts. (16.)

The type in which the insulated bolt is renewable. (8.)

Have just adopted the solid body type with the belief that it is most economical; consider next best the renewable insulated bolt type. (21.)

Cap and cone. Approximate cost, $2.85 per mile. (4.)

Solid body hanger most economical and satisfactory. (14.)

18. *Give some methods of protection of telephone instruments when telephone lines are carried on same poles with high-tension wires?*

We have found that the ordinary types of so-called telephone protectors cannot be used where the wires are run on the same poles with high-tension circuits, because the mica between the carbon blocks will be punctured by the "static" induced on the telephone wire. We have found reasonably satisfactory results by taking care to use instruments so insulated that the user does not come in contact with metallic parts, and providing double-pole knife blade switch with each instrument, which is kept cut out when the instrument is not in use. We have instruments burned up quite frequently from lightning and from line troubles; but we have never had anyone hurt by this system. (16.)

A number of good lightning arresters and fuses. (8.)

By fuses, lightning arresters and condensers. (14.)

19. *Under what circumstances is the star method of transmission to be preferred to the delta?*

I do not believe the star method of transmission is ever to be preferred to the delta, except where the line voltage is so high that it is desirable to keep down the voltage on the transformer coils by this means. The star connection with grounded neutral prevents so high a rise of potential on insulators and lightning arresters as may occur with the delta system, but also involves a shut-down from the grounding of one line which does not necessarily occur with the delta system. For modern voltage I think the latter is preferable. (16.)

Delta preferred. (22.)

One advantage of the star method of transmission is that it allows the possibility of grounded neutral. (25.)

The star connection of the high-tension windings of transformers for transmission purposes is preferred when it is desired to operate with the neutral grounded, and for high potential systems where the cost of transformer construction is reduced by the lower coil potentials required for the star connection. (7.)

Star should be used for transmission to great distances for low current strength and "high pressure on the mains." (1.)

When voltage employed is about 6600, and when distances are great. (4.)

We use star method only in case of emergency. (14.)

20. *Which is preferable on step-up systems of high potential—to depend upon the transformers for the step-up, say from 1100 volts to 20,000, or depend on the generator for the higher voltage?*

Depend on transformers. (22.)

It is not desirable to depend upon generators for voltages as high as 20,000 volts, except possibly where the generators are very large and are under special conditions of attendance. For ordinary circumstances it is preferable to depend upon transformers for stepping up from a standard generator voltage (such as 2200 volts) to the higher voltage. (6.)

Depend on transformers. (1.)

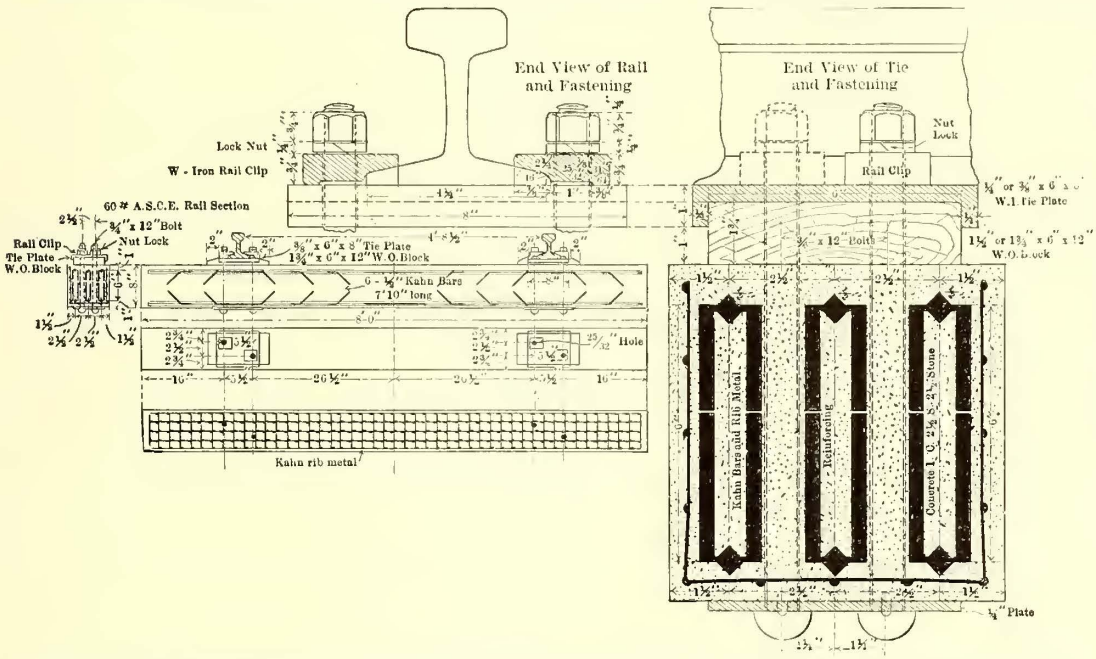
If it is possible to design the generator to develop the required line voltage, this should be done rather than use transformers. I believe this should be done for much higher voltages than customary. The limit should be at least as high as 20,000 volts instead of 13,200, which seems to be the commercial limit up to the present time. The slight loss of efficiency in higher voltage generator should be less than the loss due to transformers. The cost should also be less. I do not believe that the greater risk of injury to the generator from lightning is sufficient to offset these considerations. (16.)

Our experience with high potential generators in small capacities has been very disastrous. We believe in stepping up. In generators of large sizes, I believe it is practical to generate as high as 10,000 volts. (8.)

Except in special cases where the transformers are desired as a protection to the generator against injury from line disturbances, it seems desirable to use generator constructed for the line voltages up to potentials in the neighborhood of 11,000 volts, or a trifle higher. For much higher potentials it is the usual practice to use step-up transformers, the generator potential being 2300 volts or higher. (7.)

Depend on generator for voltage of 13,200, over which step-up transformers are preferable. (4.)

We prefer transformers for higher voltages, rather than generators. (14.)



Question 16—Reinforced Concrete Tie, Fort Wayne & Wabash Valley Traction Company, Fort Wayne, Ind.

CAR BODIES

21. *What is the heaviest passenger car used on city streets?*

The heaviest passenger car we have weighs 72,800 lb. empty. (16.)

Our heaviest car weighs 37½ tons. (1.)

Thirty-nine tons complete. (12.)

30 ft. 8 in. semi-convertible with four Westinghouse 101-D motors, multiple unit electro-pneumatic control, which weighs about 51,500 lb. (4.)

About 50 tons. (14.)

Thirty-six thousand pounds. (2.)

The heaviest passenger car we use for city work weighs 49,000 lb. (18.)

22. *When a car body is mounted for clearance on city tracks, say 3 in. off center, ought distance to be divided between body center and truck center and balanced, or the 3 in. obtained by moving the car body over and balancing?*

Move body over and balance. (12.)

Divided between body and truck with heavy spring on passenger side and balanced. (1.)

The results obtained from actual service should determine this question. (4.)

The distance should be divided between body center and truck center. (2.)

23. *Where is the best place to locate baggage compartment on interurban cars, in the center or at the end?*

By all means at the front end if single-ended cars are used, or at one end if double-ended. (8.)

We believe that there are many reasons why the baggage compartment on interurban cars should be located at the end, among the most important of which are the fact that passengers or employees may pass freely from one compartment of the car to another; that the additional weight is carried over the trucks; if motors are located on one truck only, it is well to have the baggage compartment at this point; in case of collision, baggage is not likely to break through and cause injury as it might through the light partition in the center of the car; the appearance of the car is improved by locating the wide doors near one end; the only objection in this territory to such an arrangement is that baggage obstructs the view to the front; this difficulty is only half removed when the baggage compartment is in the center. (13.)

Front end on car that operates one end only. (12.)

At the end, as it is nearer to support of truck beneath. (4.)

At the end. (2.)

At the front end. (14.)

24. *Is there any way of connecting an excessive cost of maintenance of rolling stock equipment with a relatively poor condition of track and special work, particularly at crossings with steam railroads?*

There can be no doubt that bad track means greater cost of maintenance of rolling stock, but I do not believe that it is possible to discover

any formula by which the exact effect of the one upon the other can be predicted. (16.)

This would seem an easy answer to decide, because the jarring due to passengers over railroad crossings develops different troubles than would be found from other sources. Bolts will loosen more rapidly, commutators and brushes will give more trouble and field coils will loosen more rapidly from running over railroad crossings than will be done from any other cause. (8.)

Bad crossings break flanges, axles and motor frames. Bad tracks knock putty out of body, rack window sashes and loosen body at all joints. (12.)

The rate at which it is usual to cross the steam crossing or special work is the important factor. If the motormen are in the habit of crossing rapidly, there will certainly be a high maintenance charge to this item. (4.)

CAR EQUIPMENT

25. *Is it good practice to depend on car circuit breakers, doing away wholly with the fuse?*

I should not call it bad practice to depend wholly on the circuit breaker and do away with the fuse, at least with a trolley as distinguished from the third-rail car. In case of the total failure of a circuit breaker in the car, there is still a protection of the station circuit breaker, the hand switch usually placed over the motorman's head, and the possibility of pulling down the trolley. I do not think that any such disaster is to be expected from the failure of the circuit breaker that the absence of a fuse could be considered reprehensible; but at the same time it seems to me better to use a fuse in addition to a circuit breaker. The fuse should be of such a capacity that it will not ordinarily blow and will only be depended upon for unusual conditions. (16.)

Better practice to have fuse as additional precaution, for circuit breaker has been known to refuse to open with heavy overload, in which case the fuse has saved serious burnout. (5.)

Good circuit breakers properly inspected should give satisfactory service in cars, and it is not necessary to duplicate devices by having both circuit breaker and fuses. (6.)

Yes, for ordinary city service. (25.)

Yes. (8, 1.)

No. Breakers will stick. (12.)

A fuse box in connection with circuit breaker has many disadvantages. (4.)

No, as sometimes the circuit breaker fails to work; in such cases the fuse will blow. (17.)

Do not think so. Believe each motor should be fused. (20.)

No. It is better to be doubly protected. (2.)

Yes, unless individual fuses are used for each motor. (14.)

We believe it good practice to depend on circuit breaker alone rather than have a fuse in series with circuit breaker. On our heaviest equipment, however, copper ribbon fuse is used in place of circuit breaker. (18.)

26. *Are there any specifications for carbon brushes for car motors?*

Only to meet the conditions of motors and service. (12.)

Definite data on carbon brushes, as to their performance at the present time, is not sufficient to draw up specifications, as each type of motor requires a certain kind or grade of brush. (4.)

Refer you to report of committee on maintenance and inspection of electrical equipment for 1908. (14.)

27. *Is there a perfectly reliable field tester on the market which requires little adjustment?*

We have used Sage Direct Reading Ohmmeter the past three years with good results, it never failing to detect bad fields. We also use same in winding all small magnets and fields. (17.)

A very handy, inexpensive and fairly reliable instrument is the Century Field Testing Instrument, manufactured in Syracuse, N. Y. (4.)

We have found the "New Century" Field Testing Instrument perfectly satisfactory. (2.)

28. *What effect does single-end operation have on motors and trucks and wheels in regard to wear?*

Single-end operation brings about excessive wear on truck bolsters and transoms, pedestal jaws and on leading wheels of double-truck cars. Double-end operation divides up the wear in such a manner as to materially reduce the cost of so frequently replacing these parts. (8.)

Single-end operation reduces the life of the pinion and gear. Where trucks are out of square and do not swivel freely, single-end operation will result in excessive flange wear. Believe it well, on single-end cars, to turn trucks end for end and place them at the opposite end of car from the one under which they have been running about every three months. (20.)

If the terminal loops at both ends of the lines run in the same direction, the wear on the wheel flanges is quite noticeable, particularly if these loops have curves of short radius. (25.)

Wears pitch line of gear badly, and gives less mileage. (12.)

The wheels develop double flanges, and the trucks and motors show excessive wear, due to the heavy service they must perform. (4.)

Wear on forward end brushes and holders. Doubles the strain and wear on one set of brake hangers. Wear flanges on car wheels on one side very thin. (2.)

All of our standard equipment is built for single-end operation, and we do not believe that this type of operation has any injurious effects on motors, trucks and wheels with reference to wear. All of these parts, including brake equipment and brake shoes, can be worn out and nothing in our experience has shown us that single-end operation has an unusually bad effect on wheels, trucks, motors, etc. (18.)

Very little difference to motors and trucks and very slight difference to wheels. (14.)

29. *What is the relative cost of maintenance of different sizes and weights of cars with various schedule speed?*

In general, the cost of maintenance will increase with bigger and heavier cars and with higher schedule speed, but I do not believe that any formula can be devised that will give reliable indications of the rate of change of this cost. So much depends upon other factors, such as the characteristics of the particular equipment used and its suitability for the service, or variations in line voltage and the track conditions, that these are likely to entirely overshadow the difference due to size, weight and schedule. (16.)

A 39-ton, 53-ft. car with four 75-hp motors, costs about 10 per cent more to maintain than a 27-ton, 48-ft. car with four 40-hp motors. (12.)

30. *What objections can be offered against use of H. B. ball bearings for motor bearings?*

None, it properly designed. (12.)

Not reliable. (1.)

31. *What is the best shop method for determining short-circuited and defective field coils? Method of inspection, test, etc.?*

We are getting good results by using the Herrick system of testing, having one set installed on a car which goes to all depots to inspect and test cars that give trouble from causes beyond the power of the foreman to locate without the aid of testing instruments. When a car is tested, we take the ohmic resistance of armatures, fields and rheostate steps; conditions found are marked on a sheet similar to the accompanying illustration. These sheets are made in triplicate, one sheet left with the foreman to enable him to know what repairs to make, one is sent to the assistant general manager's office, where it is afterward sent to the inspector in charge of the depot from which the car runs, so he can follow it up and see that the needed repairs are made. The original sheet is filed in the test car. The second set of Herrick's Testing Instruments are located at our regular repair shop. All cars sent in for overhauling are tested before any repairs are made to them, and again after the repairs are made to make sure that the equipment is in good shape when the car leaves the shop. (20.)

In the absence of instruments, fields may be tested by connecting in series permitting the current to pass through for five minutes; the field which does not show a considerable increase in temperature is defective. (13.)

The drop test for short circuits and the voltmeter test for insulation is the best method that we know. (8.)

By noticing rise of temperature. (12.)

Drop method the best and simplest. (1.)

We use resistance test for determining short circuited and defective field coils. Readings are taken with both volt and ammeter. This is the only test on field coils made while the coils are in the motor frame. (18.)

32. *What are the results of slotting mica out of GE-1000 commutators?*

Slots collect carbon dust from brushes and are short circuited. (13.)

Since slotting the mica on the GE-1000 and GE-54 commutators we have less trouble with short-circuiting, also get longer life out of the

Philadelphia Rapid Transit Company.

ELECTRICAL INSPECTION OF

OPEN / CLOSED Car No. ..... Division, ...

Date, ... *190*

Controllers, ...

Motors, ...

COMPRESSOR MOTOR		AUTOMATIC HOOD SWITCH
Field	Armature	

	Motor No. 1	Motor No. 2	Motor No. 3	Motor No. 4
Fields,				
Armature,				
Total,				

$R_2 - R_1$	$R_3 - R_2$	$R_4 - R_3$	4 — 5	A_1 — 5	Shunt No. 1	Shunt No. 2

Remarks:

Ref. No. ..... *Inspected by* .....

B. ..... *P.* ..... *Checked by* .....

Question No. 31—Electrical Inspection Form, Philadelphia Rapid Transit Company

brushes and commutators, due to less sparking at the brushes. We have arranged a tool on the ordinary machine lathe for doing this work. After setting the tool in holder, we can groove a commutator in one-half hour by using the hand-feed rack to move tool forward and back, each time grooving one mica slot. (17.)

Remedy worse than the effect. (1.)

Slotting gives better commutation; when a medium grade brush is used it also reduces brush wear, especially on commutators where hard mica is found. (5.)

Note.—See Report of Committee on Maintenance and Inspection of Electrical Equipment in 1907 Proceedings, pages 57 and 58.—Editor.

33. *Are there any proper specifications covering the steel to be used in the manufacture of gears and pinions? If so, what are they?*

Do not know of any. (18.)

Tool steel treatment for surface hardening should give very high mileage. (4.)

See report of Committee on Maintenance and Inspection of Electrical Equipment for 1908. (14.)

34. *Is it advisable to use semi-automatic or automatic air brakes for single-car interurban operation?*

If the cars are intended to be used always as single cars, straight air brakes should be used. If they are likely to run in trains in regular service, semi-automatic brakes should be used unless the trains are to exceed three or four cars in length, when automatic brakes should be used. (16.)

Automatic or semi-automatic air brakes not recommended for single-end operation. (13.)

Straight air is preferable. (8, 14.)

Semi-automatic. (1.)

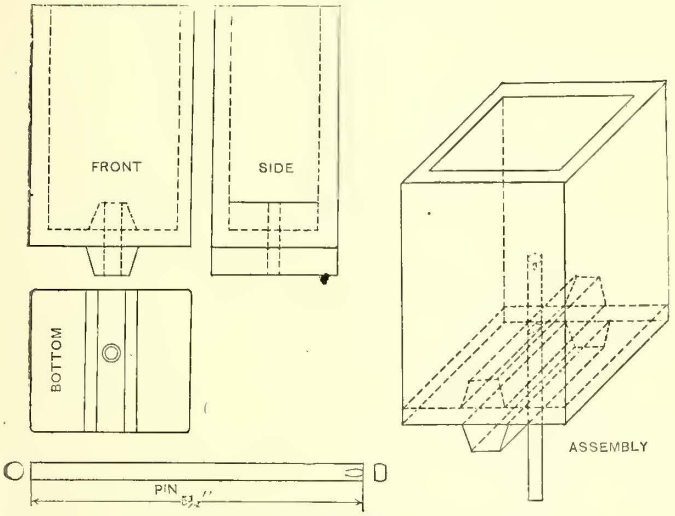
It is advisable to use automatic. (12.)
Straight air is preferable. ,(8.) (14.)

35. *Why is it that, when a K-28-F controller is thrown off quickly, the arc breaks in the controller instead of at the contactor? What remedy can be applied?*

Never had any trouble from this source. (1.)
Contactors are not either designed or adjusted properly in order to act quickly enough to break arc in contactor before it is broken in controller. (5.)

36. *What is the best material to refill controller cylinders?*

Best sulphur. (1.)
Asbestos, shellac, ground mica, sealing wax. (12.)



Question 47—Sketch of Oil Cup Used by East St. Louis & Suburban Railway Company

37. *What is the best babbitt metal for armature bearings—a metal with a lead base or a metal with a tin base, taking cost of lead at from 18 cents to 20 cents per lb. and cost of tin at from 30 cents to 35 cents per lb.?*

After trying both lead and tin base metals, we find the tin base metal is best for armature bearings. (17.)
Tin base. (12, 2, 8, 4. 5, 14.)
Best babbitt with tin base. (12, 2, 8, 4, 5, 14.)
50 lb. tin, 4 lb. copper, 5 lb. lead. (1.)
Tin base. (1.)
A metal with a tin base. (1.)

38. *Which is the more profitable form of control, considering both maintenance and accidents, for single-car operation of 75-hp to 100-hp equipments—platform control or multiple unit control?*

For single-car operation of equipment not exceeding 100 hp, I think platform control is the proper thing from all points of view, in preference to multiple unit. It is cheaper, lighter and more reliable and less expensive to maintain. About the only argument against it is the liability of accidents from controller blowouts. I think the design of platform controllers is one of those features of railroading that has been prevented from undergoing a proper development by unwise standardization. These controllers have been very defective with respect to their liability to cause extensive burnouts. I think that with some of the later types of controllers having individual blowout coils and a non-metalilc front case this trouble should be practically eliminated. (16.)
Multiple unit. (12.)
Platform control, with circuit breaker calibrated and in first-class shape, and with fuse properly selected. (4.)
Platform control. (8, 14, 1.)
Platform control. (8, 14, 1.)

39. *Refined iron. What grade should be bought for general blacksmith work in carhouses and shops?*

Norway. (1.)
Norway for brake rods and chains—double refined for levers, beams and jaws. (12.)
Burden iron. (2.)
Where possible use Norway iron; it gives the best results. (4.)

40. *Can you suggest a simple test for railway motor carbon brushes to insure uniformity?*

If a few brushes in each lot are broken, after a little experience one can judge of the quality by the texture shown. (5.)
A chattering test. See report of Committee on Maintenance and Inspection of Electrical Equipment for 1908. (14.)

41. *What percentage of increase in the cost of maintenance should be added per year as railway motor equipments increase in age, and at what age should it begin?*

My experience is that in severe interurban service the cost of motor maintenance will reach its maximum in about four years and continues with considerable uniformity thereafter. I cannot give the rate at which the cost of maintenance would increase during the first four yeras. (16.)
After five years 10 per cent. (1.)
This is a depreciation item on which there is quite a variety of opinion. I would not wish to go on record in this case. (8.)
This depends on quite a number of widely differing conditions, such as design, service, average load and maintenance. (4.)

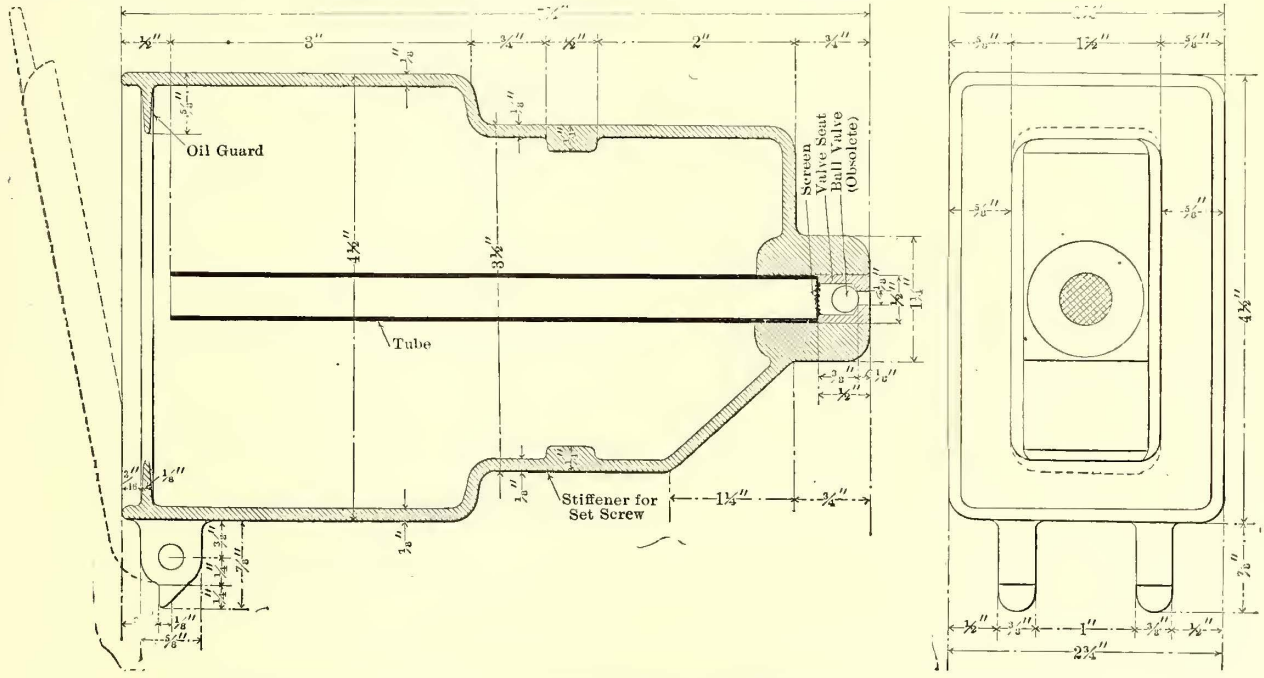
42. *When should a railway motor be scrapped on account of excessive maintenance, to be replaced with a modern motor?*

The time to scrap a railway motor cannot be fixed with precision. The maintenance cost is not the only factor to be considered; there are also annoyance to passengers, delays in service and the cost that is caused through failures of old and defective apparatus. (6.)
After the motor frames have been rebored, say three times, or when the frames on the axle bearing become too thin to be bored again. (1.)

WHEELS AND AXLES.

43. *What factors determine the limit of life of car axles or when should axles be scrapped?*

The breaking of car axles is caused by the crystallization localizing at places where the size of the axle suddenly changes or where it has been weakened by a key-way. I think the entire abandonment of the key-way in axles will greatly increase the life. It is sometimes possible to find an incipient crack in a car axle by a hammer test when the wheels have been removed for replacement. In this case, of course, the axles should be scrapped. Other than that, I know of no way to determine when the limit of life has been reached, except by the actual breaking of the axle. If many axles of a given make are breaking at about the same age, it would naturally seem wise to dispose of all the axles of this type before they reach that age. (16.)



Question 47—Sketch of Oil Cup Used with No. 50 Motors, West Penn Railways

When worn 1/16 in. below original size on motor axle bearings and on journal bearings. (12.)
When 5/32 in. below original size. (1.)
Small size, worn spots, journals too small, small wheel seats. (2.)
Breakage and wear of journals. (14.)

44. *What type of iron, insert or gray iron, gives best results on hand-brake cars?*

My experience is in favor of the gray iron shoe. (23, 11, 14.)
Insert. (1, 2, 4, 8.)
Gray iron with inserts. (12.)
Gray iron. (3, 11, 14.)

Insert shoe gives most economical results. (1, 2, 4, 8.)

45. *What is the maximum allowable difference in diameter between steel wheels on the same car?*

With the ordinary series railway motor, I do not think any one need worry over a difference in diameter between different wheels on the same car, so long as they are not on the same axle. A difference of 1 in. in diameter would be only about 3 per cent, and this would probably not make a total difference in the work of the motors of more than 5 per cent. which would be practically negligible. (16.)

2 in. (1.)

½ in. between largest and smallest. (12.)

For the best results wheels should all be maintained at the same diameter as nearly as possible. (4.)

⅜ in. (2.)

We use wheels with a difference of 2 in. in diameter in the same combination of motors and have no trouble whatever with them. (8.)

We believe that 2½ in. is the maximum difference in diameter which should be allowed between steel wheels on the same car. (18.)

¾ in. (14.)

46. *Are cast-iron wheels safe to use on interurban cars run at a speed not to exceed 40 m.p.h.?*

Believe cast-iron wheels to be safe on cars not exceeding 60,000 lb. weight at speed up to 40 m.p.h. (13.)

Decidedly no. Cast-iron wheels should not be used on cars reaching a maximum speed of over 25 m.p.h. This would be on the assumption that the cars have to run on ordinary street railway track in some places, and the wheels are limited in size accordingly. If it is possible to use regular M. C. B. wheels, it would probably be reasonably safe to use iron wheels up to a speed of 40 m.p.h., but it would not be a good financial policy. (16.)

No. (8, 11, 2.)

Cast-iron wheels are safe on low-speed interurban roads unless special track work is poor. Cast wheels, however, are more expensive than steel or steel tired whels for interurban roads. (10.)

Yes, if run on T-rail only. (12.)

Cast-iron wheels under cars weighing about 40,000 lb., running on a T-rail at 40 m.p.h., should be very safe. (4.)

Depends largely on track conditions. (14.)

We believe that cast-iron wheels should not be used on cars operated at a speed exceeding 30 m.p.h. (18.)

LUBRICATION.

47. *What design of oil cup can you recommend for use in motors designed for grease lubrication? Wanted—sketch of cup and figures showing oil consumption per car-hour or car-mile; also hot bearing record?*

I have used several different makes of oil cups in the old-type motors, and did not get satisfactory results. (17.)

It is not possible to design a satisfactory oil cup for use in motors designed for grease lubrication. The idea is all wrong. The first dynamo machines were made to be lubricated with sight feed oil cups and they were unsatisfactory and a ring oil bearing has been universally substituted. This attempt to use oil cups on these old-style motors is an attempt to go back to the principle of the sight feed oil cup, with the added disadvantage of cutting down the rate of feed so that the oil in the cup will last from 24 to 48 hours. It is impossible to get good lubrication with such rate of feed. (16.)

Brass cup with pin resting on shaft. (See illustration.) (12.)

The accompanying illustration shows the oil cup used for our No. 56 motors, designed for grease lubrication. We use about 0.06 gill per car per mile. (10.)

"Franklin" oil cup and "Factory" oil cup. (1.)

48. *What are considered proper specifications for a good motor grease, and also a good gear grease?*

We have found it possible to get very satisfactory motor grease and gear grease, but would not know how to draw up specifications for them. In the absence of a knowledge of the exact composition of a satisfactory grease, careful practical tests of the various greases offered seem to be the only solution. (16.)

We now use "non-fluid" oil, made by the New York & New Jersey Lubricant Company, at New York City, on all the old-type motors, such as the GE-800, GE-1000, GE-54, Westinghouse No. 3 and Westinghouse No. 12. Since using this lubricant we have had no trouble with melted armature bearings and armatures being torn up by getting down on the pole pieces. This has proven for the last six months to be the best lubricant we have ever used on the old-type motors. (17.)

We use oil lubrication on motors and have a gear grease for the quadruple 75-hp equipments operated on this road, which has given us excellent results. This is the Standard Oil Company's No. 2 pinion grease. (8.)

Do not use grease in motor boxes, as oil is much to be preferred. For gears, a grease that will flow but will not leak through to the street gives excellent results. (4.)

A non-fatty substance without wood pulp or cork in its composition, a compound which can be applied with a paddle or which has body to it and which is not thinned with heat. (12.)

Don't use motor grease. Graphite, wood pulp and cheap grease. (1.)

49. *Is there any advantage or saving in changing from the use of grease to the use of oil in old motors designed for the use of grease? If so, what are they?*

There are no advantages in changing from the use of grease to the use of oil in motors designed for grease. It is all the other way. (16.)

From 17 lb. of grease per day per car of four-motor equipment, to ½ pint of good oil in actual practice. (1.)

Yes. Decrease obtained in lubrication, to say nothing of cleanliness. (8.)

Mileage or bearings 2/3 greater. Oil at 21 cents per gal. is cheaper than grease at 2 1/3 cents per lb. No bearings and armatures torn up. (12.)

50. *Under what specifications should rubber-covered wire be bought for general use, both car and lighting? "Code Wire," at least most of it, is much too poor.*

Under wiring specifications in conformity with finest grade of interior wiring as applied to Builders' Code. (1.)

Specifications as adopted by A. I. E. E. (4.)

The Louisville & Southern Indiana Traction Company, New Albany, Ind., has entered into an agreement to construct a large auditorium at Glenwood Park, a few miles northwest of New Albany.

DISCUSSION ON REPORT OF COMMITTEE ON POWER DISTRIBUTION*

BY R. D. COOMBS, ELECTRICAL ENGINEER, P., N. Y. & L. I.

For the overhead construction of high-speed interurban roads and for the electrification of important steam roads there seems to be three governing conditions: (1) Is a given type of construction feasible from a construction standpoint? (2) Is it desirable from an operating standpoint? (3) Is it economical?

Considering these conditions in the order given we may dismiss the first condition as a mere question of factors of safety, if reasonably severe ice and wind loads are provided for in the design, and if the maximum unit stresses arising therefrom are not greatly in excess of two-thirds of the elastic limit of the material, then a given type of construction may be considered entirely feasible. The writer agrees with R. L. Allen as to the general amount of ice and wind loads, but prefers to specify a thickness of one-half inch of ice, and requires a wind pressure of 8 lbs. per sq. ft. on the ice covered wires. This is approximately the same as the assumption in the paper under discussion, but appears to be more logical as an engineering requirement.

The second condition, that of operative desirability, is really the important point at the present time, and the one requiring the most study and experiment. No system can be a success, which does not practically eliminate sparking and undue wear of the current collector, whether that collector is a trolley wheel or a pantagraph. To obtain this end various designs of catenary construction have been evolved, and are being tested on the Long Island Railroad.

Of the two types in general favor, *i.e.*, the "single catenary," and what the writer has called the "secondary catenary," there exist in this country a number of installations of the former, but none of the latter type. The single catenary, having the trolley wires suspended from one messenger, is familiar to all. The secondary catenary which has been described by Mr. Allen, is intended to provide an elastic track for the collector, and at the same time to remove the excessive tension in the trolley wire, due to changes in temperature. At present no definite decision can be made as to which of these types is better suited for Eastern climatic conditions and American operating requirements. The successful type must accommodate itself to changes in temperature, and provide a trolley wire, on which the collector may run smoothly.

From an operating standpoint, the construction should not involve unnecessary supports over the tracks, and long spans are therefore desirable. The writer is of the opinion that spans in excess of 300 ft. will be both economical and practicable. Owing to the relatively small cost of the material between supports, theoretical considerations alone would point to much longer spans. To what extent this increase may be made is rather uncertain, though long spans have a decided advantage in not multiplying the number of structures along the right of way. These structures should be designed to avoid unnecessary masses of materials over the tracks or in line with signals. The design of details should be given great attention, so as to evolve connections that permit rapid field work and require a minimum of maintenance.

The third consideration—that of economy—depends very largely upon the successful solution of the above conditions and introduces the important question of original expenditure, vs. future interruptions to service, and to this question no general answer is possible at the present time.

*Read before the American Street & Interurban Railway Engineering Association, Atlantic City, N. J., Oct. 13-16.

FINAL PAPERS READ BEFORE THE ACCOUNTANTS' ASSOCIATION AT ATLANTIC CITY

EFFECT OF ELECTRIFICATION ON THE ACCOUNTING METHODS OF A STEAM RAILWAY*

BY ALBERT B. BIERCK, GENERAL AUDITOR, LONG ISLAND CONSOLIDATED ELECTRICAL COMPANIES, LONG ISLAND CITY, N. Y.

The problem which presents itself first to the accountant by reason of the partial electrification of a steam railroad is the treatment of expenditures for construction and equipment.

Prior to July 1, 1907, no provision was made in the classification of construction accounts prescribed by the Interstate Commerce Commission, or the classification used generally by the railroads, for electrification expenditures, other than a single account entitled "electric motive power plans," to which was charged all expenditures covering the installation of plants intended to generate and distribute electricity for motive power; no accounts whatever to which the cost of electric rolling stock might be charged were provided.

It became necessary, therefore, in order that the costs of electrification might be recorded properly, to provide specific accounts to which such expenditures should be charged in the event of a railroad company entering upon the work of electrifying its lines in whole or in part, rather than to attempt to distribute such expenditures to analagous accounts contained in the classification of construction expenses used by steam railroads.

The work of electrifying the westerly lines of the Long Island Railroad, including the lines to Rockaway Beach, was begun in 1904, and at the close of the year 1905 electric train service was in operation on 96 miles of single track, over which 172 scheduled trains were operated daily.

The electrification work has been continued so that, at the present time, trains are operated electrically over about 105 miles of single track, and the accounting method followed, covering the expenditures made on account of this electrification work, has been as follows:

CHARGES TO CAPITAL ACCOUNT

One general ledger account, entitled "electric motive power plants and equipment," is provided, to which all expenditures are charged in the first instance; in rendering accounts of such charges, the various heads of departments submit, with their reports, a detailed statement on a form provided for the purpose, showing the section of road covered and the construction account chargeable; that is to say, a sub-record kept in the auditor's office covers the construction accounts provided in the classification of construction and equipment accounts adopted by the American Street & Interurban Railway Accountants' Association and designated as accounts "A" to "O," inclusive.

This classification, amplified somewhat, was made to apply to 12 different sections of the road on which electric transmission lines were installed, so that a complete record of all expenditures was obtained, properly distributed to the construction and equipment accounts and further divided by sections of road; and, at the same time, the large amount of detail involved did not delay or interfere with the closing of the books and preparation of statements for the entire road by reason of the initial charge being made to the general ledger account "electric motive power plants and equipment," thus permitting the statements covering the detail of this construction account to be prepared subsequently.

The records are kept in sufficient detail to show the itemized cost of all important parts of the work and bear the approval of the engineers in charge.

In addition to, and possibly of even greater importance than, the record of construction costs, is the record of operating revenues and operating costs; and, where electric operation is carried on in connection with steam operation, and, in many instances, traffic interchanged between the two, it is somewhat difficult to segregate the earnings and expenses applicable to each.

EARNINGS OF ELECTRIC TRAINS

To record the earnings of electric trains, it was found necessary to provide conductors with a card slip conveniently arranged so that a record might be kept of the number of passengers using the electric trains and subsequently transferring to a steam train at a transfer point, requiring them to hold their tickets for cancellation and collection by conductors of steam trains.

By means of this record of passengers carried on through tickets, we have been able to ascertain and record the proportion of transportation revenue earned by the electric trains, which, added to the strictly local business carried, gives the total revenue earned by each electric train.

These so-called punch slips are arranged so that the conductor indicates by a punch mark the number of passengers holding through tickets, and in a separate space, the number of passengers holding local tickets of card form which are honored but not collected. This plan was adopted as it was found impracticable for conductors to make any other record on heavily loaded trains making frequent stops.

DIVISION OF OPERATING EXPENSES

Obtaining the operating expenses applicable to the electric train service presented the greatest difficulties.

In attempting to divide operating expenses between electric and steam service, we have taken the actual charges to each class of service, where such are obtainable, and the balance is divided on a percentage basis, according to the nature of the expenses.

In making the arbitrary divisions which become necessary by reason of electric and steam service being operated over the same tracks, and using the same terminals and facilities, the first factors used are car- and ton-miles.

Electric car-miles are arrived at by taking the sum of motor and trailer car-miles, and ton-miles are obtained by multiplying the car-miles made by each class of equipment by the weight thereof; for this purpose, the average weight of the electrical equipment [loaded] is taken.

Having obtained these factors, maintenance of way accounts are divided with regard to sections of the road on which steam and electric operation is maintained, taking into consideration the number of tracks equipped for electric operations and the total number of tracks, and further dividing the various joint accounts on the basis of actual use; that is to say, using "buildings and grounds" as an illustration, the account is divided into two parts, i. e., "general repairs and maintenance" and "repairs to power plant and substations," the first named being divided on

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

the ton-mileage basis and the latter charged entirely to electric operation.

The maintenance of equipment accounts are divided accurately, according to the class of equipment involved, and by appropriate subrecords the costs applicable thereto are kept, shop expenses being prorated in proportion to the total maintenance charges to steam and electric equipment.

Traffice expenses are divided on the basis of passenger car-miles run, excluding such items as are clearly applicable to steam operation.

The division of transportation charges is made on the basis of sections of road over which both classes of service are maintained, and also on the basis of ton-miles run in each class of service where the nature of the accounts is such as to include both classes of service.

General expenses are divided on the basis of ton-miles of steam and electric traffic.

These divisions of expenses are made, of course, after the regular accounts have been stated, and form the basis for a general monthly statement of the cost of both electric and steam operation, and have been found to reflect reasonable results when worked out accurately.

It is not admitted that the bases used are absolutely accurate, but they have been found satisfactory in a general way, although it is recognized that the weight of traffic is not an entirely satisfactory factor governing cost of maintenance or operation, and that the speed of electric passenger trains, as compared with the speed of local passenger and freight trains, would change to a degree the factors used, if any satisfactory conclusions could be reached as to the exact effect of speed and weight in maintenance.

The records thus briefly outlined are, of course, furnished by the different departments making charges to the various accounts; if kept currently they do not prove burdensome, or does the method interfere with the usual routine of accounting work.

The necessity of recording separately the results from electric and steam operation in order that the management may be informed at all times of the efficiency of each, is recognized; if either form of motive power is used exclusively on any division or divisions of a road, the problem is simplified; but where both forms are used on the same lines of road, difficulties arise which require the adoption of arbitrary bases for determining operating costs.

Such bases are determined by the engineering, operating and accounting officers, with due regard to the special conditions existing in each case, and the results obtained will prove to be of great value.

The Interstate Commerce Commission, in its supplement to the third revised issue of operating expenses for steam roads, effective July 1, 1908, provides accounts for carriers that wish to subdivide accounts applying to the operation of electric divisions, but the provision does not outline a plan for the apportionment of expenses on such divisions as may be operated by both steam and electric power.

THE RELATIONSHIP OF THE CLAIM DEPARTMENT TO THE ACCOUNTING DEPARTMENT *

BY ELLIS C. CARPENTER, CLAIM ADJUSTER, INDIANA UNION TRACTION COMPANY

When President Goshorn referred to me the request of Acting President Wallis to present, from a claim agent's viewpoint, the relationship existing between the accounting and claim departments, it took considerable thought to be able to show that there existed even a very distant relationship. I felt sure that the accounting department would not care to assume the responsibility for the birth of the claim department, and as all other departments occupy a somewhat similar position, no branch of the service seeming to be willing to acknowledge the responsibility for the claim department's presence, I am forced to the conclusion that, like Topsy, it "just growed."

The claim department has been dubbed "the rat hole of the treasury." It is the claim agent's duty to see that the hole is made as small as possible. When reports come from the transportation or other departments of collisions or serious accidents, it is the fist of the claim agent that is thrust into the hole in the dyke, and he assists in repairing the breaks in the walls about the treasury. While thus acting as a constant guard, repairing breaks and receiving the blows and complaints of the injured and parrying the faultfindings of many who imagine themselves aggrieved, by fair dealing, friendly words and mien he makes friends for his company. The resources of the claim agent and treasury are being constantly called upon to satisfy the legitimate and sometimes the unworthy demands made by claimants.

It is quite necessary that an accurate report be made of all expenditures incident thereto, so that results may be submitted to those in authority. This brings the claim and accounting departments into close contact, it being the duty of the accounting department to see that proper distribution and entry is made of all items of expense incurred by the claim department.

I understand that one of the objects of the accountants' association is to have a standard system of accounting, which would, if followed, enable the various companies to accurately keep and compare accounts. Knowing that your association has been active and aggressive, and that some years ago it adopted a standard classification of accounts and form of report with which, I take it, you are all familiar, and that under account No. 33 the various damage items are classified and under account No. 34 legal expenses in connection with damages are to be charged, I felt it would be interesting to know just how the accounting departments of some of the larger companies were treating the items chargeable to the claim department. With this in view, and by the courtesy of the auditor of our company, I had mailed, under his signature, to 26 companies the following letter:

Will you kindly advise me just what items are included in the damage account of your company in the distribution of your accounts. I mean by damage account all matters pertaining to the claim department. I would thank you for a copy of your distribution for claim department, as used by your company.

To the 26 inquiries mailed I received 22 replies. Let us look at some of these replies and see how the damage accounts are being treated by the accounting departments.

In Boston the classification is as follows:

Salaries and wages of claim department.
Legal expense in connection with accident settlements and suits.
Damages to employees.
Damages to passengers.
Damages to property.
Damages to others.
Miscellaneous expenses (the latter including all expenses, such as traveling and office, not specified).

One of the large companies in New York City divides its damage cases into two classes, "accident cases" and "transfer cases," using the following subdivisions:

*Read before the American Street & Interurban Railway Accountants' Association, Atlantic City, N. J., Oct. 12 to 16, 1908.

The accident cases are classified as follows:

Settlements: Claims, suits, judgments.

Claim department: Office force, adjusters and investigators, doctors, lost time witnesses, incidentals.

Trial department: Office force, outside counsel, investigators, doctors, lost time witnesses, incidentals.

Appeal department: Office force, outside counsel, incidentals.

The transfer cases are classified as follows:

Settlements.

Expenses:

Trial department: Office force, outside counsel, investigators, doctors, lost time witnesses, incidentals.

Appeal department: Office force, outside counsel, incidentals.

It has three distinct departments for handling its accident cases, viz.:

Claim department.
Trial department.
Appeal department.

In Brooklyn the classification is as follows:

Damages.
Claim department salaries and expenses.
Legal expenses in connection with damages.

To the first-named account are charged payments for all damages, including both settlements made by our general claim agent and judgments recovered through litigation. Payment to doctors in cases where same are made in lieu of payments to claimants direct are also charged to "damages."

The second account includes, as its title shows, all salaries and expenses of the claim department as distinct from the law department. To this account are charged all payments incurred directly in the settlement of claims, not chargeable to the first named account.

The account of "legal expenses in connection with damages" provides for all salaries and other expenses, such as attorneys' salaries, doctors' fees, stenographers' services, printing, office supplies and expenses, etc., of the law department; in other words, the expenses in connection with all damage cases that have been carried to the courts for settlement.

The classification in Philadelphia is somewhat different, and covers the following:

1. All amounts paid in settlement of claims for damages for personal injuries, damage to clothing, damage to vehicles or horses, or damage to property along our lines due to faulty construction, or accidents of any kind.
2. All amounts paid in settlement of all suits for damages of every kind and all verdicts against the company in such suits.
3. All costs, witness fees and expenses of witnesses.
4. Salaries and fees of all counsel for the defendant.
5. Salaries and traveling expenses of claim agents, adjusters, inspectors and all other persons employed in the claim department.
6. Rental of offices, etc., used by the claim department, other than the offices in the company's own building.
7. All stationery, printing and supplies and all furniture, etc., purchased for the use of the department. In fact, every charge that can be in any way connected with the claim department is charged to it.

At Buffalo, N. Y., the accounts are subdivided into various kinds of accidents, the expense accounts being classified in this order:

1, Claim department salaries; 2, incidental and office expenses; 3, medical expense; 4, special service; 5, attorneys' salaries and fees; 6, court fees, transcript, etc.; 7, expert testimony; 8, witness fees.

The reply from Baltimore indicates the method of how the amount to be set aside for the damages is determined as well as what is chargeable thereto:

Beginning with each year, a careful estimate is made by the auditing department in conjunction with the claim agent, of the amount necessary to meet the requirements of that department for the following year, based on past experience and data. That amount is then divided by one-twelfth charged each month by cross entry to "accident account" (operating) and credited to "accident payable account," which is the funding account. All accident settlements and suits are charged when settled to the "accident payable account," and at the end of the year, when all adjustments are made in closing the books for the year, another estimate is made of cases still outstanding for that year and that amount is set up as a reserve fund out of the balance of the "accident payable account," and the "accident" and "accident payable accounts" are then closed out—one adjusting the other. These accounts have represented the actual settlement of cases and suits, doctors' bills, hospital expenses, witness fees and petty expenses, but do not include salaries of the claim agent, his assistants and clerks, for which we have an account known as "salaries, claim agent, assistants and clerks," nor fees of attorneys at law, which are charged to "legal expenses."

The claims of previous years, say 1905, are, when settled, charged to "accident reserve—1905," which is a liability account set up out of profit and loss account to meet these requirements. At the end of the year these accounts are thrown back into profit and loss again and a new deal made to meet the estimated requirements of past years.

Columbus, Ohio, uses the following classification:

Personal injury claim.
Property damage claim, other than car damage.
Wages of employees injured in line of duty.

Doctors' accounts for first aid and subsequent attention, authorized by claim department or agreed to upon claimants singing a release.

Ambulance service, hack hire for injured people or employees.

Attorneys' fees, where the service applies directly on work for the claim department.

The new régime at Cleveland classifies as follows:

1. Collisions with persons (A. Adults; B. Children). 2. Collisions with vehicles. 3. Collisions of cars. 4. Struck by trolley. 5. Fuse blowing out. 6. Fell off cars. 7. Fell in cars. 8. Fell getting on cars. 10. Electric shock. 11. Cars leaving track. 12. Railway gates damaged. 13. Running-board accidents. 14. Miscellaneous. 15. Office expenses. 16. Salaries. (a) Witness fees and expenses. (b) Expert testimony. (c) Doctor bills. (d) Hospital bills, ambulance bills. etc. (e) Special services. (f) Wages of motormen, conductors, etc. 17. Other legal expenses. (a) Court costs and expense. (b) Court stenographers and printing. (c) Attorneys' fees.

In Chicago, against a reserve fund for the purpose, is charged:

For damages: Adjusters, salaries and expenses. Doctors' salaries and expenses. Injuries to persons. Injuries to horses or vehicles. Injuries to property. Other expenses account injuries. Attorneys' salaries, fees and expenses. Court costs and expenses. Law books and printing.

At St. Louis and Milwaukee the standard system of accounting is practically followed.

At Seattle the following distribution is used:

Damages to persons. Medical attendance in connection with damages to persons. Damages to property. Legal expenses in connection with damages. To the above accounts we charge all expenses in connection with damages caused by our street railway department.

The lines at Los Angeles classify as follows:

Loss and damage—stock killed:

This account includes all expenditures on account of loss, damage or destruction of cattle and other live stock killed or injured by trains while crossing or trespassing on the right-of-way, removing and burying the same and all expenses directly incident thereto (except lawyers' fees and court expenses), wages and expenses of employees or others engaged as adjusters or as witnesses in case of law suits on account of stock killed, payments for the detection of thieves, etc.

Loss and damage—property:

This account includes all expenditures on account of loss,

damage or destruction, whether occasioned by fire or collision, overflow or otherwise, to crops, buildings, lands, fences, vehicles or any other property, with the following exceptions: Stock killed or property entrusted for transportation, which should be charged to accounts Nos. 46, 47 or 48, as the case may be. Company property, which should be charged to the proper operating expense account, and lawyers' fees and court expenses, which should be charged to account No. 62. But wages and expenses of employees or others engaged as adjusters or witneses in case of lawsuits on account of loss and damage to property and payments to civil officers for the detection and apprehension of thieves, train robbers, etc., are properly chargeable to this account.

Injuries to persons:

This account includes all expenditures on account of employees or other persons killed or injured, such as gratuities and coinpensation paid to injured or disabled persons, their guardians, heirs, relatives or attorneys, fees and expenses of coroners, undertakers, witnesses and others (except lawyers' fees and court expenses), funeral expenses, railroad fares when sending injured persons home or elsewhere and expenses of attendant when necessary; payments made for ejectment from trains, bills for board, wages and expenses of employees engaged as witnesses or otherwise. Also wages and expenses of others occupied in connection with the adjustment of claims coming under this head.

It also includes the following expenditures, when not chargeable to hospital fund: Salaries and expenses of chief surgeon, assistant surgeons, division surgeons and attendants, fees and expenses of doctors, nursing and hospital attendance, medical and surgical supplies, etc.

Many of the claim departments keep a classified list of accidents and the amounts paid out for each class. This is valuable for the information of all departments concerned and should aid in determining which department is having the greater number and kinds of accidents, and attention should be given accordingly.

Many companies arbitrarily set aside each month a certain per cent of the gross receipts out of which to pay all accounts chargeable to damages, and in comparing the result of one claim department with another the comparison is usually upon the per cent basis, the particular items charged against this fund by each company being lost sight of, the per cent only being in mind. This, many times, is unfair, for the reason, as you have seen, there is such a variance in the different companies in dealing with the items comprising the damage account.

Every charge, whether large or small, against the claim department should bear the written approval of the head of the claim department (and any subordinate as he may require) before it is passed to the accounting department for entry. This also applies to charges from the legal department which affect the claim department, and no items should be passed without such approval. The claim department should not be burdened with the keeping of any accounts that may be wholly or in part the duty of the accounting department, but the claim department may, with propriety and profit, classify its accidents and indicate, as the charges are approved, to which class a particular item belongs, the accounting department making the proper entry and rendering monthly statements of results. This form of report should have blank spaces in which the claim department can add the number of each class of accidents occurring, the complete results being thus tabulated in a way that will be of value.

Persons engaged in the work of claim departments, as a rule, are not accountants. Their training is not along the technical and accurate line necessary for the accountant. The successful adjuster, I feel sure, were he to attempt to take a trial balance and found that a discrepancy existed, would be tempted, without hunting and digging sometimes for days, to "split the difference," charging one half to the accounting department and the other half to damages.

The most cordial relation should at all times prevail between our departments and associations, and we appreciate this opportunity and the honor of appearing before your honorable members upon this occasion.

THE RELATION BETWEEN ACCOUNTANT AND ENGINEER IN CONSTRUCTION, MAINTENANCE AND OPERATION*

BY F. G. SIMMONS, PRESIDENT OF THE ENGINEERING ASSOCIATION.

Your Executive Committee some time since expressed a desire that the president of the Engineering Association, or some representative of that association, deliver a talk at this time; and as the request was delivered to me as president of the Engineers' Association, and furthermore, as I have some decided views as to this relation and found myself glad of the opportunity to present them to you and through you indirectly to my associates in the engineering body, I accepted this invitation on my own behalf. I am pleased, gentlemen, that your letter extending this request used the designation "A Talk."

I am much better able to put this matter before you as a talk than I would be were the required vehicle to be known as an address, and I believe many of you will appreciate exactly what I mean. As an engineer in this line of work, and connected, as I am, with one of the large systems of this country, it has been my duty and my pleasure to have many talks with the accountant of the property; and the benefit I have derived from these talks has been and is one of the greatest assets I have been able to accrue during over 20 years in the street and interurban railway field. This statement is the keynote upon which I desire to enlarge in the talk to you to-day.

It has been too common in the past for an engineer or superintendent in actual charge of construction or maintenance work to look upon the accountant as a person especially appointed to harass and confound him by presenting to him, at certain periods, figures which perchance were not in accord with estimates, either verbal or written, that he had prepared for the management prior to the authorization of the work. All too often the only lesson drawn from this was a feeling of resentment that careful accounting methods had permitted so exact a check.

James Logan, mayor of Worcester, Mass., in an address presented to the graduates of the Worcester Polytechnical Institute and published in the August number of the Journal of Accountancy, in crediting a large amount of the success of that great commercial genius, Andrew Carnegie, to his careful accounting methods, cites the case of a foreman employed by the Carnegie Steel Company who was building a heating furnace and whose costs were being scrutinized carefully, as saying: "There goes that damn bookkeeper, and if I use a dozen more bricks than I did last month he knows it and comes around to ask why." Two lessons directly applicable to my subject may be derived from this. One of these is set forth clearly in the descriptive adjective preceding the noun "bookkeeper." The man evidently felt harassed and worried by the careful methods of the accountant and he voiced his spleen instead of consulting with the accountant and, by taking advantage of the knowledge thus assembled and made available, building up for himself a reputation for ability to which no other one

*Delivered before the American Street & Interurban Accountants' Association, Atlantic City, N. J., October 15, 1908.

thing can contribute more than can the knowledge of final results as set forth in actual figures.

The other lesson applies to the accountants themselves, who, one and all, should follow the example of the berated bookkeeper and, to as great an extent as they can consistently, should so delve into the methods and work of the other department as to give them the greatest possible insight into the reasons for the results reported and not be dependent altogether on the regular reports forwarded. The accountants may thus be able to nose out mistakes before they have become a matter of actual record. For doing so they should receive the hearty thanks of the engineers responsible for the work, as well as of the executive for whom they are acting. The great danger of inefficiency on the part of the accountant is that in working out his accounts according to a regular set of forms and methods he may allow himself to fall into a rut and see nothing beyond the limit of these forms. No one believes more in the good to be derived from the use of a standard set of forms and no one appreciates more the great advantages that have been obtained in that manner through the zealous and painstaking work of the Accountants' Association than myself; but, gentlemen, the accountant himself, the responsible head, should guard carefully against the danger of becoming hemmed in by these forms to such an extent that he can see nothing beyond them. A desire for conferences with the other heads, a carefully fostered curiosity as to the whys and wherefores and a fearless investigation of unusual showings are, in my opinion, broader and deeper qualifications for an accountant than anything else. The working out of forms and the filling in of statistics are more or less automatic matters, and will be taken care of in a regular routine. The accountant should be not only a deducer of results; he should be a student of methods and, when all engineers recognize this and help him to observe in every manner possible we shall be approaching the millennium in this business.

Still further to impress the importance of this broader conception of accounting upon my brothers in the engineering field, and to talk to you but at them, I desire to say that I believe the engineer, whether connected with a large or small property, should see himself that in every case possible an estimate of cost and a plan of procedure is prepared and a copy filed with the accountant for any and every piece of work that may be thus individualized. If this is done and the accountant is worthy the name, he can present to the engineer upon the completion of the work an exact statement of the final results, and a continuous comparison of these results with the original estimates cannot fail to be of the greatest benefit to any engineer no matter how able. I know that to many of you this is but a re-hash of methods long employed, but there are many who have not yet realized that the value of accounting applies in greater measure to future operations than it does to past results, which are unalterable.

In his address as president of your association, some years ago, C. N. Duffy compared the exhibit of the accountant somewhat to the pride taken by a person in exhibiting a house which he has just completed; attention is called first to the general aspects and architectural lines. If the proper interest is manifested attention is then called to more particular features and at last details are discussed. In no case will the visitor be taken into the basement and shown the number of stones in the basement walls, unless for some reason he desires this particular information, in which case it is obtained easily.

So with the accountant: The broad general facts first; but, if it is desired, he must be in a position to furnish the minutæ of detail, and the engineers are those whom this minutiæ of detail can benefit most; therefore I say, gentlemen, that the accountant should keep himself in thorough touch with the engineer and his work and the engineer should co-operate cheerfully and enthusiastically with the accountant in this desire and should, in this manner, keep himself fully informed as to his costs and the reasons therefor.

Mr. Beggs, in an address delivered before your association at the Kansas City convention in 1900, called attention to and emphasized the necessity for the accountant maintaining a careful scrutiny of the rates of pay and hours of service in the various departments to the end that there might be no discrimination in the treatment of the employees which might work advantage to one department and disadvantage to another. No more prolific cause for trouble can be imagined and yet on many roads where the accountant does not exercise this broad phase of his duty these troubles are causing continual friction. Here, too, the engineers in charge of the various departments—rolling stock, power plants, electrical and way—should co-operate fully with the accountant and, with an unreserved sense of loyalty to the company, should endeavor to help him maintain a uniform treatment of employees that will inure to the benefit of all.

The foregoing suggestions, which I have tried to treat in as broad and as general a sense as possible, constitute what we might call the fundamental relations necessary between the accountant and the engineer. A large amount of detail has been worked out in the shape of standard forms and standard methods, which are undoubtedly accomplishing very much toward the outworking of the results which I have mentioned as desirable, but much remains to do, and it has been suggested to me by many persons since the last convention of our associations that it is probably advisable at this time that a joint committee be appointed from the two associations the duty of which it should be to endeavor still further to develop and unify the methods to be employed in accounting for the work of the various engineering branches. The great necessity for this has been impressed upon me by the failure of many of our member companies to reply to data sheets sent out by our various committees. In one case these data sheets were sent out to nearly 200 member companies and less than 40 replies were received; of this smaller number of replies many confessed that the data required were not available owing to the fact that the accounting methods of the company did not give them the necessary information.

Now, gentlemen, the information asked was of such importance that for economical and thorough operation of the property the executive staff could not afford not to have it; and yet their methods were such that they apparently did not know facts as to the results they were obtaining that were of vital importance to the successful operation of any street railway property. If success is to be obtained in the unification and standardization of street and interurban practice, the information asked by these hard working and earnest committees should be forthcoming generally in order that the most thorough knowledge of results possible be secured. It is only on such knowledge that deductions can be based which will lead to the selection of the most efficient and economical standards of practice.

In conclusion, then, it appears to me that a joint committee would become very effective if its efforts were directed to disseminating among all our member companies

the necessity for a uniform method of compiling data as to their methods and as to the results that they are obtaining which would make available to those engaged in the work of standardizing the exact data prepared in a uniform manner upon the various items in both the maintenance and construction operations. I assume that it is scarcely necessary to dwell at this time on the fact, and to call to the attention of those companies who in the past have been slow to co-operate in the work, that eventually it will accrue to the benefit of all and that by adopting modern and thorough methods of accounting they will benefit later by the experience of all; and that this assembled information will be the basis on which every company in this line of business will be enabled, to some extent at least, to better its results, lessen the operating as well as the construction expenses and make glad the heart of the investor, who, after all, gentlemen, is the person most concerned.

REPORT OF THE COMMITTEE ON COLLECTION OF BLANKS AND FORMS*

BY E. M. WHITE, CHAIRMAN.

The third collection of blanks and forms has been made, and is here for your inspection. It is by far the largest and best collection we have ever had. Over 100 companies, located at various points in the United States and Canada, from Cape Breton to Seattle, and from Dallas to Charleston, have responded to the request, and the number of blanks exceeds the 1904 collection by about 20 per cent.

The second collection was presented at the St. Louis convention, and has been in constant use ever since. The bound collection has been used at the conventions, and the duplicate or unbound collection has been freely circulated among the members.

If we judge rightly from letters received from the members that have availed themselves of the use of the previous collections, the time and expense in getting together a new collection is warranted.

The present collection has been gathered and arranged in the office of the American association by Secretary Swenson and his assistants, and to them belongs the full credit for the prompt and very satisfactory manner in which this immense number of blanks has been compiled. The "committee" has had none of the detail, and will, therefore, claim none of the credit which surely is due for such a commendable piece of work.

It will be worth nothing to you to have a collection of blanks from the various street railway companies of the country at your disposal if you do not avail yourself of their use.

The next time you wish to get up a new form, or feel that some of your old forms are not quite up to date, just look through the index which follows this report and make the selection, by numbers, of such blanks as you desire and send this list to B. V. Swenson, secretary of the American Street & Interurban Railway Association, 29 West 39th street, New York, N. Y., requesting him to loan you these forms. Remember that other companies are making similar requests, and return these forms promptly.

The arrangements for keeping the duplicate set at the association office are very complete, so that requests for blanks can be very promptly filled. The collection in book form will be kept at the association office when not at the conventions, and will be available at all times. There is much to interest you at the New York office of the association, and all who can do so should avail themselves of opportunities to visit the home of the association.

The present collection of blanks and forms is in 16 books. Fifteen of these books (100 to 1,500) are entirely new, while book 1,600 (Glasgow Corporation Tramways) has not been changed, as we received no new forms from them. The books are bound in the same covers as were used on the previous collection, and the same scheme has been followed in arranging and numbering.

The collection as a whole shows a decided improvement in style and general makeup over the 1904 collection, and there is no doubt that the best blanks of that collection have been used as models. This is the very object of the collection, and it is hoped that the requisitions on Secretary Swenson will be many, for there are still many forms that can be improved greatly by a little more thought being given to the size and general makeup; in other words, think who is to use the blank and what is to be done with it after it is filled out. If a truck foreman or a blacksmith is to make it out, give him plenty of room to write; if it is to be made out by an office man, keep the size down. If the report is a permanent one, don't hesitate to use good paper, but if it is only for temporary use, much money may be saved by using a cheap paper.

Form numbers are still missing on many blanks; if you once used them, with the date and a figure to denote quantity, I am sure you would never let a blank be printed without that information on.

Give a little thought to the making up of a new form, and make it of a size that will cut to advantage from some of the standard sizes of paper; you will thereby soon obtain uniformity in your blanks and save money in your account No. 27.

All of the best blanks will not be found bearing the names of the large companies, as some of the small companies have sent excellent collections and many of these forms show a careful working out, as well as a number of new ideas.

INDEX TO COLLECTION OF BLANKS

BOOK 100—INCOME A.

REFERENCE

105 CONDUCTORS' REPORTS.
Day card, trip slip, trip report or trip sheet.
These reports show the number of trips, the car number, their destination, the leaving time, the various tickets, including transfers collected, cash received, and register readings.

110 STATION AGENTS' REPORT.
Record of business for the month, including ticket sales.
Daily and monthly reports of business, showing receipts from passengers, freight, express, etc.

115 ROUTE NUMBERS AND TARIFFS.
Route numbers.
Rates of fare.
Rates for chartered cars.

120 SPECIAL CAR REPORTS.
Orders for special or chartered cars.
Memorandum of agreement.
Conductors' report.
Foreman's report of special car run.

125 CONDUCTORS' REMITTANCE SLIPS.
A form on which the conductor gives the amount in detail of his daily collection of tickets and cash.
A receipt given the conductor for his remittance.

130 CONDUCTORS' ENVELOPES.
Envelopes used for turning in transfers, tickets, or cash or all, either by trips or daily.
Station agents' envelopes used for remittances.
Tags for conductors' remittance bags.

135 COUNTERS' AND RECEIVERS' REPORTS.
Counter or receiver, the person who receives and counts conductors' daily remittances. Reporting the conductors' names and amount received on the various lines run. Report of total receipts to auditor.
(See also shorts and overs 165.)

140 TICKET SALES.
Report to treasurer or auditor of daily or monthly ticket sales, and receipts for same.

145 DAILY REPORT OF EARNINGS.
Earnings by lines showing trips and miles run, car hours, tickets, and cash received.
Summary of daily receipts, including ticket sales, chartered cars, and receipts from other sources.

*Read before the American Street & Interurban Railway Accountants' Association, Atlantic City, N. J., Oct. 12 to 16.

REFERENCE

150 WEEKLY REPORT OF EARNINGS.
This report includes the same items as the daily report, but is a report for a week.

155 MONTHLY REPORT OF EARNINGS.
Earnings by line for each day of the month, showing trips, miles run, car hours, tickets and cash received.
Also showing earnings by lines for the 12 months and giving the total for the year.
Earnings from passengers and freight from stations.

160 PARK AND AMUSEMENT RECEIPTS.
Report of earnings of park and amusement resorts.

165 SHORTS AND OVERS.
Reports of counters and receivers showing the amount due from or overpaid by conductors in their daily settlements of cash and transfers. Notices to conductors. Also record of conductors' errors.

BOOK 200—INCOME.

205 TICKETS.
Tickets for 5-cent local fares, children's tickets, special workmen's tickets, etc.

210 INTERURBAN TICKETS.
Either a coupon ticket with one or more coupons for the various points, a ticket on which the destinations are punched, either duplex or plain, or a ticket that is torn to show the destination.

215 COMMUTATION TICKET BOOKS.
Tickets in book form either good for a definite time or until used, usually one coupon for a 5-cent fare.

220 PASSES.
A card-pass for employees or other persons, usually an annual. A one-way or round-trip pass limited to time and destination, or a coupon pass book.

225 EMPLOYEES' TICKETS.
Either in book form with coupons, in strips, or single tickets.
Limited or unlimited, as to time and destination.

230 MISCELLANEOUS TICKETS.
Special tickets of various kinds, including complimentary letter carrier, police, fireman, etc. Dog tickets or permits, tickets used at summer resorts, etc. Tickets used in connection with railroads, steamboats or trolley lines of other companies.

235 PUPILS' TICKETS.
Usually a 2½ or 3-cent ticket with same privileges as a 5-cent ticket, but restricted as to use.
Application for tickets and certificate from school.

240 TRANSFER TICKETS.
Good for continuous passage from transfer point on next car, etc.

245 TRANSFER INSTRUCTIONS.
Instructions regarding the use of transfer tickets.

250 MISCELLANEOUS INCOME.
Explained by heading.

255 APPLICATION FOR PASSES.
Application for passes for employees.

260 REQUISITION FOR TICKETS.
Requests from station agents and others for tickets.

265 EMPLOYEES' TICKETS REPORTS.
Report of tickets issued to employees.

270 TICKET AND TRANSFER RECORD.
Records of tickets and transfers issued.

275 REGISTER RECORDS.
Daily report of register readings.

BOOK 300—LABOR A.

305 APPLICATIONS.
Application for position as conductor or motorman or other car service work. Also position in mechanical department and power house.

310 REQUISITIONS FOR MEN.
Requests for extra men for service.

315 REFERENCES.
Certificate given employees who have left the service.
Reports for references regarding a person seeking employment.

320 PHYSICAL EXAMINATION.
Requests for physical examination for service with the company or benefit association and reports or certificates of examination made.

325 AGREEMENTS.
Agreements between company and men.

330 APPOINTMENTS.
Notice of appointment.
Certificate of apprenticeship.

335 RECEIPTS FOR DEPOSITS, BADGES, ETC.
Employee's receipt for, also receipt given to employees for, deposits, badges and other property of the company.

340 RECOMMENDATION OF ADVANCEMENT.
Advancement recommended or asked for.

345 EXCUSED LIST.
Application for leave of absence, granting of application and record of same.

350 DISCIPLINING.
Suspensions, complaints, resignations, discharges, reinstated.

355 EMPLOYEES' RECORD.
Names, addresses and record of individual employees.

360 RECORDS OF EMPLOYERS.
Record of names of employers.

BOOK 400—LABOR B.

405 TIME BOOKS.
Time books used by timekeepers, foremen or individual employees, daily, weekly or monthly.

410 TIME CARDS.
Daily, weekly or monthly cards used by individual employees in shop, giving hours worked and the kind of work done. Trainmen's time cards giving hours and minutes worked.

415 TIME REPORTS.
Foremen's daily report of trainmen's time ,also time of electricians, trackmen and shopmen.

420 TIME RECORDS AND DISTRIBUTION.
Distribution of pay-rolls to various expense accounts. Distribution of trainmen's time to various lines or divisions.

REFERENCE

425 PAY-ROLL COMPARISONS.
Comparison of number of employees, or amounts paid, with same period last year.

430 PAY-ROLL AND TIME CHECKS.
Pay-roll sheets showing name, occupation, hours worked, rate, amount and signature.
Foreman's time check, an order on paymaster for wages due, not previously reported.
Foreman's notice of discharge.

435 METHODS OF PAYING.
Checks on bank for wages.
Receipt for wages.
Pay envelopes.
Tables for figuring wages.

440 PAY-ROLL SUMMARIES.
Summary of pay-rolls for several divisions or departments.

445 UNCLAIMED WAGES.
List of unclaimed wages.
Receipt for unclaimed wages.

BOOK 500—MATERIAL.

505 REQUISITION FOR SUPPLIES.
Requisition on general manager or purchasing agent by storekeeper for supplies for storeroom.

510 QUOTATIONS.
Request for prices with form for quotation.

515 PURCHASING AGENTS' ORDERS.
Orders of the general manager, superintendent or purchasing agent for supplies, also record of orders.

520 SHIPPING MANIFEST.
Memorandum or list of supplies shipped to storeroom.

525 REQUESTS FOR INVOICES.
Requests for invoices and statements.

530 ALTERATIONS IN INVOICES.
Notice of alterations made for various reasons.

535 UNFILLED ORDERS.
Requests for information regarding unfilled or back orders.

540 SUPPLIES RETURNED.
Supplies returned to shipper.

545 INVOICE SUMMARIES.
List of invoices sent to the accounting department from the purchasing department.
Record of bills approved.

550 SUPPLIES RECEIVED.
Supplies received and put into stores. Old material or scrap returned to stores.

555 REQUISITIONS ON STOREKEEPER.
Foreman's requisition on storekeeper for supplies.

560 STOREKEEPER'S MANIFEST.
Memorandum or list of supplies issued from storeroom.

565 REPORTS OF MATERIALS USED.
Foreman's report of materials used.

570 MATERIALS SUPPLIED.
Storekeeper's record and distribution of supplies issued from storeroom.

575 STOCK ON HAND.
Stock on hand as shown by stock card or ledger account.

580 INVENTORIES.
Inventory of goods in stores or on hand in various departments.

BOOK 600—MAINTENANCE.

605 REQUESTS FOR REPAIRS.
Requests for general repairs.
Report of condition of cars, line or track, and request for repairs needed.

610 SHOP ORDERS.
For general or special repairs with report of labor and material used and record of same. (Also called job order.)

615 TRACK DEPARTMENT.
Inspection, report of work done and amount of labor and material.

620 LINE DEPARTMENT.
Inspection, report of work done, amount of labor and material.
Report of emergency crew.

625 CAR SHOP.
Work done on car bodies and trucks. List of cars received at and delivered from shop. Reports and records. (See 640 for wheel and axle.)

630 ELECTRICAL DEPARTMENT.
Maintenance of electrical equipment. Reports and records. (See 645 for armatures.)

635 MISCELLANEOUS SHOP REPORTS.
Miscellaneous reports of shop work, including small repairs made in shed. Reports of condition of equipment in shop.

640 WHEEL AND AXLE REPORTS AND RECORDS.
Date removed and cause.
Mileage.

645 ARMATURE REPORTS AND RECORDS.
Date removed and record of work done.

650 CHANGES IN EQUIPMENT.
Trucks or electrical equipment changed from one car to another.

655 EQUIPMENT RECORDS.
Record of equipment, when and where purchased, kind, style and size, etc., etc. (For record of maintenance see 625, 630, 635.)

BOOK 700—POWER HOUSE.

705 POWER HOUSE.
All blanks for use at power house will be found together by companies.

BOOK 800—TRANSPORTATION.

805 TIME TABLES.
Printed schedule of leaving time from various points.
Blank forms for filling in runs, giving time at several points. Headway, etc.

REFERENCE

810 ASSIGNMENT OF RUNS.
Blank forms for names of conductor and motorman for the several runs.

815 CAR STARTERS' REPORTS.
Reports showing time cars on the several lines leave (pull out) and arrive (pull in) at the car barn.
Number of cars in service, etc.

820 REPORTING LIST.
List of employees showing those excused or absent.

825 DESPATCHERS' REPORTS.
Reports showing time cars actually pass various points, and name of crew.
Register of train crews and runs assigned them.
Train sheets.

830 TRAIN ORDERS.
Despatchers' orders to trainmen.

835 TRAINMEN'S REGISTERS.
Trainmen's report of time worked, showing time on and off, etc.

840 REPORT OF CONDITION OF CARS.
Trainmen's or inspectors' report of condition of car.

845 REPORT OF EXTRA CAR RUN.
Extra, chartered or special cars.

850 DELAY REPORTS.
Reports of delays and causes; made by trainmen, despatcher, or superintendent, also work of wrecking crew.

855 CARS PULLED IN.
Report of cars pulled in and cause.

860 RECORD OF TRIPS.
Report of trips run, made by trainmen, and record of total trips on the several lines.

865 MISCELLANEOUS TRANSPORTATION REPORTS.
Miscellaneous reports of trainmen.

BOOK 900—TRANSPORTATION B.

905 INSTRUCTIONS TO TRAINMEN.
Books of rules giving general instructions, special instructions, and notices. Questions for trainmen to answer.

910 SECRET INSPECTION.
Reports of inspectors and records of same.

915 ARTICLES FOUND.
Tags to be put on articles found.
Notice sent to owner and record of same.
Receipt signed by owner.

920 TRACK CLEANING.
Clearing snow and ice.
Sprinkling and sanding track.

925 CAR MILEAGE.
Individual car, daily, by lines.

930 STABLES.
Various blanks used in this department.

935 ADVERTISING.
Folders advertising park resorts, etc.
Notices giving fares, etc.

940 BENEFIT ASSOCIATIONS.
Application for membership.
Notice of sickness.
Claim for benefit, etc.

BOOK 1000—INJURIES AND DAMAGES.

1095 EMPLOYEES' ACCIDENT REPORTS.
Accidents to persons or damage to property as reported by trainmen.

1010 REPORT OF DAMAGES.
Report of damage to companies' property.

1015 REPORT OF ACCIDENT TO EMPLOYEES.
Report of accident to an employee in any department.

1020 REPORT TO RAILROAD COMMISSIONERS.
Report of accidents in State of New York, made to Railroad Commissioners.

1025 WITNESSES' ADDRESS CARDS.
Names and addresses of witnesses.

1030 WITNESSES' STATEMENTS.
Statements of witnesses giving details of occurrence.

1035 REPORTS OF INVESTIGATION.
Report as to cause of accident and condition of property after.

1040 SURGEONS' REPORTS.
Report of surgeons on condition of persons injured.

1045 CLAIMANTS' STATEMENT.
Statements of persons injured.
Affidavit of claim.

1050 RELEASE OF RESPONSIBILITY.
Release of all blame attached to the company for an accident, in consideration of cash payment or not.

1055 ACKNOWLEDGMENT OF INDEBTEDNESS.
Employees' acknowledgment of neglect and an agreement to pay a specified sum for damage done.

1060 LAW DEPARTMENT BLANKS.
Miscellaneous blanks of claim department, and law blanks and forms.

1065 REPORT ENVELOPES.
Envelopes for keeping reports of accidents, and all papers relating to each individual claim.
Envelopes for sending reports to claim department.

1070 RECORD OF CLAIMS.
Record of all accidents and disposition of claims.

1075 SUMMARY OF CLAIMS AND COMPARISONS.
Summary of claims.
Statement of claim department.
Compartive statement as to cause, cost, etc.

BOOK 1100—VOUCHERS, ETC.

1105 VOUCHERS.
Blank forms for bill of goods purchased with spaces for payment, etc., also form for receipt and backing showing distribution of charges. Also voucher folders with backing.

REFERENCE

1110 RECEIPTS.
Receipts for cash.

1115 ACCOUNTS RECEIVABLE.
Bill form for accounts due.

1120 JOURNAL ENTRIES.
Blank forms for journal entries.

1125 MISCELLANEOUS OFFICE BLANKS.
Office blanks not otherwise provided for.

1130 PROXIES.

1135 CHECKS.
Bank checks or drafts.

1140 REGISTER OF BILLS.
Bills approved for payment.

1145 TREASURER'S REPORTS.
Daily cash balances in office or bank.

1150 ENVELOPES.
Envelopes for regular correspondence or special purposes.

1155 LETTER PAPER.

BOOK 1200—MONTHLY AND ANNUAL REPORTS.

1205 COMPARATIVE STATEMENT OF EARNINGS.
Comparative statement by lines or divisions for day, month or year.

1210 COMPARATIVE STATEMENT OF EXPENSES.
Comparative statement by accounts for month or year.

1215 MONTHLY AND ANNUAL REPORTS.
These reports cover statement of income, expenditure, cash statement, balance sheet, etc., for month or year.

1220 TRIAL BALANCE.

BOOK 1300—RECORDS.

1305 VOUCHER RECORD.
Record of accounts payable with distribution to various operating and construction accounts, etc.

1310 DISTRIBUTION OF VOUCHER.
Distribution of voucher charges to sub-accounts not shown on voucher record.

1315 ACCOUNTS RECEIVABLE.
Record of amounts due from rents, etc.
Record of accruals, interests, taxes, etc.

1320 CASH BOOK.

1325 JOURNAL.

1330 LEDGER.

1335 CLASSIFICATION OF ACCOUNTS.
The standard classification, the standard with changes, and additions.

BOOK 1400—ELECTRIC LIGHTING, GAS, WATER.

1405 SOLICITORS' REPORTS.
Business solicited and secured and records of same.
Service discontinued.

1410 CONTRACTS AND AGREEMENTS.
Applications, contracts and agreements for service.

1415 ORDERS TO CONNECT, ETC.
Orders to connect or disconnect meters, etc.

1420 INSPECTORS' REPORTS.
Arc lamps, meters, wiring tests and inspections of various kinds.

1425 REPORTS OF WORK DONE.
New installations. Reports of trouble and repairs made.

1430 TRIMMERS' REPORTS.
Number of lamps trimmed and material used. Lamps out of order, etc.

1435 METER READINGS.
Single readings.
Readings by months for the year.

1440 LAMP RECORD AND SALES.
Record of lamps in use, renewed or sold.

1445 BILLS.
Bills. Notice of bill past due.

1450 COLLECTORS' REPORT.
Reports of collectors and records of cash received.

1455 RECORD OF POWER AND GAS OUTPUT.
Power-station records, also output of gas, etc.

1460 CONSUMERS' REGISTER.
Meter readings and amount of charges each month, also discounts and cash paid.
Record of kind of service and meters, etc., installed.

1465 MISCELLANEOUS OFFICE BLANKS.
Blanks and forms not otherwise provided for.

1470 STATEMENT OF EARNINGS AND EXPENSES.
Daily and monthly reports.

1475 EQUIPMENT RECORDS.
Lamps, meters, transformers, etc.

BOOK 1500—FREIGHT AND EXPRESS.

1505 FREIGHT AND EXPRESS.
All blanks for freight and express will be found arranged by companies.

BOOK 1600—FOREIGN TRAMWAYS.

1605 FOREIGN TRAMWAYS.
All blanks of the Glasgow Corporation and other tramways will be found in this book arranged as nearly as possible in accordance with the scheme followed in arranging other blanks, beginning with income.

ENGINEERING ASSOCIATION—FRIDAY SESSION

The meeting was called to order at 10 A. M. and the president called for the report of the Committee on Car and Car House Wiring. Mr. Palmer presented the report, which is published elsewhere in this issue.

CAR AND CAR HOUSE WIRING

M. V. Ayres (Boston & Worcester Street Railway) said that he thought the committee deserved the thanks of the Association for having accomplished what it had in getting some of the stringent rules of the underwriters modified, but that there was still more to be done. The requirement of 4 in. from the current carrying part to the woodwork seemed to him unnecessary and rather absurd. Other provisions could also be altered to advantage. One change which had been brought about by the commitee was in regard to the rule relating to the size of the incandescent lamps used in the cars. It was formerly specified that nothing greater than 32 cp was to be used. That has been changed to read 128 watts, which would be the same consumption as in the case of the ordinary 32-cp 4-watt lamp, but permits the use of a higher efficiency lamp. The speaker did not see why the companies should be limited in the size or current consumption of its incandescent lamps. He thought the underwriters were somewhat in the habit of taking standard practice and establishing that as a limiting feature. This ought not to be, because the greatest liberty, consistent with safety, should be permitted to make modifications that might seem desirable. He did not know that he should want to use a bigger lamp than one using 128 watts, but he did not think he should be interfered with by the rules of the National Board of Fire Underwriters, as he thought it was perfectly safe to use larger lamps. He also had noticed that the rule in regard to the use of lamp sockets and clusters provides for an approved cluster or porcelain reception but for nothing else. This would inferentially prohibit the use of an improved metal socket which he considered perfectly safe if properly installed. Another important point was prohibiting grounded circuits. A great many waiting rooms are lighted that way. This rule was adopted at a time when grounded circuits were considered dangerous. To-day most of the electric lighting companies use grounded circuits as a matter of safety. The rule may have been founded on a fear on the part of the electric lighting companies that street railway companies would go into the lighting business, but there is no danger of that under ordinary conditions, because no street railway circuit has steady enough voltage to be used for commercial lighting; hence there is no reason on that ground for prohibiting the use of electric railway power where it is desirable and necessary for lighting purposes. Proper rules of construction should be specified for use with 500 volt work and that should be the only limit. He had mentioned a few points only, and believed it would be desirable for the committee to assemble these rules in a book and circulate them among the members for their consideration, and comment would be desirable.

H. H. Adams (New York City Railway) thought the suggestion made by Mr. Ayres relative to assembling all of the rules for car and car house wiring in one book was a very desirable one and of great advantage to the Association. He urged that the question be given further consideration.

W. J. Harvie (Utica & Mohawk Valley Railway) suggested that next year's committee also take up the matter of knife switches, which the underwriters seem so desirous of having used in car houses and elsewhere. He thought an ample snap switch was just as good as a knife switch and that if the matter was taken up properly with the underwriters they might approve some form of snap switch for car house work.

Wm. Roberts (Northern Ohio Traction & Light) suggested that some consideration might well be given in the future to the proper procedure to follow in the case of lightning storms and also the arrangements for taking care of the cars in the car house at night.

There being no further discussion, upon motion of Mr. Adams, the committee was given a vote of thanks and it was decided to assign, for further consideration by the proper committee, the question of assembling the rules in regard to car and car house wiring in a book.

The president then called for the report of the Committee on Operating and Storage Car House Designs.

DESIGN OF OPERATING AND STORAGE CAR HOUSES

Martin Schreiber (Public Service Railway), said:

I have read the report of the committee with great interest, and consider that it is a step in the right direction toward proper design. Varying conditions on different properties make it difficult to advocate definite rules of details and designs for car-house layouts. But if we stop to examine some of the existing terminal layouts in the country, the value of the report will certainly be very apparent. This subject may well be divided into two parts: First, location, and then design. And, further, the design may be separated into two divisions, the track layout and the arrangement and construction of buildings and accessories.

The track layout should be made as flexible as possible for convenient and economical operation. The battle bar should be eliminated, if possible, where cars have the same way to get in or out. In the yards if practical, it is desirable to keep the cars moving head on and irrespective of the fact if it is necessary to approach the barn in either direction, so that the cars may go on to the main line both ways. This would be the condition if the terminal is located at a point intermediate between the ends of the line. Again, if the terminal is on the main line, the arrangement of special work should be such that the least interference is presented to the regular operation. Of course, the carrying out of the above may mean more first costs, but after that, the expense will be small compared with the loss which would follow from juggling around cars with a cheap and inefficient track layout.

I believe that in the majority of cases for operating barns and with cars of width varying from 8 ft. to 8 ft. 6 in., 11 ft. center track spacing is good practice. Where the wall covers the distance from center of track to pilaster of wall, a distance of 8 ft. 4 in. is recommended. The distance from center to center of track where roof columns are placed should be 13 ft. Any portion especially reserved for an overhauling shop to have two 14-ft. centers and carpenter shop 14-ft. center and paint shop 16-ft. centers.

For the construction of the building we are assisted much by the co-operation of the insurance companies, particularly in recent years, who have not only given the subject careful consideration and made some valuable recommendations, but better still, made it an object for managements to accept these recommendations by showing a money-saving in insurance and operations.

To meet all present requirements a three or four-track bay seems to be the best. This allows the low-pitch and short-span roof which are so desirable with a single-piece heavy mill construction or concrete monolith roof. The report of the committee states that the three-track bay is objectionable. Sometimes this arrangement is very desirable, especially when the barn is long or in dividing up the property the width does not work out in multiples, and where four-track and one or more three-track barns cover all the ground. The trussed front for three-track barns works out very simple. The lower chord and two top rafters are one piece and a single rod in the center is covered with a 6-in. x 6-in. This design takes little more timber in the roof, as it gets away from the posts.

The natural ventilation and lighting of the short-span roof is very important. Especially on very long buildings ventilation is absolutely necessary if the stationary flat skylight is used, otherwise the monitor type skylight is desirable. Insufficient ventilation will cause a dampness in the barn, which is very destructive to car bodies and painting.

I do not concur in the opinion with the committee on the subject of heating. My opinion is that if the area is large enough to justify a blower system or hot air, that it is the only heating system to install; and that first cost and maintenance is greatly reduced over either the steam or hot-water system. This is due to the advantage of having all the apparatus concentrated at one location.

The arrangement of the salt, coal, sand and charcoal bank is important in that they shall be placed convenient to the operation of the cars, so that when the cars leave the barn these auxiliaries are right at hand.

The pit construction is always of paramount importance. These little details may not seem to cut much figure when you first bring out the drawings for a car barn, but after you have operated a car barn for two or three years they may have a great deal to do with the expense of operation.

I notice in the design submitted that several provide for anchoring rails on structural stone or in concrete. In designing the fastenings they should be made flexible, otherwise it is difficult to line the rail, a point very often overlooked. In the concrete pit it is found to be satisfactory to anchor a 12-in. x 12-in. x 8-in. creosoted block in the pier, and then fasten the rail to the block with lag screws. This allows for lining the rail, and as compared to rails fastened direct on steel is much more advantageous.

The question of doors for car barns is also one that deserves a great deal of attention. The trouble with the swinging door, which is generally most desirable, is that you have not the clearance for posts to hold it, but I think it is best to put in the swinging doors and place them further back on the track, rather than not to have them.

Mr. Adams called attention to the fact that the committee recommended flush transfer tables, and asked whether anyone present had had any experience with them.

Paul Winsor (Boston Elevated Railway) said his company had 24 or 25 operating houses and used nothing but flush transfer tables. Their great advantage, of course, was that they permitted the use of the whole space of the runway at night for car storage. The Boston Elevated used for many years a table carried on four sets of wheels, but its later tables have two sets of wheels. The table is a true span, the side trusses coming up some 4 ft., he thought, over the rails, while the height of the rail was about 7 in. above the track. One of these tables has been in use for several months, and the company is building three more, designed to handle 60,000-lb. cars. The drive motor on the table is provided with clutches which can drive a winch for hauling cars. These tables have been extremely satisfactory. They cost about $2,500 each, without track.

John Lindall (Boston Elevated Railway) said that another advantage of the flush transfer table, in car houses which have a large number of entering tracks, is that in case of emergency or a car house fire a very large number of cars can be got out without using the table.

Mr. Adams spoke of the statement made in the report that: "While the underwriters stipulate that no section of the house shall contain more cars than amount to the value of $200,000, your committee believes that no road should expose more than a certain per cent of their rolling stock to the risk of destruction by any one fire, as the loss of cars means the loss of revenue." Mr. Adams said that he was partly responsible for this provision of the Underwriters, having been on the committee of car-house construction last year, reporting to the American Association. That committee, in arriving at this figure, endeavored to place the amount as high as it was possible to do under the existing conditions. The fire underwriters wanted to limit that figure to a somewhat lower valuation, but were finally persuaded to permit $200,000 valuation. A company can always get under that if it desires.

E. W. Olds (Milwaukee Railway & Electric) said that he had lately inspected a number of car houses recently built by a large road in a neighboring city and had found that the size of the bays or fire area had been so reduced that the maximum number of cars that could be burned at any one time was 30. He thought this an excellent plan, if it could be done without interfering materially with the operating convenience of the car house. He asked Mr. Lindall whether he would recommend a flush transfer table in the gangway between two shops. The general construction followed is with a pit.

Mr. Lindall said that the flush transfer table had a decided advantage for such a location, inasmuch as material could be handled by trucks across the floor much better than with a pit transfer table, and he thought it also presented less interference for the workmen in getting around.

Mr. Olds asked whether any benefit would be gained if the main tracks were slightly depressed just before the transfer table was reached, so that the rise to get onto the table would be lessened.

Mr. Winsor replied that this plan had been tried in Boston, but that a slight depression of even a few inches interfered with the car-house floor construction. The company had also studied the raising of the tracks slightly to meet the table, but, on the whole, found it better to keep the tracks perfectly flat. He thought the rise was 7 in., which meant a transfer way about 15 ft. The only drawback he could see to a flush table was that a little more snow-shoveling was required in outdoor work than with a pit table.

On motion of W. B. Reed, a vote of thanks was extended to the committee for its report, and the report was adopted.

REPORT OF COMMITTEE ON WAY MATTERS

Mr. Schreiber then presented the report of the Committee on Way Matters. The report included papers by Messrs. Voynow, Weiss and Steward. These papers are published elsewhere in this issue.

A communication from G. L. Wilson (Twin City Rapid Transit) discussing Mr. Voynow's paper was then read. It was as follows:

The proposed new rail section as designed by Mr. Voynow shows careful thought and much ingenuity on his part. It is, however, a very radical change to place the flange on the rail instead of on the wheel, and it appears to the writer as if the design would invite all passing teams to use the rail.

The present forms of rail have been worked out with the intention of offering no obstruction to vehicles, but, on the other hand, it is not intended that vehicles shall be invited to use the tracks and thus make trouble and delay for the cars, on account of the track being better than the balance of the roadway. This interference from teams, it is believed, would be much worse with the proposed section than with either of the present grooved types or the T-rail.

As this association has recommended the use of T-rail wherever practicable, the writer does not believe that it would be advisable to favor such radical change in the rail section. The resistance offered by dirt and obstacles on the track, the writer believes, would be much increased, and the liability to derailment much greater than at present. This opinion of the writer is advanced with considerable hesitation, as it is in opposition to Mr. Voynow, but it is believed to be correct.

In the case of cars running on both city streets, and on outside lines—on open track—the proposed section is believed to be impracticable, as this condition exists in most cities and the use of city tracks is increasing by cars that run on interurban tracks. It is believed that this offers another very serious objection to the proposed rail section

In the earliest forms of tramway attempts were made to construct the track so that the wheels would be held on wooden rails by devices similar to the proposed section. These were found to be impracticable, and this section appears to begin back at the development of rail section again.

C. Boardman Reed (New York), in discussing Mr. Voynow's paper, thought that the guard of curve rails would wear out rapidly.

W. J. French (Utica & Mohawk Valley Railway) thought that the rail might be better than the girder rail, but not so desirable as a T-rail. He thought city engineers were beginning to see that the T-rail was the proper thing. During the past year the Utica and Syracuse companies had secured permission to use T-rails in paved streets that are traveled, at least in Utica, not by the heaviest kind of traffic, but by the ordinary city traffic. It has been shown that the pavement will wear well, that there will be no more danger from breakage of wheels than with the tram headed flat girder rail, and that the construction is far more stable and rational than the girder construction. He thought that sentiment was now changing in many cities in regard to the T-rail. Certainly it had proved satisfactory in Syracuse and Utica.

R. C. Cram (Consolidated Railway, New Haven) said the problem with T-rail construction related to the proper pavement to use with it, rather than anything regarding the rail itself. His company in several instances recently had placed T-rails in streets which had been previously paved with girder rails. When laid in a wooden block pavement the company uses two rows of stretchers and granite blocks at the gage line, and when laid in a bitulithic pavement one row of stretchers on the head side of the rail. These granite blocks are set so as to come in under the head of the rail, but about 1 in. below the top of the head, giving flange way room and providing an easy turnout for street traffic. As yet no extended experience had been had with this construction, but it would seem that the granite blocks would last a long time and that in conjunction with the T-rail a standard is being approached which will be more generally adopted as fast as the city engineers can be convinced that the construction is a good one.

C. B. Voynow (Philadelphia Rapid Transit) said there was no question that T-rail track was better than the ordinary rail, but it cannot be used everywhere. In a city where the streets are narrow the wagons have to take to the rails. With a T-rail there must be a groove for the wheel flange. Wagons will drive in these grooves and in course of time, on account of abrasion, there will be more obstruction in the middle of the track than the flanges of the proposed rail will present. Derailments will also be less with this track. All problems of standardization would disappear because there would be only one type of rail for all kinds of traffic.

Mr. French said one claim made for the rail was that teams could use it, but he thought this a disadvantage. The height of the flange was not given, but the speaker assumed it would be at least 1 in., and thought that would present a very serious obstruction to teams at crossings.

Mr. Voynow explained that the height assumed was corfect, but that at crossings the flanges would not have as great a rise and drop as at present. After further discussion, Mr. Reed asked the president for his opinion.

President Simmons, in closing the discussion, said that he looked upon Mr. Voynow's plan as somewhat in the nature of what an artist calls a study. The paper is certainly of value in pointing out a new line of thought and being printed in the proceedings would undoubtedly be discussed by railway engineers throughout the country. He said he did not approve of having wagons use the tracks while on the street. Even in a narrow street it is better for the wagon to straddle the track than to use the rails, because it can then get out of the road much more quickly and easily. He had been pleased to hear the testimony of Mr. French, of Utica, in regard to the increasing use of T-rail in that city and in Syracuse, and thought that possibly in the dim and distant future even Philadelphia might use T-rails.

TIMBER PRESERVATION

The paper on the tank method of preserving timber, by Howard F. Weiss, was then presented. It is published in this issue.

G. W. Palmer, Jr. (Boston & Northern Street Railway), asked Mr. Weiss if he knew of any company which was using this process for treating the butts of wooden poles and what can be done in the way of adding life; also the cost of treatment of poles and the cost of the plant for treating.

Mr. Weiss said that the only companies that had really taken this question up on a practical basis are some electrical companies in California. The Forest Service is now co-operating with four or five of them which have installed plants of moderate cost. In fact, the entire expense, including boiler and pump, is only $400. These various preservatives are injected simply into the butt of the pole. That contract will be terminated in about two months, and it is very possible that these electrical companies around Los Angeles will go into the business for themselves. The Government simply carries on this thing to the point of proving its value to the companies. The cost of treatment varies with so many factors that it is hard to give a definite answer. In general, it is about $1 per pole. A penetration of about 4 in. is secured. The only figures which the speaker could give on the length of life of wood treated with crude oil are derived from the work of the Santa Fé and Southern Pacific.

Mr. Palmer asked whether the Government was inaugurating experiment stations and operating men until they are able to convince the people who use poles and lumber commercially that they are a commercial success.

Mr. Weiss said that was the case, but that it was not the intention of the Government to boom any particular process.

Mr. Winsor said that the paper was an extremely interesting one; but like most papers, it points out what is the best thing to do. He thought a great many of those present were interested not in what is the best thing to do, but what can be done in a small way. He then asked Mr. Weiss what superficial treatment can be used to retard the decay and increase the life of ties or exposed timber.

Mr. Weiss said the Forest Service had carried out many experiments in that direction also. One was to apply the preservative with a brush; that is, to paint two or three coats of preservative on top of thoroughly seasoned wood. On green timber this is unsatisfactory, as the timber will check out as it dries and expose the untreated portion. Telephone companies frequently have a habit of cutting a pole in a pretty form and painting it in green condition. The other method is to take the wood to be treated and dip it into a tank containing the preservative. The most common preservative is dead oil of coal tar. The extended life with brush treatment would more than pay for the cost.

Mr. Winsor asked whether the first thing then was thoroughly to season the timber in some way either by air drying or by vacuum drying.

Mr. Weiss replied this was very advisable, because if green wood is subjected to steaming and pressure one is

very liable to injure the wood physically because of the excessive checking and decrease of strength.

Mr. Palmer said that during the past year his company had made quite an extended investigation of the merits of wood preservation. Both the open-tank method and the method of preserving poles by brush treatment had received attention and the company is pretty thoroughly convinced that it would be to the benefit of its maintenance accounts to adopt some method of preserving the ties and poles. The open-tank treatment seemed the most desirable, but not altogether the most practicable. As for the brush treatment, the investigation seemed to show that application could be given with dead oil of coal tar, two coats applied hot at a cost of about 15 cents per pole, and that it would add about 20 per cent to the life of the pole. That, of course, could be done with no plant at all, simply a fire to heat a pot of coal tar or creosote. The cost is almost nominal and the method is well worth trying by anybody using poles to any extent.

F. M. Durbin (Evansville & Southern Indiana Traction) said they had been treating their ties of California red wood with a bath of hot crude California oil, and around the butts of the poles they had been pouring a lot of this crude oil of coal. He asked Mr. Weiss what he thought of that.

Mr. Weiss said that if crude oil should be injected thoroughly into thoroughly seasoned wood it will keep down the moisture content of that wood. If crude oil is injected into a piece of wood so as to render it impervious to water, it will last just as long as the water content can be kept down below the point where the organisms that hurt the wood can exist.

Mr. Winsor asked Mr. Weiss about the use of paint on structures and bridges and whether timber in such places could be preserved by thoroughly painting it.

Mr. Weiss replied it was desirable to paint it on all sides and only after it was seasoned, otherwise the paint would retain the moisture in the wood.

Mr. Winsor said that in the case of guard timbers on an elevated railway it was difficult to paint all the sides; moreover, it is the tops of the guard timbers which decay first.

Mr. Weiss said that if there is a free circulation of air beneath the guard timber to keep it in a dry condition at that point, painting the upper surface was undoubtedly beneficial, but that it would be far better to paint it all the way around.

Mr. Schreiber suggested that Ernest F. Hartmann, president of the Carbolineum Wood Preserving Company, of New York, be asked to address the meeting. The invitation was extended by the president.

Mr. Hartmann said that wood preservation by the open-tank process began about 75 or 80 years ago in Europe, by simply treating in oil at normal temperatures, or at temperatures at which the oil would be liquid enough to use in the treating process. To-day the open-tank process differs from that merely in the treating process being conducted at a temperature above the boiling point, thereby creating a vacuum in the wood. By treating at these higher temperatures also at least a part of the sap and water which are contained in the wood is vaporized. In regard to the preservation of structures already erected, as mentioned by Mr. Winsor, the decayed parts, wherever possible, should be scraped away, then the application of a preservative would be far better than applying an oil paint. Oil is a preservative, but it is a vegetable compound, and decays the same as any other vegetable matter, but the antiseptic action of any preservative material on partially decayed wood will certainly help to a considerable extent. At Hoboken, N. J., there is a trestle which was constructed with the idea that it would soon be replaced by a steel structure, but it had to remain in service much longer than was expected. That structure was treated on the tops, and oil run into the cracks and crevices wherever possible, with a preservative, and inasmuch as the wood-destroying fungus is mostly from the outside, the application of a concentrated preservative at these points will help a great deal toward the preservation of these timbers. Some companies merely coat their timber in hot oil. This is an old practice and has given good results. The Boston Elevated Company is treating ties by the open-tank or immersion process, at a cost of from 16 cents to 18 cents each. It began in 1897 and has treated something like 90,000 ties. Mr. Plimpton, the engineer of the company, writes that the results are absolutely satisfactory, as he has had occasion to remove some of the ties that were untreated, which were laid at the same time the treated ties were laid. At Bangor, cross-arms have been treated and the cost of treatment there was, the speaker thought, $8.68 per 1000 ft. B. M.

At Norfolk, gum ties have been treated by the open-tank method at a cost of 23 cents per tie. At Columbus, Ga., the cost is 31 cents; at Denver, 17 cents; at Salt Lake City, 28 cents. The average of all the cost data obtained was $8.337 per 1000 ft. B. M., and covered the data of a great many plants.

The open-tank method can often be used when no other method is feasible. The timbers can be treated at once. The method can also be used during spare hours, when the men are not otherwise employed.

Mr. Cram (New Haven) said that some experiments with the open-tank method at Bridgeport had shown that green timber is not suitable for treatment with any process. The timber treated was some wooden block pavement designed for a bridge.

Mr. Hartman said that he was acquainted with that case and that if the bridge had been laid with expansion joints he did not believe there would have been any trouble, but there was nothing but a little sand grouting on the top of the blocks. The wooden blocks did not have a chance to show what they would do.

The president then read the following communication from G. L. Wilson (Twin City Rapid Transit):

The rapid increase in cost and the difficulty in obtaining timber for ties and all other railway construction work is one of the most important things to be considered by railway men. The tank treatment of timber promises to give satisfactory and economical results at a minimum of cost and it is hoped that experiments on a large scale will be tried so as to demonstrate the best practice and also to show the economy of tank treatment where the closed-tank methods of impregnating under pressure are too expensive. It appears to the writer that there is not a subject to-day where more valuable results can be obtained than along the line of timber preservation methods.

The writer would also like to state that as the meeting of this section was placed at the close of the convention, it has been impossible for him to remain and take part in the discussion of these papers. He earnestly desires and requests that in the future the discussion of papers before the engineering section may be had at an earlier date during the convention week.

E. O. Ackerman (Columbus Railway & Light) asked the extent of the life added to the timber by the open-cell and the filled-cell processes.

Mr. Weiss said he could give figures regarding the full-cell, but the empty-cell process is so new in this country there are no figures. He understood that ties treated by

the Rüping method are still standing up after very many years' use. The best example of the full-cell process of added life is found on the bridge across Lake Ponchatrain, near New Orleans. These piles have been in use for 30 years, and the untreated portion of the bridge lasted only about three years. Another good example of this process is also found on the Louisville & Nashville, at Scranton, Miss. The American Telegraph & Telephone Company poles have been in for over 10 years now and they are still fairly sound. The empty-cell process is new in this country, although some tests have been carried on in Germany. It is particularly adapted to conditions where the cost must be as low as possible. It gives a maximum penetration with a minimum absorption of oil, as Mr. Hartmann pointed out.

Mr. Winsor asked if wood partially buried in cement would decay.

Mr. Weiss said it would not as long as it was kept in a thoroughly air-dry condition. Ties that have been laid in cement flush with the top seem to have a long life. Possibly the protection came partly from ashes or something of that kind that had been worked into the surface. If the moisture is kept less than a certain point, or if the tie is wholly submerged in water, it will not decay. If a wooden tie is embedded in a concrete foundation and kept saturated with water it will never decay.

C. K. Durbin (Tucson Rapid Transit Company) said that about a year ago the Western Union Telegraph Company in Denver took down a line of 50 poles which had probably been imbedded in concrete for 20 years, and the butts looked as sound as the day they were put in.

Mr. Voynow said that he had tried to infuse preservative material into growing trees by boring holes at various points in the periphery, placing a glass tube in each hole, and attaching to the glass tube a bucketful of a solution of copper sulphate, which is considered a preservative. It was late in the spring, and a bucketful of the solution was absorbed every 24 hours. After some 18 days it was found that the copper sulphate had permeated into the tree as high as 30 ft. and 40 ft. above the point where it was applied.

Mr. Weiss said that the great German scientist, Mr. Hartig, had carried on some experiments along that line, and that method is used to a limited extent in lumbering with felled trees. The process has also been tried of injecting preservatives into live trees, but it has never become of any practical importance, although the government later may make some tests.

Mr. Schreiber (Public Service Railway) said that company used white oak ties for track work, and until about two years ago was able to get such a tie for about 60 cents, delivered on its wharf. Recently the white oak is of poorer quality, so that the company began to look around for some substitute at the same price. At first it considered the closed-tank process, but it was impossible to use that at any reasonable cost, and the open-tank method was used, and the company is now anticipating treating 50,000 ties by the open method. The company figures that the yellow pine sap tie, costing about 40 cents or 45 cents apiece, can be preserved by the open-tank method at about 20 cents, so that that will give a tie for practically the same price as the oak tie, and have, it is thought, a longer life. The company expects to treat about 1000 ties a day, and keep them in the preserver for about 10 minutes.

MANGANESE STEEL RAILS

The president then called for the "Life of Manganese Steel Rail on Curves," by Mr. Steward. This paper is published elsewhere in this issue.

Mr. Schreiber said that he had recently had an opportunity to examine some 85-lb. A. S. C. E. rail rolled by the Manganese Company and was surprised to find it so uniformly and accurately finished. He was informed that an analysis of the ingots from which the rails were made was about as follows: Manganese, 11.75; carbon, 1.12; phosphorous, 0.07; sulphur, 0.04. This 85-lb. section of manganese steel rail stood a drop test equal to that of the 100-lb. Bessemer section. The speaker thought that the use of the rolled manganese rail would increase rapidly for frogs, crossings, and curves, may well be built of that material. A frog with rolled manganese rails alone will have a larger percentage of life, probably an increase of 10 times. A steam and trolley crossing may have the steel running rail manganese and the remainder Bessemer or open-hearth. This will materially increase the life of the frogs at a small expense. The Public Service Railway is about to erect an extensive double-decked terminal adjacent to the new D., L. & W. station and over the station of the Hudson and Manhattan tunnel in the city of Hoboken, N. J. All the curves of the structure and the major part of the special work will be of solid manganese steel.

On motion, the report of the committee was accepted and ordered to be printed in the proceedings.

The meeting then adjourned until 2 o'clock.

AFTERNOON SESSION

The president said that if there was no discussion on the Question Box he would call for the report of the committee on economical maintenance. Mr. Lindall, of the committee, presented the paper.

REPORT OF COMMITTEE ON ECONOMICAL MAINTENANCE

Secretary Corning said that Mr. Munger stated in his remarks that comparisons with other roads were of little value; but it seems to him that sometimes comparisons with other roads would work to the advantage of a road having a high maintenance cost on some part of its equipment by leading it to look into the methods it employed and comparing them with other roads and possibly finding out that its methods were obsolete or could be improved upon.

Mr. Winsor said that in his opinion the paper was a very valuable one. The question of supplies, he thought, was an extremely interesting one, as was also the question of specifications. His company had a purchasing agent who was a purchasing agent in the best sense. He was gradually trying to work into the use of specifications; but it was very difficult.

President Simmons asked Mr. Winsor if he did not believe that it was strictly within the province of the standing committees in the consideration of their work to take up, as opportunity offers, specifications for material used in the line of work which the committee represents.

Mr. Winsor said he did; not, perhaps, to make the specifications standard; but as suggestions.

Mr. Palmer said his company had been trying to determine for its regular purchasers of materials that were used constantly just what kind should be bought. As rapidly as possible standard specifications covering such material were made up. It did not seem to him that it was the province of the purchasing agent to say what kind of material should be used in the various operations.

William Roberts said he noticed one paragraph in the conclusion of the report which said: "The paucity of replies received and the very evident absence of consistency in shop and maintenance costs accounting impresses the com-

mittee very forcibly of the need of a uniform method of detail shop accounting by means of which accurate records and current shop and maintenance costs on car-mile or ton-mile basis may be maintained and quickly and intelligently compared with figures of other roads." He received a communication from the committee relating to cost of operating for chilled wheels, chilled cast wheels, pressed steel wheels and steel tired wheels, which had been very carefully taken on his road; and he also gave the cost per 1000 car-miles of the different type of wheels and had interchanged this information with other members of the committee. His road operated over very severe grades. It had a great number of grades, running from 3 per cent and 4 per cent up to 13.3 per cent, and did not expect, and could not expect, as great mileage on its wheels and other material as may be expected in the case of fairly level grades of track. There were two questions that he invariably put to the traveling men who wanted to sell goods. He asked them first, if they could sell him something better than he had at the same cost, or if they could sell him something as good as that he had, but which would cost less.

Under the order of general business proposed amendments to the constitution and by-laws were brought up. One amendment proposed would make the past presidents of the association practically ex-officio members of the executive committee of the association. The change was adopted. Another change proposed was designed to eliminate the necessity of sending a notice 30 days in advance of the convention in relation to any desired change in the by-laws. An amendment providing for this change was adopted. The other change suggested that the office of secretary of the Engineering Association be made an honorary one and the active duties of the secretary be performed by the secretary of the American Street & Interurban Railway Association. A resolution providing that the suggestion be referred to the incoming executive committee for consideration and report to the association, was passed.

President Simmons said he wished to state that the work of the executive committee during the year was evidence of the necessity for a joint committee between the Accountants' and the Engineering Associations, looking to a further development of 73 accounts of detail work. This committee would take up all questions relating jointly to the accounting and engineering departments. On motion, this matter was referred to the incoming executive committee for the appointment of such a committee.

H. H. Adams spoke on the question of the associate members. He thought it would be well to have this matter taken up to see that these members were supplied with advance papers at the same time the company members were supplied. He thought that this should extend as far as possible to the data sheets, and that all data sheets should be forwarded to associate members. He moved that the secretary be instructed to see that associate members were supplied with advance papers and also with all data sheets and general notices that could consistently be forwarded to them. The motion was carried.

W. J. Harvie said it occurred to him that there was no association at the present time with which the purchasing agents were affiliated. It seemed to him that their business pertained largely to the engineering end of the work, and he moved that an invitation be sent to the purchasing agents of the member companies asking them to affiliate with the Engineering Association. The motion was seconded and carried.

E. T. Munger, chairman of the nominating committee, then presented the report of the committee, which made the following nominations:

President, Paul Winsor, Boston.
First vice-president, F. H. Lincoln, Philadelphia.
Second vice-president, W. H. Evans, Buffalo.
Third vice-president, W. J. Harvie, Utica.
Secretary and treasurer, John W. Corning, Boston.
Executive committee: William Roberts, Akron; E. O. Ackerman, Columbus, Ohio; L. L. Smith, Highwood, Ill.; Martin Schreiber, Newark, N. J.

The president was authorized to cast one ballot for the candidates as reported.

In accepting office, Mr. Winsor said:

The work of the association has been well laid out. It is in better shape than it ever has been. The engineering work of the association will go on better and more easily from the past experience, but there is one thing that may be hard to handle this next year, and that is the question of the possible separation of the different associations which comes up before the main association.

The committee work is the most important work. The success of our meetings depends almost entirely on the work done by the committees and on their report. This year we have had a large number of reports, all of them of great importance, and they have brought out discussions, and many of them extremely able, and I shall look to the aid of all of you gentlemen in assisting in the work of all these committees, either the active work of the committees or in giving them the information asked for.

The meeting was then adjourned.

THE POSSIBILITIES OF A WELL-CONDUCTED PUBLICITY DEPARTMENT*

BY G. H. GALL, PUBLICITY MANAGER, WASHINGTON, BALTIMORE & ANNAPOLIS ELECTRIC RAILWAY COMPANY, BALTIMORE, MD.

The Washington, Baltimore & Annapolis Electric Railway Company established a publicity department on June 22, 1908.

Theoretically, as to possibilities, "the sky's the limit." Practically, a publicity department should be the medium through which is expressed every relation a public service corporation bears to its patrons, the public. More important still, it should be the instrument for holding and creating business, the creative, aggressive branch of the traffic department. If a publicity department successfully brings about a friendly attitude on the part of the public toward the company and, furthermore, induces that public to patronize its lines more and more, then it may be termed a well-conducted department and said practically to have realized its possibilities.

Let us consider the latter function, the creation of business, first.

In groping about for light on the subject, after accepting the invitation to write this paper, I wrote letters to a score or more officials of companies operating properties similar to our own, asking them for any suggestions they might care to offer and making the letter purposely indefinite. Most of the gentlemen addressed replied, and I wish here in passing to recite some of their views on the traffic-increasing functions of a publicity department, and later to quote them on the purely publicity features, using the term in the sense established by Mr. J. Harvey White.

A. D. B. Van Zandt, of the press department of the Detroit United Railway, remarked in this connection: "That a publicity department is a necessity to a street railway company is every year becoming more and more apparent

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

to railway managements. As a matter of fact, a street railway company, either city, suburban or combined, is in the market to sell its goods, and its goods consist of rides, and that it can dispose of more of these goods by increasing and improving its advertising is none the less true than in any line of business. Witness the wonderful growth of electricity and gas in the houses, due, I honestly believe, as much to the extensive and clever advertising these people have been doing as to any other factor. The possibilities exist with us just as much as they exist with the grocer and dry-goods man."

You will note Mr. Van Zandt's interpretation of the word "possibilities" as used in the title of the paper.

Arthur W. Brady, president of the Indiana Union Traction Company, emphasizes the importance of the "goods selling" function in the following way. He says: "Your paper touches a subject of decided importance at the present stage of electric railway development. My view is that the functions of a publicity department are principally twofold. One is to advertise the company's goods; that is, to keep the public advised of all the company's offerings. The other is by disseminating proper information to aid in bringing about a correct understanding of the mutual interests of company and public, and in securing and retaining public good will."

ADVERTISING

Other letters touching upon the advertising work of the department deal with methods, and it is appropriate here that some consideration be given to advertising methods. Our work in creating travel between Washington, Baltimore and Annapolis has already covered a rather wide range. This may be classed as newspaper advertising and special advertising. We have aimed to make all our newspaper advertising practically news matter, not so much in form as in substance. Whenever any coming event of large public interest in any of the three cities is announced, we aim to take advantage of the wide free publicity given it by following that up, in one or both of the other cities, with advertising announcements calculated to associate the line with the event when it is fresh in the public mind. For instance, a notable convention is to be held in Washington, to which the Baltimore papers are giving considerable space. A few days before the convention is held, when Baltimoreans are planning to attend the affair in Washingon, "The Electric Line" (which is the trade-mark we use) is set forth as the best means of reaching Washington. Again, Cardinal Gibbons is expected to reach Baltimore, after a long absence in Europe, and the Washington newspapers state that thousands of Catholics in Washington are planning to participate in the home-coming celebration. A properly timed announcement that "The Electric Line" is the best way by which to travel to Baltimore for this occasion, associates the line with the event when it is fresh in the minds of Washington Catholics.

In this way not only is the newspaper advertising given definite news value, but it takes the place of practically all general newspaper advertising. Of course, this necessitates a constant and intelligent reading of all the newspapers and keeping in touch with all future public events of wide interest.

We also aim to make all our newspaper announcements of excursions, special trains and rates, as newsy as possible.

In addition to the straight advertising copy, we find that the newspapers are always willing to publish news stories and "readers," for which, of course, there is no charge, when offered to their city editors. In order to get the most out of this sort of service, the experience of a practical newspaper man in the publicity department is almost necessary. Reference will be made later to other newspaper features which the well-conducted publicity department is able to obtain without charge to the company.

In a word, we believe that the best results from newspaper advertising lie in making the copy contain as much of news interest to the public as the department store advertisement holds for the housewife.

All our other advertising is supplementary, more or less, and general, but, we believe, none the less important. This includes bill boards, street car advertising, publication of pamphlets, souvenir cards for conventions, souvenir cards for general sale, circular letters, attractively printed and framed time cards carefully distributed in business offices, hotels, restaurants, and theatres, steamers, theatre program advertising, society program advertising, half sheets and complimentary excursions.

During the summer we have given but one complimentary excursion, but have others in mind. This excursion was planned at a time when the newspapers of Washington were devoting a great deal of space to the "Fresh Air" campaign of the Asociated Charities. This body was tendered a free outing for 500 poor children. They were to be taken over "The Electric Line" to Annapolis, and thence by steamer out on the cool waters of Chesapeake Bay. The trip was a duplicate of regular excursions that we were trying hard to popularize in Washington. The outing was a success, of course, and the children had a great time, but the important point is that all of the newspapers gave advance stories of the event and on the day of the excursion sent reporters and photographers and printed attractive stories that day and the next. The publicity department was even able to induce some of the Baltimore papers to send reporters on the trip. Of course, we obtained publicity for the regular excursion of a kind which could not have been had in any other way.

One point should here be noted as showing the value of newspaper experience in the publicity department. The longest and most complete accounts of the events of the day printed by any of the papers were written by the manager of the publicity department himself, at the offices of the newspapers.

Before leaving the subject of advertising methods reference should be made to care in preparation of copy. Every piece of copy to be written should be studied carefully with reference to the medium to be used and the class of people to be addressed. Care in the selection of type and arrangement of matter is also important. When much advertising is done this care entails considerable labor, but it is only in this way that the space purchased can be made to return its full value. Advertising experience, therefore, as well as newspaper experience, is essential to the properly conducted publicity department.

The publicity department should also work closely with the traffic department. We have found this of the greatest value. The publicity department, making a special effort to keep in touch with all public events entailing the movement of traffic, may keep the traffic department constantly informed in order that its agents may go after every bit of possible business. The traffic department, on the other hand, may keep the publicity department informed of its plans, in order that advantage may be taken of every occasion for a news story.

RELATIONS WITH PUBLIC

Let us now consider the other functions of the publicity

department, those concerning the relations of the company to the public, made clear through the medium of the newspapers: the possibilities before any publicity man who has had newspaper training and the opportunities for so-called "press agent" work.

Among street and interurban railroad men I fear the possibilities of this branch of the publicity department's work are but meagerly appreciated or understood. Allow me first to give you a good newspaper man's conception of the good publicity man, to follow that with some expressions from the letters referred to illustrating how far short of this conception the street railroad man falls, and then to illustrate the idea with examples.

Allen D. Albert, editor of the Washington *Times,* thus conceives the possibilities of the publicity department:

The modern newspaper was originally a political pamphlet. Its business was purveyance of opinion, not promulgation of information. The news columns came later; but they have gradually crowded out the opinion department, until nowadays it is recognized that the effective way to influence the public, through the press, is not by preaching at it through the editorial columns, but by getting the right kind of news printed in the news column.

The newspapers being disposed to "boss" their own news columns, the only way to get into them right is to do things they will want to tell about. They will want to print anything the public will want to read. Ergo, the publicist who understands what the public will want to read about is well started on the way to success.

That is where the press agent comes in. He manages his principal; his business is to put the spot light at the right time on the things which will make good copy; to see that there is something doing that will be good to write about; to make sure that when it is once done, it is duly exploited.

Everything has a press agent attached to it nowadays. (This editorial appeared soon after the Washington, Baltimore & Annapolis Electric Railway established its publicity department.) The political managers do their work largely with reference to the appearance it will make in print. It may be called demogoguery; but it isn't just that. It is a concession to public opinion; in short, it is an admissioin of the very big fact that this is the day of democracy.

Now I quote from the letters of street and interurban railroad officials, all of large and important properties, but whose names in some instances are withheld.

A president of a very large system writes:

Our publicity department is of very simple construction and exercises scarcely more than the functions of a fender to newspaper inquiries and the imparting of correct information.

It is quite possible that I have personally been inclined to attach less importance to this department than it should receive, and I would feel obliged for any information, etc.

Another president writes:

We have done considerable newspaper advertising, but it has been handled by the various members of our staff in addition to their other duties.

We believe that appealing to the public through the medium of the press is a good thing. While it may be very hard to see the results at first, yet it seems to me that the result will be just as apparent from telling the story from the street railway's standpoint as from telling it from the "muck-raker's" side. These last-named have had a free rein for the past few years, and I believe that if their various articles had been taken up on the start and answered through the columns of the press, it would have resulted differently for the various corporation interests of this country.

I have a letter from George H. Harries, vice-president Washington Railway & Electric Company, but he says he will be satisfied with an opportunity to discuss the paper at the convention. Although that company has no publicity department, General Harries has personally devoted considerable attention to this matter.

Mr. Albert well states the tendency of public thought. People like to draw their own conclusions about public matters rather than to have them formed for them by the editorial columns; hence the supreme importance of getting the right sort of news into the news columns. First give the people what they want to read, and there is no trouble in getting it past the city editor. Of course, a newspaper man is best equipped to judge of the merits of a story, and his place in a publicity department is important. He should always be looking out for something to give the newspapers, and he usually can find something. Our stories have covered excursions, the fact that certain organizations and well-known persons have traveled over the line, accounts of new construction, special feature and magazine stories, and other matters that are always acceptable to newspapers. We have even induced the papers in Baltimore, for instance, to cover, by telegraph, events in Washington that otherwise would have gone unnoticed.

In a word, the nose for news is just as important in the publicity department of an interurban road as it is on the staff of the newspaper itself. By these means the road and its service are frequently brought before the public in a pleasing way. No direct advertising could get the same results.

Secondly, it is important to see that when the road does a thing worthy of public notice it should be properly exploited. In the early part of this paper I cited the instance of the press reports of the poor children's excursion. The publicity manager should be right on the job in cases of this kind, and in case he finds that any paper is not going to give an account satisfactory to him, he can write the story himself. The city editor will usually be glad to take it all and save the time of his own reporter.

Where roads have publicity departments they too frequently pursue a non-aggressive policy toward the newspapers. Instead of waiting for reporters to call at the office for news, the publicity department should all the time be offering news, bringing it to the city editor. It will always go, provided it is good stuff, and sometimes when it is not so good.

Much has been said about accidents and the handling of the newspapers. We believe that the best results, both temporary and permanent, are had from complete frankness and assistance in getting the facts. Attempts to minimize accounts of accidents by withholding facts only put the newspapers in a skeptical mood, and misstatements result. Attempts at holding down stories of this nature should be made only in the most careful manner, and preferably by the manager, rather than by another official of the company.

A wide acquaintance among newspaper men is a most valuable asset to the manager of the publicity department and these acquaintances should be carefully fostered and widened. In the last report of the committee on promotion of traffic the following statement is made: "It must not be forgotten that newspaper men are a bright, intelligent, self-respecting lot of workers, very sensitive about being used fairly and squarely, as one gentleman should use another, and they will do more in return for courteous, fair-minded treatment than money can ever procure." There should be no distant attitude of respect. The publicity manager should be well acquainted with as many newspaper men as possible, and his depatrment should be a little news bureau itself. It is only in this closeness of association that the best relations with the newspapers, which means the public, can be cultivated.

ACCOUNTANTS' ASSOCIATION—FRIDAY SESSION

The Accountants' Association was called to order by Acting President Wallis at 10:20 o'clock on Friday morning.

In the absence of A. B. Bierck, general auditor, Long Island Consolidated Electric Railways, his paper on the "Effect of Electrification on the Accounting Methods of Steam Railways" was read by Acting Secretary Weeks.

Frank R. Henry, who resigned as president of the association during the last year because of his resignation from the United Railways Company, of St. Louis, to engage in other business, was elected an honorary member of the association.

On motion of S. C. Rogers (Mahoning & Shenango Railway & Light Company), the incoming executive committee was directed to take up with the Transportation and Traffic Association the desirability of the appointment of a joint committee to consider questions of interest to that organization and the Accountants' Association. Similar committees, it is proposed, shall also be created with the Claim Agents' Association and with the Engineering Association.

On motion of A. L. Linn, Jr. (Mohawk Valley Lines), the incoming president was directed to request the president of each of the various State electric railway associations to appoint one member to keep the member companies in such associations in touch with the work of the committee on standard classification of construction and equipment accounts and form of report of the Accountants' Association.

As directed at a previous session, Acting President Wallis appointed a committee on interline accounts, as follows: W. H. Forse, Jr. (Indiana Union Traction Company), chairman; Irwin Fullerton (Detroit United Railway) C. L. Wight (Inter-Urban Railway, Des Moines, Iowa).

The committee on resolutions then presented a report expressing the thanks of the association for various courtesies. The report was adopted.

R. N. Wallis, treasurer, Fitchburg (Mass.) & Leominster Street Railway, was elected president for the ensuing year. Under the new plan the office of secretary and treasurer of the association is purely honorary. H. E. Weeks, secretary and treasurer, Tri-City Railway, Davenport, Ia., was elected to fill this position.

CATENARY CONSTRUCTION DISCUSSED AT THE A. S. C. E.

On Oct. 7 O. S. Lyford presented a paper on the catenary trolley construction of the Denver & Interurban Railway before the American Society of Civil Engineers. An abstract of Mr. Lyford's paper was published in the Electric Railway Journal of Sept. 5, 1908. The discussion on the paper was confined principally to C. R. Harte, assistant engineer of the New York, New Haven & Hartford Railroad, and W. K. Archbold, of the Archbold-Brady Company, of Syracuse, N. Y.

Mr. Harte stated that the last word has not been said on catenary construction. One of the important problems in electrifying steam railroads is that the construction must be carried on without hindering the regular operation of the roads. His company had used several different methods according to traffic conditions. Derrick cars have been used with success except where traffic is heavy. In the more recent construction work of his company flat cars carrying towers had proved more advantageous than the derrick cars. If possible the construction train should be at least as long as the standard span. A series of flat cars carrying towers are more desirable where suspensions are as close as 10 ft. With such construction train the material can be laid out in exactly the proper order and thus the annoyance of installing hangers of the wrong length is avoided. Extension platforms have been used on the towers to make it possible to work simultaneously on two trolleys in main line work. Mr. Harte also mentioned a method developed by Messrs. Latey and Slater for erecting brackets from the ground outside the track and then installing the wires with a very light tower car which can be quickly removed for passing trains.

The clearance of 6 ft. 6 in. recommended by Mr. Lyford seemed rather scanty to him and he favored some larger dimension like 10 ft. on account of signals. When poles are set close it is difficult to get a good view of the signal setting. The optical illusion presented by a long line of poles is such that even with the 10-ft. clearance, the poles seem almost in line with the signal posts.

Mr. Harte also spoke of the suggestions which have been made regarding compound conductors—that is, one which will secure the benefit of low-line losses with minimum wear of the contact wire. On the New York, New Haven & Hartford line this feature is secured by using a steel wire of high strength for contact and an intermediate copper messenger wire for feeding. The speaker showed some recent examples of catenary construction both abroad and in the United States, the latter including a view of the New York, New Haven & Hartford Railroad's secondary trolley construction and clips shown in the Electric Railway Journal of Oct. 10, pages 860 and 924.

Mr. Archbold, the second speaker, pointed out the increasing difficulty of getting the right kind of long straight poles desirable for catenary construction. His estimate for the Syracuse, Lake Shore & Northern Railroad showed that for a very slight increase per mile for a double-track line, it was possible to install the light steel bridges of the type described in the Street Railway Journal of Feb. 15, 1908, and in the Electric Railway Journal of Sept. 19. This extra cost included the steel construction, the concrete foundations and the catenary supports of the trolley. It must be remembered that the life of wooden poles is short, making the expense of replacement something that must be considered. Mr. Archbold said that no difficulty had been experienced on the Syracuse, Lake Shore & Northern Railroad from side sway, although the spans are 300 ft. Wire steadying strains are used on each bridge with tension on each side of the trolley, this being found more desirable than stiff steadying strains. Regarding rigidity in a vertical plane some difficulty was experienced in hot weather from this source, but as the hangers spaced 20 ft. were giving a great deal less trouble than those spaced 10 ft., it was determined to go a step further by increasing the standard intervals between the hangers to 30 ft. The change from 10 ft. to 30 ft. has brought about the elimination of arcing, which occurred when the trolley wheels of heavy cars ran under the hangers. The new bridges which the Archbold-Brady Company is supplying to the Syracuse, Lake Shore & Northern Railroad will be accompanied by the Ohio Brass Company's overhead fittings as installed on the original line.

FENDER AND WHEEL GUARD TEST BY NEW YORK COMMISSION AT PITTSBURG

The series of tests of fenders and wheel guards recently conducted by the Public Service Commission of the First District of New York at the works of the General Electric Company in Schenectady will be continued at the works

of the Westinghouse Electric & Manufacturing Company, Pittsburg, beginning Oct. 20.

The following list of intending participants has been furnished by A. W. McLimont, electrical engineer for the commission:

T. A. Nelson, care of John W. Gilger, Bank of Commerce Building, Minneapolis, Minn.

Eclipse Railway Supply Company, 113 St. Clair Avenue, N. E., Cleveland, Ohio.

John L. Hawthorne, 215-217 Edgemont Avenue, Chester, Pa.

Hunter Illuminated Car Sign Company, 542-546 West Twenty-third Street, New York City.

Jenkins Automatic Fender Company, Church and Adelaide Streets, Toronto, Ont.

Sterling Electric Company, Lafayette, Ind.

Mountain & Gibson, Ltd. (represented by W. Edgar Reed), Machesney Building, Pittsburg, Pa.

Philipson & Company (represented by W. H. Peckham), 440 Columbus Avenue, New York City.

George H. Schulze, care of Ball & Ryland, First National Bank Building, Kansas City, Mo.

Worcester Railway & Supply Company (W. H. Gilbert), Worcester, Mass.

David Ambrose, P. O. Box 394, Ambridge, Pa.

George H. Bolduc, 671 McGraw Avenue, Detroit, Mich.

Wilfred Braithwaite, 227 Dixwell Avenue, New Haven, Conn.

George F. Brandau, 2 Oak Street, Utica, N. Y.

D. H. Brazil, care of Clancey Hotel, Montgomery, Ala.

J. H. Caliga, 142 Federal Street, Salem, Mass.

Ira P. Clark, 953 North Main Street, Decatur, Ill.

Chester B. Albee Iron Works, Allegheny, Pa.

L. H. Daniels, 44 West Twenty-fifth Street, New York City.

M. J. Ganagher, 99 Hyland Avenue, Grand Rapids, Mich.

Rosario Genovese, 601 McCoy Avenue, McKees Rocks, Pa.

F. J. Groehl, 32 Broadway, New York City.

J. Miller Haines, 5637 Master Street, Philadelphia, Pa.

Mrs. F. E. Jousset, 510 West 170th Street, New York City.

E. C. Juettner, 519 West 147th Street, New York City.

Louis Kahn, 29 Rhine Street, Rochester, N. Y.

Kinnebrew & Robins, 5824 Castleman Street, Pittsburg, Pa.

Kontinentale Bremsen Gesellschaft.

Alex. O. Lamson, Standard Fender Company.

G. W. Mahan, Cold Spring Harbor, N. Y.

Mrs. Anna Manning, 318 Jewett Avenue, West New Brighton, N. Y.

Lowell M. Maxham, 15 Ashburton Place, Boston, Mass.

Anton Mazzanovitch, 112 West 109th Street, New York City.

Nicholas C. Miller, 154 Nassau Street, New York City.

F. W. O'Connor, 479 Euclid Avenue, Toronto, Ont.

Alfred J. Pritchard, 418 Burke Building, Seattle, Wash.

Charles R. Reeves, Pairpoint Corporation, New Bedford, Mass.

Frederick Roeder, 811 Sycamore Street, Buffalo, N. Y.

Charles F. Rowe, 350 Fulton Street, Brooklyn.

Thomas A. Ryan, 6 Main Street, Yonkers, N. Y.

Earl Sherwood, Honesdale, Pa.

Th. Strauss, 902-4 Fort Dearborn Building, Chicago, Ill.

Wm. Thos. Watson, care of Toronto Railway, Toronto, Ont.

Francis Wilde Company, Room 1304, 43 Exchange Place, New York City.

Robert Wilkinson, 3162 G Street, Philadelphia, Pa.

Samuel T. Williams, 223 North Calvert Street, Baltimore, Md.

Charles D. B. Fiske, 10 Sparhawk Street, Brighton, Mass.

The following are among those who made preliminary entrances, but it is not yet known whether they will have their devices ready for the tests:

E. J. Lauth, Buffalo, N. Y.

F. J. Lehman, 402 Troy Street, Toledo, Ohio.

Lesser, Fleischmann & Long, 140 Nassau Street, New York City.

INTERSTATE COMMERCE COMMISSION CLASSIFICATION OF ACCOUNTS FOR ELECTRIC ROADS

The Interstate Commerce Commission classification of accounts for electric railways under its jurisdiction was made public by promulgation during the present week. The system comprises a classification of operating expenses, a classification of operating revenues and a classification of construction expenditures. The classifications include orders prescribing their use, passed by the commission on June 1 last, and introductory letters from Prof. H. C. Adams, in charge of statistics and accounts for the commission, dated as of June 12, 1908. The letter of Professor Adams concerning the classification of operating expenses states:

CLASSIFICATION OF OPERATING EXPENSES

This classification of operating expenses of electric railways, with the text pertaining thereto, is issued in accordance with an order of the Interstate Commerce Commission. Attention is called to three important facts:

First.—Under the order of the commissioin this classification becomes effective on Jan. 1, 1909. This does not mean that a change has been made in the date for the closing of the fiscal year for which annual reports will be required, its purpose being merely to allow the carriers concerned ample time to adjust their accounts to the rules prescribed. It would be highly advantageous from every point of view if carriers should adjust their accounts for the six months ending Dec. 31, 1908, to this classification of operating expenses.

Second.—This classification of operating expenses provides an alternative method for the treatment of depreciation of way and structures and equipment. It seems appropriate, in view of the fact that the responsibility for the administration of accounting rules relative to electric railways rests so largely upon the railway commissions of the different States, that the orders of the respective State commissions with regard to depreciation should be accepted as controlling orders rather than the order of the Interstate Commerce Commission. It is the purpose of this office, therefore, in the matter of monthly and annual reports of electric railways subject to the jurisdiction of the Interstate Commerce Commission, to conform, so far as the treatment of depreciation of way and structures and equipment is concerned, to the order of the State in which the major portion of the operated mileage of a particular railway is situated.

Third.—For the purpose of this classification of operating expenses, electric railway companies are divided into three classes, designated, respectively, Class A, Class B and Class C. Under Class A are included all companies having annual operating revenues of more than $1,000,000; under Class B, all companies having annual operating revenues of more than $250,000 but not in excess of $1,000,000, and under class C, all companies having annual operating revenues not in excess of $250,000.

Immediately following this letter will be found a schedule of the accounts for which provision is made in this classification, so arranged as to indicate which accounts are to be kept by the companies of the respective classes. Companies of Class A are required to keep all the primary accounts provided in this classification, which accounts are numbered consecutively. Companies of Classes B and C are to use as primary accounts such groupings of the primary accounts provided for Class A as are indicated in the schedule. By reference to this schedule these groupings are clearly shown. For example, under "maintenance of roadway and track," companies of Class B are to include all charges covered by the primary accounts numbered from 2 to 12, inclusive, and under "maintenance of way," companies of Class C are to include all the primary accounts numbered from 2 to 19, inclusive. By this arrangement it is apparent that carriers of all three classes can make use of the text descriptive of the accounts.

It is proper to say that this classification, as also the classification of operating revenues and of expenditures for road and equipment, was worked out with the co-

operation of representatives of the American Street & Interurban Railway Association and the American Street & Interurban Railway Accountants' Association. This fact is mentioned in order to make acknowledgment of the assistance rendered by these associations, but it should not be construed as meaning that all the rules here promulgated received the unanimous approval of the committees representing them.

The letters of Professor Adams accompanying the other classifications are similar, with the exception of the following statement explanatory of one account in the classification of operating revenues.

It will be observed that this classification gives a liberal interpretation to "rents" as an operating revenue, and in this regard conforms to what is understood to be the current practice of electric railways. It is possible that this feature in the classification will be modified at no distant date, and carriers will find it to their advantage to exercise special care in their records of both rents received and rents paid, since by this means they will be enabled to maintain comparisons should certain items of this class be transferred from the operating accounts to the income account.

A note in the text of the capital account "interest" states: "Discounts and commissions on securities issued for construction purposes or to raise funds for construction should not be charged to this account or considered as a proper charge against construction."

FORM OF THE ORDER

The form of the order of the commission is identical for each classification; for the classification of operating expenses the following order was entered:

The subject of a uniform system of accounts to be prescribed for and kept by carriers being under consideration, the following order was entered:

It is ordered, That the classification of operating expenses of electric railways and the text pertaining thereto, prepared under the direction of this commission by Henry C. Adams, in charge of statistics and accounts, and embodied in printed form to be hereafter known as first issue, a copy of which is now before this commission, be, and the same is hereby approved; that a copy thereof duly authenticated by the secretary of the commission be filed in its archives, and a second copy thereof, in like manner authenticated, in the office of the division of statistics and accounts; and that each of said copies so authenticated and filed shall be deemed an original record thereof.

It is further ordered, That the said classification of operating expenses of electric railways with the text pertaining thereto be, and is hereby prescribed, for the use of electric railways subject to the provisions of the act to regulate commerce as amended June 29, 1906, in the keeping and recording of their operating expense accounts; that each and every such carrier and each and every receiver or operating trustee of any such carrier be required to keep all operating expense accounts in conformity therewith; and that a copy of such first issue be sent to each and every such carrier and to each and every receiver or operating trustee of any such carrier.

It is further ordered, That the rules contained in said first issue of the classification of operating expenses of electric railways are, and by virtue of this order do become, the lawful rules according to which the said operating expenses are defined; and that each and every person directly in charge of the accounts of any such carrier or of any receiver or operating trustee of any such carrier is hereby required to see to, and under the law is responsible for, the correct application of the said rules in the keeping and recording of the operating expense accounts of any such carrier; and that it shall be unlawful for any such carrier or for any person directly in charge of the accounts of any for any receiver or operating trustee of any such carrier or for any person directly in charge of the accounts of any such carrier or of any receiver or operating trustee of any such carrier to keep any account or record or memorandum of any operating expense item except in the manner and form in said first issue set forth and hereby prescribed, and except as hereinafter authorized.

It is further ordered, That any such carrier or any receiver or operating trustee of any such carrier may subdivide any pimary account in said first issue established as may be required for the purposes of any such carrier or of any receiver or operating trustee of any such carrier; or may make assignment of the amount charged to any such primary account to operating divisions, to its individual lines, or to States: Provided, however, That a list of such subprimary accounts set up or such assignments made by any such carrier or by any receiver or operating trustee of any such carrier be first filed in the office of the division of statistics and accounts of this commission, subject to disapproval by the commission.

It is further ordered, That in order that the basis of comparison between the present year and previous years be not destroyed, any such carrier or any receiver or operating trustee of any such carrier may, during the twelve months from the time that said first issue becomes effective, keep and maintain, in addition to the operating expense accounts hereby prescribed, such portion or portions of its present accounts with respect to operating expense items as may be deemed desirable by any such carrier, or by any receiver or operating trustee thereof, for the purposes of such comparison; or, during the same period, may maintain such groupings of the primary accounts hereby prescribed as may be desired for that purpose.

It is further ordered, That any such carrier or any receiver or operating trustee of any such carrier may, in addition to the operating expense accounts hereby prescribed, keep any temporary or experimental accounts, the purpose of which is to develop the efficiency of operations: Provided, however, That such temporary or experimental accounts shall not impair the integrity of any general or primary account hereby prescribed; and that any such temporary or experimental accounts shall be open to inspection by the commission.

It is further ordered, That Jan. 1, 1909, be, and is hereby, fixed as the date on which said first issue shall become effective.

INTERSTATE COMMERCE COMMISSION SYSTEM OF ACCOUNTS

Classification of Operating Expenses of Electric Railways

CLASSES OF ELECTRIC RAILWAYS

Class.

A. Annual operating revenues, more than $1 000,000.
B. Annual operating revenues, more than $250,000 but not in excess of $1,000,000.
C. Annual operating revenues, not more than $250,000.

General Accounts

Account.

I. Way and structures.
II. Equipment.
III. Traffic.
IV. Conducting transportation.
V. General and miscellaneous.

Primary Accounts

Note.—The letters A. B and C opposite the names of the accounts indicate that the accounts severally so designated are to be kept by companies of the classes having like designations.

I.	Way and structures—			
	1. Superintendence of way and structures	A	B	C
	Maintenance of way			C
	Maintenance of roadway and track		B	
	2. Ballast	A		
	3. Ties	A		
	4. Rails	A		
	5. Rail fastenings and joints	A		
	6. Special work	A		
	7. Underground construction	A		
	8. Roadway and track labor	A		
	9. Paving	A		
	10. Miscellaneous roadway and track expenses	A		
	11. Cleaning and sanding tracks	A		
	12. Removal of snow, ice and sand	A		
	Other maintenance of way		B	
	13. Tunnels	A		
	14. Elevated structures and foundations	A		
	15. Bridges, trestles and culverts	A		
	16. Crossings, fences, cattle guards and signs	A		
	17. Signal and interlocking systems	A		
	18. Telephone and telegraph systems	A		
	19. Other miscellaneous way expenses	A		
	Maintenance of electric lines			C
	20. Poles and fixtures	A	B	
	21. Underground conduits	A	B	
	22. Transmission system	A	B	
	23. Distribution system	A	B	
	24. Miscellaneous electric line expenses	A	B	
	25. Buildings and structures	A	B	C
	*26. Depreciation of way and structures	A	B	C
	27. Other operations—Dr.	A	B	C
	28. Other operations—Cr.	A	B	C
II.	Equipment—			
	29. Superintendence of equipment	A	B	C
	Maintenance of power equipment			C
	30. Power-plant equipment	A	B	
	31. Substation equipment	A	B	
	Maintenance of cars and locomotives		B	C
	32. Passenger and combination cars	A		
	33. Freight, express and mail cars	A		

34.	Locomotives	A		
35.	Service cars	A		
	Maintenance of electric equipment of cars and locomotives		B	C
36.	Electric equipment of cars	A		
37.	Electric equipment of locomotives	A		
	Miscellaneous equipment expenses		B	C
38.	Shop machinery and tools	A		
39.	Shop expenses	A		
40.	Horses and vehicles	A		
41.	Other miscellaneous equipment expenses	A		
*42.	Depreciation of equipment	A	B	C
43.	Other operations—Dr.	A	B	C
44.	Other operations—Cr.	A	B	C
III. Traffic—				
	Traffic expenses		B	C
45.	Superintendence and solicitation	A		
46.	Advertising	A		
47.	Miscellaneous traffic expenses	A		
IV. Conducting transportation—				
48.	Superintendence of transportation	A	B	C
	Group I—Power			
49.	Power-plant employees	A	B	C
50.	Substation employees	A	B	C
51.	Fuel for power	A	B	C
	Other power supplies and expenses			C
52.	Water for power	A	B	
53.	Lubricants for power	A	B	
54.	Miscellaneous power-plant supplies and expenses	A	B	
55.	Substation supplies and expenses	A	B	
56.	Power purchased	A	B	C
57.	Power exchanged—balance	A	B	C
58.	Other operations—Dr.	A	B	C
59.	Other operations—Cr.	A	B	C
	Group II—Operation of Cars			
	Conductors, motormen and trainmen			C
60.	Passenger conductors, motormen and trainmen	A	B	
61.	Freight and express conductors motormen and trainmen	A	B	
	Miscellaneous transportation expenses			C
	Miscellaneous car-service employees and expenses		B	
62.	Miscellaneous car-service employees	A		
63.	Miscellaneous car-service expenses	A		
	Station employees and expenses		B	
64.	Station employees	A		
65.	Station expenses	A		
	Carhouse employees and expenses		B	
66.	Carhouse employees	A		
67.	Carhouse expenses	A		
	Signal interlocking, telephone and telegraph systems		B	
68.	Operation of signal and interlocking systems	A		
69.	Operation of telephone and telegraph systems	A		
70.	Express and freight collections and delivery	A	B	
71.	Loss and damage	A	B	
72.	Other transportation expenses	A	B	
V. General and miscellaneous—				
	General expenses			C
	Salaries and expenses of general officers and general office clerks		B	
73.	Salaries and expenses of general officers	A		
74.	Salaries and expenses of general office clerks	A		
75.	General office supplies and expenses	A	B	
76.	Law expenses	A	B	
77.	Relief department expenses	A	B	
78.	Pensions	A	B	
79.	Miscellaneous general expenses	A	B	
80.	Other operations—Dr.	A	B	C
81.	Other operations—Cr.	A	B	C
	Undistributed Accounts			
Note.—Carriers are at liberty to distribute items covered by the following accounts, but all reports to the commission must agree with accounts which are prescribed.				
82.	Injuries and damages	A	B	C
83.	Insurance	A	B	C
84.	Stationery and printing	A	B	C
	Store and stable expenses			C
85.	Store expenses	A	B	
86.	Stable expenses	A	B	
87.	Rent of tracks and terminals	A	B	C
88.	Rent of equipment	A	B	C

Class A.—88 accounts.
Class B.—58 accounts.
Class C.—36 accounts.

*The following note comprises the text for each of these accounts:
"This account is provided in case such an account should be prescribed by any of the State commissions, and in such case there should be excluded charges for renewals from all the accounts affected by the introduction of this account. Such expenditures for renewals will then be charged direct to an appropriate replacement account, maintained by the prescribed charges to this account."

Classification of Operating Revenues of Electric Railways

General Accounts

Account.
I. Revenue from transportation.
II. Revenue from operations other than transportation.

Primary Accounts

1. Revenue from transportation—
   1. Passenger revenue.
   2. Baggage revenue.
   3. Parlor, chair and special car revenue.
   4. Mail revenue.
   5. Express revenue.
   6. Milk revenue.
   7. Freight revenue.
   8. Switching revenue.
   9. Miscellaneous transportation revenue.
2. Revenue from operations other than transportation.
   10. Station and car privileges.
   11. Parcel-room receipts.
   12. Storage.
   13. Car service.
   14. Telegraph and telephone service.
   15. Rents of tracks and terminals.
   16. Rents of equipment.
   17. Rents of buildings and other property.
   18. Power.
   19. Miscellaneous.

Classification of Expenditures for Road and Equipment of Electric Railways

General Accounts

Account.
I. Road.
II. Equipment.
III. General expenditures.

Primary Accounts

I. Road—
   1. Engineering and superintendence.
   2. Right of way.
   3. Other land used in electric railway operations.
   4. Grading.
   5. Ballast.
   6. Ties.
   7. Rails, rail fastenings and joints.
   8. Special work.
   9. Underground construction.
   10. Paving.
   11. Track laying and surfacing.
   12. Roadway tools.
   13. Tunnels.
   14. Elevated structures and foundations.
   15. Bridges, trestles and culverts.
   16. Crossings, fences, cattle guards and signs.
   17. Interlocking and other signal apparatus.
   18. Telegraph and telephone lines.
   19. Poles and fixtures.
   20. Underground conduits.
   21. Transmission system.
   22. Distribution system.
   23. Dams, canals and pipe lines.
   24. Power-plant buildings.
   25. Substation buildings.
   26. General office buildings.
   27. Shops and carhouses.
   28. Stations, waiting rooms and miscellaneous buildings.
   29. Docks and wharves.
   30. Power-plant equipment.
   31. Substation equipment.
   32. Shop equipment.
   33. Park and resort property.
   34. Cost of road purchased.
II. Equipment—
   35. Cars.
   36. Locomotives.
   37. Electric equipment of cars.
   38. Other rail equipment.
   39. Miscellaneous equipment.
III. General expenditures—
   40. Law expenses.
   41. Interest.
   42. Injuries and damages.
   43. Taxes.
   44. Miscellaneous.

The American Brake Shoe & Foundry Company's exhibit at the Atlantic City convention contained a large number of brake shoes and brake heads illustrating the standard brake heads and shoes of the American Street & Interurban Railway Association in comparison with old practice. The exhibit exemplified the many advantages which are obtained by standardizing. It showed that combined heads and shoes can be replaced by a separable head and shoe, which may save as high as 50 per cent on the cost of brake shoe maintenance; or old style separable heads and shoes can be replaced by common standards, permitting a saving in the weight of new shoes purchased of from 5 cents to 10 cents on each new shoe. This will afford equal, if not greater, service before removal than the old-style shoe replaced. The saving in the cost of brake shoes, it is said, will soon pay for the new brake heads, and thereafter each shoe applied will pay a handsome dividend over the cost of the old shoe.

The Lord Electric Company, New York, has received an order for 1650 Earll trolley catchers from the Chicago City Railway. These catchers will be used on equipment including the pay-as-you-enter cars. This is one of the largest orders ever placed for a device of this character, and when the news of the order was made public at the convention, Mr. Garton, of the Lord Electric Company, received many compliments for the achievement.

In the item on page 1167 of the Oct. 16 daily Electric Railway Journal, regarding the Cincinnati Car Company's exhibit, there was an unfortunate typographical error in the total weight of the company's pay-as-you-enter car used in Cleveland. The correct weight is 41,656 lb., instead of 51,656 lb. as will be seen by adding the component figures given in the original item.

News of Electric Railways

The Cleveland Situation

At a meeting of the directors of the Municipal Traction Company at the residence of Mayor Johnson on Sunday evening, Oct. 11, an agreement was reached to accept the plan of placing the stock in the hands of a board of trustees, as formulated by the committee of attorneys named by F. H. Goff some time ago. A meeting was held on the morning of Oct. 11 at the Mayor's office, at which Mr. Goff was present, and satisfaction was expressed with most of the conditions. Mr. Goff, however, held that a majority of the trustees should be men not heretofore connected with the Municipal Traction Company or the movement in any way, but the Mayor insisted that he be allowed to name a majority so that there might be men of street railway experience on the board. The new plan, it would seem, merely changes the name of the governing body and adds a few members powerless to do anything not in accord with the Mayor's wishes. The board, as selected by the Mayor, consists of F. H Goff, attorney and president of the Cleveland Trust Company; E. V. Hale, treasurer of the Citizens' Savings & Trust Company; H. H. McKeehan, attorney; G. K. Shurtleff, general secretary of the Young Men's Christian Association; Tom L. Johnson, Mayor; A. B. DuPont, president of the Municipal Traction Company; Newton D. Baker, city solicitor; Ben T. Cable, capitalist, Rock Island, Ill.; William Greif, manufacturer; C. W. Stage, attorney; Frederick C. Howe, State Senator. The last seven members are directors of the Municipal Traction Company, while the first four are independent. It is also provided that Mayor Johnson and City Solicitor Baker shall remain members of the board of trustees after their terms in public office shall have expired and that their successors shall also be made members of the board. In any event, the Mayor will have a majority of the members.

The form of the trust deed to be used was accepted by the committee on Oct. 9. It provides that the present stockholders shall sell their stock to James C. Brooks, Max J. Rudolph, Fred C. Alber, J. B. Tanner and D. C. Westenhaver for the sum of $10 and that after these men have organized and chosen their own officers they shall turn the stock over to the board of trustees. Their services will then be at an end. The trustees are to be supreme in the management of the property, with the exception that the actual detail of management shall be in the hands of the present board of directors and officers of the company. The deed further specifies that all profits from the stock in the hands of the trustees shall be used for electric lighting or public parks and playgrounds.

All vacancies on the board shall be filled by surviving members. The board may consist of eleven members, but never less than seven. According to the action of the directors of the Municipal Traction Company, however, it will consist of 13 members whenever successors are elected to Mayor Johnson and City Solicitor Baker.

The trust shall cease whenever the city acquires the right by law to purchase the property of the Cleveland Railway, or when it secures the authority by law to make a direct contract with the Municipal Traction Company.

Mr. Goff, Mr. Shurtleff and Mr. McKeehan have all accepted the places tendered them on the board of trustees. Mr. Goff, however, will resign as soon as he can find some one acceptable to all parties who will take his place. He accepted because others made their acceptance conditional upon his serving. Mr. Hale wrote the Mayor that his banking business required all his time and that he would not be able to give any attention to traction matters. Mr. Goff was subsequently chosen chairman of the committee and the properties were then transferred to the trustees in accordance with the previous arrangements. The trustees named the present board of directors of the Municipal Traction Company to serve as directors, but none of the new men on the board of trustees was given a place on the directorate. The trustees will probably meet once a week for the present.

Mayor Johnson held his first referendum tent meeting on Oct. 12, when he, City Solicitor Baker and others addressed a large audience. The probable result of the vote to be taken is very uncertain.

The tax returns on the property of the Cleveland Electric Railway property, just filed, shows a physical valuation of $4,831,515, in comparison with $4,278,225 last year. The various items are as follows: Cars, $1,851,703; machinery, cash and supplies, $377,322; track and overhead construction inside the city, $2,096,160; outside of the city, $506,330. The Forest City Railway reported its tax valuation at $450,170, in comparison with $287,450 in 1907.

The fight against the referendum will be conducted, it seems, without a recognized leader. On the other hand, Mayor Johnson will lead his own organized force. Seemingly there is no one willing to give his time and attention to the leadership of the opposition and the cause of the Mayor's opponents will be greatly weakened for this reason.

Nominations for Railroad Club Officers

The regular nominating committee of the New York Railroad Club has nominated the following as officers of the club for the coming year: For president, John F. Deems; vice-president, W. G. Besler; second vice-president, H. S. Hayward; third vice-president, Frank Hedley; treasurer, R. M. Dixon; executive member (three years), E. T. Campbell; (one year), G. H. Campbell; member finance committee (three years), B. A. Hegeman, Jr.

The election will be taken by ballot during the first twenty days of November, and the results will be announced at the meeting of the club on the evening of Nov. 20.

Trespassers Warned.—The Milwaukee Light, Heat & Traction Company will enforce rules hereafter forbidding persons from trespassing on its interurban tracks and viaducts. Trespassers will be prosecuted. It is stated that the company has been obliged lately to stop cars on its viaducts because of trespassers.

Homes for Employees of Interurban Road.—The Washington, Baltimore & Annapolis Electric Railway will build twenty-five modern dwellings for its employees at Odenton, Md. The dwellings, which will be erected in a group, will be of neat and ornate appearance, two stories high. They will be erected on spacious lots, and all the latest conveniences and improvements will be installed.

Advisability of Purchase of New York Tunnel Under Consideration.—The New York Public Service Commission, First District, has under consideration the practicability of the purchase by New York City of the Steinway tunnel. Henry B. Seaman, chief engineer for the commission, is making a study of the physical condition of the tunnel and its traffic possibilities, and accountants are going over the books of the New York & Long Island Railroad in order to determine the actual expenditure on construction to this time.

To Electrify the Erie.—It was stated in financial circles on Oct. 10 that E. H. Harriman had pledged $14,000,000 to the Erie Railroad to enable that company to electrify its New Jersey suburban service, which has provoked so much complaint among commuters for the last two years. Questioned on this subject, one of the directors of the Erie Railroad is quoted as having admitted that the electrification of the main line between Jersey City and Suffern would be begun soon by the company. He said that the suburban service of the company can be increased sufficiently to justify a large expenditure for electrification, and the management has decided to go ahead with the preliminary work. He stated that it would probably take several months to get plans made, and that it was hardly likely that electric trains could be run before the end of a year. The main line to Suffern, which would be the first section to be electrified, extends 32 miles between that point and Jersey City.

Attack on Chicago Board of Engineers.—The City Council of Chicago passed on Oct. 5 an order providing for an inquiry into the board of supervising engineers, Chicago Traction. The order stated that the expenses of maintaining the board "are outrageously high," and that as under the terms of the ordinances the city shares in the net proceeds from operation of the railways, "it behooves the city to extend supervising influence over the expenses" of the board. The city comptroller is directed to submit to the Council at the next regular meeting a statement of the expense of maintaining the board during August, 1908, and the corporation counsel is instructed to report upon the legal right of the Council to so amend the ordinances granting franchises as to abolish the board. George Weston, representative of the city of Chicago on the board, said that the expenses of the board were remarkably low for the work that was being accomplished. He said that the expenses did not affect now the 55 per cent of the net earnings which the city receives, inasmuch as the cost of maintaining the board during the three-year rehabilitation period is charged to the capital account, and that after the rehabilitation period is over the expense of maintaining the board will be small.

Financial and Corporate

New York Stock and Money Markets

Oct. 16, 1908.

The general tendency of the week in Wall Street was toward lower prices. For several days losses were recorded on the day's transactions. At the close of the market on Oct. 15, however, there was a very much stronger tone and considerable recovery in price. The effect of the war scare in Europe, which was responsible for the recession in prices, seems to have worn off. During the period when the situation in the Balkan States seemed to mean war and the possible complication of the more important powers, there was an eager haste to sell American securities in Europe. Within a few days 300,000 shares of American stocks, held abroad, were dumped into this market, and the strength of Wall Street conditions was clearly demonstrated by the readiness with which they were absorbed.

At the present moment Europe is not selling, in fact seems inclined to buy again, and there is no especial cause for depression. Neither is there any especial reason to buy, and the result is that trading is light and is mostly confined to a few specialties that are particular favorites of the market masters. While politics seems to be a matter of very little interest to the Street, there is a general willingness to wait until after the election before beginning active operations.

The money markets continue very easy at a slight advance over recent weeks and somewhat better demand. The banks, however, continue to accumulate surplus, due to the entire lack of demand, customary at this season, from the interior. The West apparently has all the money it needs for crop moving, and New York's cash remains unemployed. Call money is quoted to-day at 1¼@1¾ per cent, 90-day loans at 3¼@3½ per cent.

Other Markets

Philadelphia Rapid Transit stock has been the leader in the Philadelphia stock market for the past week, and has advanced gradually but steadily, and closed Oct. 15 at 24⅛, which is near the high point. Union Traction has also been freely dealt in and closed on the above date at 52. Philadelphia Electric has also shown some life and reached 11.

In the Chicago market traction securities have been fairly strong. Chicago Railways certificates, series 2, have advanced to 42½, and series 1 were steady at 102½. Trading in these issues has been strong. Metropolitan Elevated preferred was easier and closed Oct. 15 at 42¾, while South Side Elevated was steady at 46.

There was little doing in traction securities in the Boston market. A few shares of Boston Elevated changed hands at 134 and some Massachusetts Electric at 51. West End preferred sold at 105½ and the common at 89.

In Baltimore. as usual, the only interest in traction securities was in bonds. United Railways issues continue to be the feature of the dealing. The 4s have been selling from 84⅛ to 84⅜, the "incomes" have been freely traded in at 51½ and the "funding 5s" at 79.

Traction securities show a little life on the Cleveland Stock Exchange. The approaching referendum vote has almost completely stopped transactions in Cleveland Railway securities, and there will probably be little doing until after Oct. 22.

Quotations for various traction securities as compared with last week follow:

	Oct. 6.	Oct. 15.
American Railways Company, Philadelphia	44¾	43¾
Boston Elevated Railway	133¾	134
Brooklyn Rapid Transit Company	48⅝	48½
Chicago City Railway	a180	a180
Consolidated Traction Company of New Jersey	—	a68
Consolidated Traction Company of New Jersey, 5 per cent bonds	—	a105½
Detroit United Railway	39	*38½
Interborough Metropolitan Company	10½	10½
Interborough-Metropolitan Company (preferred)	31½	31⅛
Manhattan Railway	134	135½
Massachusetts Electric Companies (common)	—	9½
Massachusetts Electric Companies (preferred	51½	51
Metropolitan West Side Elevated Railway, Chicago (common)	a14	a13
Metropolitan West Side Elevated Railway, Chicago (preferred)	a44	a42¾
Metropolitan Street Railway	24½	*28
North American Company	62¾	63⅞
Philadelphia Company, Pittsburg (common)	39	38⅞
Philadelphia Company, Pittsburg (preferred)	40¾	40¼
Philadelphia Rapid Transit Company	20½	24⅛
Philadelphia Traction Company	88¼	90
Twin City Rapid Transit Company, Minneapolis (common)	89	89
Union Traction Company, Philadelphia	48¾	52

a Asked.
* Last sale.

Financing the Unfinished Hudson & Manhattan Railroad

In a circular addressed to the preferred stockholders of the Hudson Companies, which controls the Hudson & Manhattan Railroad, operating the tunnels under the Hudson River between New York and New Jersey, a new financial plan is announced for the completion of the principal unfinished parts of the system. This includes all of the original projects except the Thirty-third Street terminal, the connecting link between the tunnel at Sixth Avenue and Ninth Street, New York, and the present city Subway, and the line under Jersey City which was to tap the Pennsylvania Railroad's suburban traffic at Summit Avenue, Jersey City. These last extensions will not be pushed for the present. The new plan involves the payment to the Hudson & Manhattan Railroad of $7,379,681 needed to complete the downtown tunnels and the other principal parts of the system in return for which the railroad company releases the Hudson Companies from its further obligation to complete the rest of the undertaking as originally planned. Part of the funds needed it is proposed to obtain from an issue of $5,000,000 three-year 6 per cent notes at par and $3,000,000 is to be obtained by the sale of the Thirty-third Street terminal property. The preferred stockholders have the first opportunity to subscribe to the notes. Under this plan the cash requirements of Hudson Companies up to July 1, 1909, are:

Money to be paid to railroad company	$7,379,681
Estimated interest charges and expenses	1,027,881
Total	$8,407,562

and its resources for meeting these requirements (including the proposed loan) are:

Cash on hand	$582,325
To be realized from real estate interests	3,000,000
Proceeds of proposed $5,000,000 loan	5,000,000
Total	$8,582,325

Philadelphia Rapid Transit Company Finances.

At the meeting of the directors of the Union Traction Company, Philadelphia, one of the subsidiaries of the Philadelphia Rapid Transit Company, on Oct. 7, to pass upon the $5,000,000 loan plan of the Philadelphia Rapid Transit Company, pledging the securities of the Union Traction Company, John B. Parsons resigned as president and a director of the Union Traction Company, and George D. Widener as vice-president and a director of the company and P. A. B. Widener, J. J. Sullivan, Geo. H. Earle, Jr., and W. H. Shelmerdine, directors, in accordance with a plan previously agreed upon. The question of whether it was proper for any or all of the members of the board of directors of the Philadelphia Rapid Transit Company to retire from the board of directors of the Union Traction Company was fully discussed, at the end of which it was agreed by all of those present that the proper step to take was that all of the members of the board of directors of the Philadelphia Rapid Transit Company who were also members of the Union Traction Company board should present their resignations, to be acted upon at the special meeting of stockholders. Accordingly John B. Parsons, P. A. B. Widener, George D. Widener, Jeremiah J. Sullivan, George H. Earle, Jr., and William H. Shelmerdine presented their resignations, to be acted upon at the special meeting of stockholders to be called. If at that meeting these resignations or any of them are accepted the vacancies will be filled.

The resolutions adopted at the meeting follow:

"Whereas, Under the lease of the Union Traction Company to the Philadelphia Rapid Transit Company, dated July 1, 1902, certain shares of stock previously acquired by the Union Traction Company, either under the lease from the Philadelphia Traction Company, or otherwise, were transferred to the Philadelphia Rapid Transit Company, subject, however, to the stipulation with respect to those shares received by the Union Traction Company from the Philadelphia Traction Company, that they should not be transferred without the consent both of the Union Traction Company and of the Philadelphia Traction Company, and with respect to other shares that they should not be transferred without the consent of the Union Traction Company; and

"Whereas, The Philadelphia Rapid Transit Company has kept all of the provisions of the said lease, and has raised and expended in improving and adding to the systems received from the Union Traction Company $40,000,000, a very considerable portion of which has been expended directly upon this property, and has built an elevated and subway road the length of Market Street, in which the Union Traction Company has no interest, but which would be of great value to the Union Traction Company in case of the termination of the lease; and

"Whereas, The Philadelphia Rapid Transit Company is desirous of providing for the borrowing of $5,000,000 to be expended upon its property, which expenditure will add to the security of the said lease, and has requested the right to use the securities transferred to it by the Union Traction Company, including those received from the Philadelphia Traction Company, and has offered, as consideration for such consent, to turn over to the Union Traction Company as collateral security for the return of the said securities, all of its interest in the said elevated and subway railway, which interest represents an expenditure of upward of $9,000,000; therefore, be it

"Resolved, That the directors of the Union Traction Company be, and they are, hereby authorized to formally assent to the use by the Philadelphia Rapid Transit Company as collateral security for an issue of $5,000,000 of bonds of all or any of the shares of stock enumerated in paragraphs 13 and 14 of the lease of the Union Traction Company to the Philadelphia Rapid Transit Company, upon the assignment to the Union Traction Company, as collateral security for the return of the same, of all of the interest of the Philadelphia Rapid Transit Company (whether represented by stock ownership, leasehold or open account) in the Market Street Elevated Passenger Railway.

"Resolved, further, That the board of directors be authorized and empowered to take such action and give such further assents as may be necessary to vest in a trustee as collateral security for an issue of $5,000,000 of bonds the full interest of the Union Traction Company in the said shares which are to be so hypothecated, and in any accounts held against said companies, and to vest in this company as collateral security the full interest of the Philadelphia Rapid Transit Company in the said Market Street Elevated Passenger Railway, and to take all other action which may be necessary to fully carry out the intent of this resolution."

The communication directed to the Philadelphia Traction Company sets forth the need of the use of these securities, and declares that it would be to the best interests of both companies to grant the same permission. It concludes:

"It is also not improbable that in working out the details of the new loan provision will be made for the immediate or ultimate retirement of the balance of the issue of 4 per cent collateral bonds negotiated by your company in 1887, thus relieving your company of its obligations with respect to the same."

Boston & Northern Street Railway, Boston, Mass.—As a basis for its petition filed with the Railroad Commissioners for their approval of an issue of preferred stock to the amount of $1,250,000 at the price fixed by its stockholders of $110 per share, the Boston & Northern Street Railway has filed an exhibit showing the cost of improvements made upon its various divisions since its last increase of capital stock. The Railroad Commissioners have granted a hearing upon the petition, which is brought under the new railway law, and the matter now awaits its decision.

Central Park, North & East River Railroad, New York.—Counsel for the Central Park, North & East River Railroad has asked Judge Lacombe, in the United States Circuit Court, to direct the receivers of the Metropolitan Street Railway to turn over to it the equipment necessary to operate its lines. The company also asked for rental of its line from Jan. 1 to Aug. 5 of this year, amounting to $96,750, and for the return of the cash turned over to the Metropolitan Street Railway when that company took over the Central Park, North & East River Railroad under the lease of Oct. 14, 1892.

New York, New Haven & Hartford Railroad, New Haven, Conn.—This company is planning to purchase the $8,000,000 capital stock and $9,000,000 of 5 per cent bonds of the United Traction & Electric Company, Providence, and the $5,000,000 4 per cent bonds of the Rhode Island Suburban Railway. Under the present arrangement the New York, New Haven & Hartford Railroad operates the properties mentioned under a guarantee of 5 per cent on the United Traction & Electric Company's capital stock, or $400,000 a year rental. The New York, New Haven & Hartford plans to exchange its 5 per cent guaranteed bonds for the securities of the other companies.

Norfolk & Bristol Street Railway, South Walpole, Mass.—The Railroad Commissioners of Massachusetts have authorized the Norfolk & Bristol Street Railway to issue $150,000 5 per cent. 20-year bonds for additional equipment.

Southern Light & Traction Company, Natchez, Miss.—The property of this company, consisting of electric light and gas plants and a street railway system of 6 miles, is reported to have been transferred by Lynn H. Dinkins, the purchaser, to Jonas Levy, of New Orleans, for $45,670, the company being subject to a mortgage for $335,000.

Traffic and Transportation

Preparing for Limited Service Between Toledo and Findlay.—The Toledo, Fostoria & Findlay Railway is completing its plans for an hourly limited service between Toledo and Findlay, but the date of putting it into effect has not been fixed. Trains will be dispatched by telephone.

New York Interurban Roads May Fix Fares on Zone Basis.—In a decision announced on Oct. 14 by the Public Service Commission in the Second District of New York the right of interurban railway companies to fix their rates of fare on a zone basis instead of a mileage basis is upheld.

Pay-as-You-Enter Cars in Columbus.—The 10 pay-as-you-enter cars for the Columbus Railway & Light Company will be placed in service on Nov. 1. If they prove satisfactory other cars will be ordered and those now in use which have long platforms will be converted into the new type.

Another Freight Franchise Granted to Massachusetts Company.—The Selectmen of Sterling have granted a franchise for express and freight business to the Worcester (Mass.) Consolidated Street Railway. The company has also been granted a similar franchise in Westboro and Shrewsbury.

Collision on Massachusetts Road.—One man was killed and about 20 injured in a head-on collision on Oct. 9 between two cars of the Boston & Northern Street Railway on Main Street in the Bradford district of Haverhill. Each car contained about 45 passengers. The accident occurred in a heavy fog.

Freight Franchise Granted in Monson, Mass.—The Selectmen have granted a franchise on the petition from the Springfield & Eastern Street Railway, allowing the company to carry freight through the northwest corner of Monson, near Overlook farm. This enables the company to carry freight to Palmer.

Brookline Transportation Facilities.—The Selectmen of Brookline, Mass., have petitioned the Railroad Commissioners to request the Boston Elevated Railway to provide an island and shelters in Village Square in connection with the remodelling of that center. This is the principal business center of Brookline and has lately undergone extensive improvements. The petitioners recite the passenger accommodations which they desire in the Square under the new conditions and point out that portion which the town desires the company to sustain with reference to expense.

Transfers to Be Restored in New York.—The Public Service Commission of the First District of New York on Oct. 14 ordered the Third Avenue Railroad to arrange with the officials of the Central Park North & East River Railroad for joint rates and through fares between the lines of the two companies by 10:30 a.m. on Oct. 19. By such an arrangement the Third Avenue Railroad will have a through north and south line on the east side via Third Avenue, a through north and south line on the west side in Broadway, and a connecting link across the two at Fifty-ninth Street.

Winter Schedule at Worcester.—The regular fall and winter timetable on the Worcester (Mass.) Consolidated Street Railway went into effect recently. The former schedule is practically cut in two, cars running from Fitchburg to Worcester and Hudson once an hour, instead of half-hourly, as has been the case all summer, although the half-hour service between Fitchburg and Leominster has been retained. Through the reduction of the running time to Worcester, from an hour and three-quarters to an hour and a half, and the running of extra cars during the rush hours, the winter service in many ways will be fully as satisfactory as the summer service.

Investigation of Service on Washington Line.—The District Railway Commission of Washington, D. C., has adopted regulations for reference to the Interstate Commerce Commission requiring that all cars in the District shall be heated from Nov. 1 to April 1 to a temperature of not less than 40 deg. and not more than 60 deg. Fahr. Secretary Eddy made a report criticising the service on the Rockville division of the Washington Railway & Electric Company. A recommendation was adopted for reference to the Interstate Commerce Commission asking the company whether all of the cars in service on the Rockville division cannot be equipped with air brakes.

New Fare Schedule on Rochester & Eastern Rapid Railway.—The new fare schedule of the Rochester & Eastern Rapid Railway, Rochester, N. Y., to go into effect on Oct. 24, will result in a general increase in the round trip rates. The round trip fare from Canandaigua to Rochester will be 92 cents, an increase of 12 cents; to Victor, 35 cents, an in-

crease of 5 cents; to Seneca Castle, 35 cents, an increase of 3 cents; to Bushnell's Basin, 58 cents, an increase of 8 cents; to Pittsford, 68 cents, an increase of 8 cents, and to Geneva, 55 cents, an increase of 7 cents. Another change will be the issuing of school commutation tickets. They will be sold only to students under 18 years of age and upon certificates from the principals or superintendents of the school which the pupils attend. Five dollars' worth of transportation will be sold for $2.50, or the same as half fare to students. The tickets will be good only on actual school days.

No More Traffic Reports in St. Louis.—Capt. Robert McCulloch, vice-president and general manager of the United Railways Company, St. Louis, notified the city register that no more reports on the number of passengers carried by the company would be made for the present. Capt. McCulloch said: "I find upon investigating the subject that I received advice from our legal department some time ago to the effect that this quarterly report should not be filed in view of the decree entered in the Circuit Court of the United States for the Eastern District of Missouri, perpetually enjoining and restraining the city from enforcing the provisions of the ordinance referred to. While this decree has been reversed by the Supreme Court of the United States, a motion for rehearing is pending, which, of course, stays the issuance of the mandate." The report involves the city's record of the number of passengers carried, on which the company is required by the ordinance upheld by the Supreme Court to pay the city a tax of one mill per passenger, aggregating about $220,000 a year.

Through Service Impeded by Chelsea Board of Control.—An interesting example of through service being hampered temporarily in one community by the action of the adjoining municipality is illustrated in Revere, Mass., in relation to the service of the Boston & Northern Street Railway through Chelsea. As a result of the Chelsea conflagration last spring that city is administered by a Board of Control, of which W. E. McClintock, former Highway Commissioner, is chairman. This board has refused to grant the Boston & Northern Street Railway the right to lay a temporary track through Cary Avenue, Chelsea, to enable the service on the Broadway lines to be continued during the reconstruction of the Broadway bridge over the Boston & Maine Railroad. The bulk of street railway traffic between Revere and Boston passes over this route, and the town of Revere feels that a five weeks' deprivation of such service would be a serious hardship. Chairman McClintock has stated that the Boston & Northern Street Railway has asked for a single track location on Cary Avenue, Chelsea, and that the magnitude of the traffic is such that congestion would occur if this arrangement should be permitted. It is probable that an appeal may be taken by the Revere authorities and the Boston & Northern Street Railway to the Railroad Commission.

Accidents in Pennsylvania in August.—The bulletin of the Pennsylvania State Railroad Commission covering accidents on the railroads and street railways of Pennsylvania during August shows that 64 per cent occurred on steam railroads and 36 per cent on street railways. The bulletin classifies railroad accidents by their character, showing the number of killed and injured under the headings of "Employees," "Passengers," "Trespassers" and "Others." "Others" refers to persons injured on grade crossings. The same classification applies in tabulations of street railway accidents, except that the word "Others" is used to cover accidents occurring to persons traveling on public highways which are also occupied by street railway tracks. More than 28 per cent of fatal injuries on railroads were suffered by employees and 70 per cent of injuries suffered on railroads occurred to employees. Seventy per cent of the injuries reported on the street railways were to passengers. The total number of accidents reported for the month, 1193, is a daily average of 38.5. The average number of killed on railroads and street railways of the State was almost three per day. Under the classification "Character of Accident," it is shown that 55 of the 92 deaths which occurred during the month were caused by persons being struck by trains, locomotives or cars; 11 occurred to persons jumping on or off trains, locomotives or cars; 7 to persons falling from trains; 6 at grade crossings, and 4 by collision.

Among the improvements started recently in connection with the train services on the Metropolitan Railway (London) is one whereby a continuous all-round service to and from every station on the Inner Circle runs every six minutes. In addition, through trains are run between Hammersmith and the city every six minutes, and between Harrow and Baker Street every 10 minutes, while every alternate train is a non-stop as between Willesden and Harrow.

Personal Mention

Mr. C. W. Rambo has been appointed auditor of the Pottstown & Reading Street Railway, Pottstown, Pa.

Mr. Sterling Morton has been elected secretary of the Aurora, DeKalb & Rockford Traction Company, Aurora, Ill.

Mr. F. S. Kinsey has been appointed park manager of the Allentown & Reading Traction Company of Allentown, Pa.

Mr. D. O'Connor has been appointed roadmaster of the Stark Electric Railroad, Alliance, Ohio, to succeed Mr. J. Webber, resigned.

Mr. R. C. Crawford has been elected president of the Spartansburg Railway, Gas & Electric Company, Spartansburg, S. C., to succeed Mr. F. D. McEowen.

Mr. W. J. Bear has been appointed superintendent, electrical engineer and master mechanic of the Allentown & Reading Traction Company, Allentown, Pa.

Mr. R. C. Jones, formerly auditor of the San Antonio (Tex.) Traction Company, has been elected secretary of the company, and Mr. Perry King has been appointed auditor, to succeed Mr. Jones in that office.

Mr. P. W. Ripple, formerly electrical engineer of the New England Securities & Investment Company, Springfield, Mass., has been appointed superintendent of power and equipment of the company.

Mr. D. L. Robinson, assistant secretary and assistant treasurer of the Joplin & Pittsburg Railway Company, Pittsburg, Kan., has been elected secretary of the company to succeed Mr. John A. Prescott. Mr. Prescott retains his position as treasurer of the company.

Mr. F. W. Ernst has resigned as superintendent of the Atlantic City (N. J.) Electric Company, operating the Atlantic City & Shore Railroad, and the office has been abolished. The duties heretofore performed by Mr. Ernst will devolve upon Mr. S. S. Neff, general manager of the company.

Mr. Roy Edington, who as engineer for the Westinghouse Electric & Manufacturing Company installed the single-phase system on the Fort Wayne & Springfield Railway, has been appointed master mechanic of the company. Mr. Edington also installed the single-phase equipment on the Pittsburg & Butler Street Railway.

Mr. R. McCalman, engineer of maintenance of way, bridges and buildings, of the Illinois Traction System, at Decatur, Ill., has tendered his resignation to take effect in the near future, to become chief engineer of the Standard Contracting Company, Cleveland, O., which has several large government contracts for dredging and dock work, as well as important work for the States of Ohio and Pennsylvania.

Mr. J. H. Neal has been appointed general auditor of the Boston (Mass.) Elevated Railway, succeeding Mr. H. L. Wilson. Mr. Neal is a native of Boston, is only 36 years old and is widely known in the street railway field. He was educated in the grammar schools and English High School, Boston, and began business as a stenographer with the Hinckley Locomotive Works, Boston. These works were purchased by the West End Street Railway and Mr. Neil joined the latter company's staff in 1888 as clerk at Central power station. In 1890 he became connected with the accounting department, being assigned to duties at the Bartlett Street shops. He was chief clerk of various consolidated mechanical and electrical departments in 1892. In 1907 Mr. Neal was made auditor of the disbursements, becoming general auditor of the company this month. Mr. Neal is a former president of the New England Street Railway Club.

J. H. Neal

Mr. A. A. Lightfoot, who, as announced in the Electric Railway Journal of Oct. 10, has been appointed superintendent of the Elgin & Belvidere Electric Company, Chicago, Ill., has had a number of years' experience in the operating and transportation departments of

electric interurban properties, for the most part in New England. He was formerly connected with the Hartford & Springfield Street Railway and the Consolidated Railway in various capacities. In 1905 Mr. Lightfoot was appointed superintendent of the Lowell & Fitchburg Street Railway and on Jan. 1, 1908, became general manager of the Mankato (Minn.) Electric Traction Company.

Mr. H. L. Wilson has been appointed treasurer of the Boston (Mass.) Elevated Railway, succeeding Mr. William Hooper, resigned. Mr. Wilson is a native of Boston and received his education in the public schools of that city. After engaging in commercial work he joined the staff of the Metropolitan Street Railway Company, Kansas City, in a clerical capacity, remaining with this company for about a year. In 1888 Mr. Wilson returned to Boston as chief clerk of the revenue department of the West End Street Railway, and in 1889 he became chief clerk of the auditing department. In 1892 he was appointed auditor of the West End Street Railway, and when the organization was leased by the Boston Elevated Railway in 1899 Mr. Wilson was made auditor of the latter company. About two years ago he was appointed comptroller of the Boston Elevated Railway. Mr. Wilson is a member of the New England Street Railway Club and was the first president of the American Street Railway Accountants' Association, serving in that office in 1898 and 1899.

Mr. H. E. Chubbuck, whose appointment as general manager of the Illinois Traction System to succeed Mr. L. E. Fischer was announced recently in the Electric Railway Journal, is general manager of the Illinois Valley Railway, Ottawa, Ill. Mr. Chubbuck was a son of Mr. A. S. Chubbuck, one of the organizers of the Telegraph Manufacturing Company, the laboratories of which Mr. Chubbuck entered at an early age. Subsequently, Mr. Chubbuck became connected with the Thomson-Houston Company and served with it and the General Electric Company, its successor, for a number of years. Mr. Chubbuck, during his connection with the General Electric Company, installed and managed plants at Auburn, N. Y.; Springfield, Ohio; Omaha, Neb.; Pueblo, Col.; Quincy, Galesburg and La Salle, Ill. He has of late years been closely associated with the McKinley interests. As general manager of the Illinois Traction System, he will have under his supervision about 500 miles of interurban railway and the public utilities at Danville, Urbana, Champaign, Decatur, Bloomington and other cities. Mr. Chubbuck is an associate member of the American Institute of Electrical Engineers and secretary of the Illinois State Electric Association.

H. E. Chubbuck

NEW PUBLICATIONS

Manual for Engineers. Compiled by Chas. E. Ferris, Professor of Mechanical Engineering, University of Tennessee, Knoxville, Tenn. 1908; 162 pages of text (3 in. x 5¾ in.). Price, $0.50.

For the last four years this pocket book has been the companion of thousands of engineers. Its initial success has been the cause for this revised edition, a particular feature of which is a carefully arranged four-place logarithm table, suitable for most engineering calculations. An unusual feature is the large number of pertinent paragraphs on technical education scattered throughout the book.

Railway Track and Track Work. By E. E. Russell Tratman. New York: The Engineering News Publishing Company, 1908; 520 pages (6 in. x 9 in.); 232 illustrations and 42 tables; cloth. Price, $3.50 net.

This work is so well and favorably known among track engineers that it is needless to go into any review of its contents. While intended primarily to cover steam railroad practice, much of the data is applicable to high-speed electric interurbans. The section devoted strictly to street railway work comprises less than 7 pages. This edition is practically a new book with 50 additional pages and illustrations of the highest grade. An appendix of statistics of standard track construction on American steam railroads is included.

Construction News

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

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

FRANCHISES

***Birmingham, Ala.**—G. T. Brazleton and associates have applied for a franchise to construct a street railway line on St. Charles Street.

Alameda, Cal.—The City Council has passed the resolution granting to the Southern Pacific Company a franchise to convert the suburban system from steam to electricity and to construct and operate a new line encircling the east shore of the city.

Los Angeles, Cal.—M. J. Nolan has been granted a franchise for a street railway from La Salle Avenue to the western city limits.

Sacramento, Cal.—The California Central Traction Company, operating an electric line between Stockton and Lodi, has applied to the City Trustees for a franchise to enter Sacramento. The road desires to enter on Thirty-first or Twenty-fifth Streets and reach the river by way of S Street.

Springfield, Ill.—The City Council has granted the Springfield, Clear Lake & Rochester Interurban Railway a franchise, giving the company the right to operate interurban cars over the tracks of the Springfield Consolidated Railway on Monroe, Sixth, Washington, Fifth, Fifteenth Streets and Capital Avenue. J. E. Melick, president.

Elkhart, Ind.—The St. Joseph Valley Railway has asked for a 50-year franchise for a street railway on East Jackson Street, from Main Street east to the city limits.

Frankfort, Ind.—The City Council has passed the ordinance granting to the Kokomo, Frankfort & Terre Haute Traction Company a right of way through Frankfort. The franchise is for 35 years and stipulates that the road must be in operation between Frankfort and Kokomo two years from Jan. 1, 1909.

Clinton, Ia.—A new franchise with a 25-year tenure for the Clinton Street Railway is provided for in an ordinance adopted by the Clinton City Council, to be submitted to the voters of the city at the general election in November. At present the Clinton Street cars are being operated under half a dozen old franchises of various terms, conditions and times of expiration. These old franchises will be eliminated and a new one granted if the vote on the proposition is favorable. It is said that the company will extend its main line to take in the factory district in the lower part of the city, making its main line 7 miles in length.

***Bay St. Louis, Miss.**—It is reported that application will be made for an electric street railway franchise by a New Orleans syndicate represented by Peter Stifft, of that city.

Baltimore, Md.—The United Railways & Electric Company has applied to the City Council for a franchise for laying double tracks on Light Street, between Baltimore and Lee Streets. It is the plan of the railway company to operate the Orleans Street line on these tracks, thus cutting off the loop on Hanover and Lee Streets.

Cumberland, Md.—The Keystone Light & Power Company, Keystone, W. Va., has applied for an electric railway franchise to build a line east to Switchback and west to Kimball, 16 miles.

Joplin, Mo.—The officials of the Joplin & Pittsburg Railway have submitted a proposition to the city, whereby the road agrees to pay 2 per cent of its gross earnings in Joplin in lieu of an occupation tax of $2,000 per annum, for the privilege of operating cars on the streets of Joplin. The Council has taken the agreement under consideration.

Long Branch, N. J.—The Atlantic Coast Electric Railway, which operates a line between Pleasure Bay and Asbury Park, has been granted a 20-year franchise to run a line between Pleasure Bay and Monmouth Beach by way of Atlantic Avenue.

Morristown, N. J.—The Morris County Traction Company has applied to the Hanover Township for a franchise to cross Morris Plains. The company will also make an effort to secure authority from Hanover to extend its line from the present terminal at the end of Speedwell Avenue, a distance of about 400 ft.

New York, N. Y.—The Board of Estimate & Apportionment has granted to the New York & Queens County Railroad Company the franchises to construct extensions to Whitestone and Bayside. It is stated that the work of construction will begin at once. The amended contract calls for the construction of a double-track line to Bayside and Whitestone, and the franchises are for 25 years, with the

privilege of renewing them for 25 years more, the company to pay $500 for each franchise and 3 per cent on the gross receipts for the first five years, and 5 per cent thereafter.

El Paso, Tex.—Richard Caples and W. B. Latta have been granted a franchise to build an interurban railway from El Paso to Fabens, in the Rio Grande Valley, 32 miles. The line will traverse a well-populated district and will furnish transportation to the towns of Orns Grove, Ysleta, Sorocco, Clint, San Elizario and Fabens. [E. R. J., Oct. 10, '08.]

Bothell, Wash.—A franchise over 12 miles of the county road to Bothell has been granted by the Board of County Commissioners to the Seattle, Snohomish & Everett Railroad. The railroad will enter the city east of the State University and will connect with the Nineteenth Avenue line of the Seattle Electric Company at the north side of the portage. The third-rail system is prohibited, and the company agrees to move its rails on one side of the highway whenever the county road becomes a State aid road. The railroad is to be built within five years. C. C. Chittenden, president.

Seattle, Wash.—The Seattle Electric Company has applied to the City Council for franchises to operate lines on Pine Street, East Pike Street, Twelfth Avenue South, and other thoroughfares. The lines covered by these franchises will be operated during the Alaska-Yukon-Pacific Exposition.

Spokane, Wash.—The Spokane Traction Company has applied to the City Council for a blanket franchise extending its lines in the east and southeastern parts of the city, with the right to build Y tracks running north and south in such manner as to connect the east and west lines in that part of the city. The franchise application proposes to establish connections, the chief of the proposed extensions being to connect with that branch of the system coming into the city via the Olive Avenue route.

RECENT INCORPORATIONS

***Omaha, Lincoln & Southeastern Railroad, Lincoln, Neb.**—Articles of incorporation have been filed with the Secretary of State by this company, which proposes to build a line between Omaha and Lincoln. Capital stock, $100,000. Incorporators: Ellery S. McNaul, L. Howard Brumbaugh, I. G. Ladd, F. H. Rile, G. E. Moffat, Stephen St. John Malvern, all of New York; Nicholas D. Pound, of Chicago; De Ver Sholes and Charles L. Dundey, of Omaha.

Cumberland Railway, Harrisburg, Pa.—Chartered at the State Department Oct. 9, to build a 3-mile line in Cumberland County with terminus at a point near Balfour. Capital stock, $12,000. Incorporators: W. E. Glatfelder, of Balfour, president; G. A. Albright, D. W. Sunday, J. A. Ring and W. F. Pascoe, of Carlisle, and J. F. Nace and J. Lenker, of Balfour. [E. R. J., Sept. 26, '08.]

TRACK & ROADWAY

Fresno, Hanford & Summit Lake Interurban Railway, Hanford, Cal.—F. S. Granger writes that surveys are now being completed, and it is probable that construction work on this proposed railway will be started about Nov. 15. No contracts have been awarded as yet. It is to be a standard gage electric railway system, about 40 miles in length, and it will start in the city of Fresno, which has a population of about 40,000 people. From this place the road will run southeast paralleling the Southern Pacific main line, passing through Calma, Malaga, Fowler, Selma, Kingsburg and Laton, the southern terminus being Hanford, with a population of 6,000. The line will pass through a great fruit raising district and will serve about 60,000 people along the line. The overhead trolley system will be adopted. It is planned to build the main power station at Kingsburg and the substations at Malaga and Laton. In addition, Mr. Granger states that it is the intention of the company to build and operate two amusement resorts—one at Laton and the other on Kings River, a few miles east of Laton. Capital stock, $1,000,000. Officers: L. A. Nares, Fresno, president; F. S. Granger, Hanford, vice-president and general manager; J. D. Biddle, Hanford, secretary; H. A. Beekhuis, Hanford, treasurer; Chadwick & Sykes, San Francisco, chief engineers. [E. R. J., Sept. 19, '08.]

Ontario & San Antonio Heights Electric Railroad, Ontario, Cal.—It is reported that this company is running a survey from the present terminus of its line at San Antonio Park to Stoddard's Canyon, about 2 miles distant.

United Railroads, San Francisco, Cal.—This company is said to be making plans for the laying of new railway tracks on Market Street from Sansome to Twelfth Street. It is announced by the company that work on the Pacific Avenue cable road would begin and probably be completed within the next three months. A double-track line extending from Polk Street to Devisadero Street will be constructed.

Atlanta (Ga.) Northeastern Railroad.—This company has been authorized to issue $1,200,000 of stocks and bonds to build its proposed line from Atlanta to Cumming, Ga., 42 miles, for which a charter was granted some time ago. T. F. Martin and J. L. Murphy, of Atlanta, are interested. [E. R. J., July 18, '08.]

Atlanta, Griffin & Macon Electric Railway, Atlanta, Ga.—C. L. Anderson, N. P. Pratt, W. A. Wimbisch, W. D. Ellis, Jr., and C. E. Caverly have filed a petition against the Georgia Securities Company and the Atlanta, Griffin & Macon Electric Railway, which proposes to build an electric railway connecting the cities named in the title, asking for an injunction and a receiver for the road's property. Judge Pendleton, of the Superior Court, has issued a restraining order against the railroad company, which enjoins it from paying out any money on certain contracts or from changing the status of the company's affairs until a hearing can be had on Jan. 9, 1909. [S. R. J., Oct. 12, '07.]

Nez Perce & Idaho Electric Railroad, Nez Perce, Idaho.—The contractors on this road began the last stretch of grading on the new line with a camp, which is located just south of Vollmer, the western terminus of the electric railway. Work will begin in the city limits of Vollmer at once, and switchyards and terminals will be built adjoining the Northern Pacific line, and a connection will be made at some point south of the Northern Pacific depot. It is said that the line will be graded by Oct. 15, as the last gap is less than 3 miles in length. [E. R. J., Aug. 22, '08.]

Chicago, Wheaton & Western Railway, Chicago, Ill.—Henry C. Wood, president of this company, informs the Electric Railway Journal that work on the proposed electric railway, which is to connect Chicago and West Chicago, has already been started. The company was incorporated on Aug. 27, 1908, and has a capitalization of $10,000. Office, 707 Rookery Building, Chicago, and Wheaton, Ill. Officers: Henry C. Wood, president; Roy B. Tabor, vice-president; M. E. Anderson, secretary; J. Sidney Condit, treasurer, all of Chicago. I. W. Troxel, Rookery Building, Chicago, chief engineer. [E. R. J., Sept. 12, '08.]

Indianapolis, Logansport & South Bend Railways, South Bend, Ind.—John M. Caufield is reported to have brought suit in the St. Joseph Superior Court for a receivership for this company, which proposes to build an electric railway from South Bend to Logansport. The company was organized Oct. 24, 1904, and holds a franchise through St. Joseph County.

Marion, Bluffton & Eastern Traction Company, Bluffton, Ind.—This company, which was organized last year for the purpose of constructing a line from Bluffton, Ind., to Celina, Ohio, via Geneva, Ind., and owing to the financial conditions abandoned the proposition at that time, has recently been revived. It is said that the people living along the line are giving it all the aid possible, and on Oct. 9 voted the company a subsidy of 1 per cent. in Hartford and Wabash Townships, Adams County. The citizens are intent upon securing this road and are also donating aid in other ways. It is the intention of the persons interested to construct this road next year. Officers: L. C. Davenport, president; R. F. Cummins, secretary and general manager; W. A. Kunkel, treasurer. [S. R. J., March 16, '07.]

Terre Haute, Indianapolis & Eastern Traction Company, Terre Haute, Ind.—This company is reported to be asking for bids for the construction of a spur line to run from Shelburn to Hymera, a distance of 6 miles. This short line, when completed, will connect six towns having an aggregate population of over 2000 inhabitants.

Terre Haute & Merom Traction Company, Terre Haute, Ind.—It is stated that this company has been reorganized and that it has been decided to resume construction work on the line from Terre Haute to Merom, through Prairieton, Middletown, Fairbanks and Graysville. Capital stock, $50,000. Directors: W. S. Roney, Terre Haute; Julius F. Ermisch, Terre Haute; Charles Harlan, Prairieton; W. P. Ring, Middletown; William Riggs, Fairbanks; C. E. Medsker, Graysville; G. R. Hammond, Merom. About 11 miles of grading have been completed south of Terre Haute.

Des Moines, Winterset & Creston Electric Railway, Des Moines, Ia.—At a meeting of the directors of this company on Oct. 6, a contract was signed with the Interurban Company, of New York, for the building of the road from Des Moines to Creston, Ia. The financing of the enterprise is nearing completion and as soon as that is out of the way actual construction will be begun. E. B. Steere resigned the office of general manager and L. H. Hixson, of Des Moines, a member of the directory board, was elected to the position. [S. R. J., March 21, '08.]

Lewiston, Augusta & Waterville Street Railway, Lewiston, Maine.—The new extension of this company's railway

system was opened for traffic on Oct. 13. Service began at 6 a.m., and an hourly schedule was maintained. The first section of the road, that from Lewiston to Augusta, is about 30 miles in length, and the schedule so far terminates at these points. The Augusta and Waterville section will be completed in the near future. The Mechanic Falls branch was completed some time ago.

Boston, Mass.—The Boston Elevated Railway, attorney for the West End Street Railway, has requested the Massachusetts Railroad Commission to approve a temporary location of tracks on Newbury and Hereford Streets and the Massachusetts Avenue bridge, in Boston, pending repairs and alterations of this bridge. The location is substantially the same as that granted the company in May, in connection with the rebuilding of the Boylston Street bridge.

Boston & Northern Street Railway, Boston, Mass.—This company has requested the Railroad Commission to approve the location and construction of a spur track in Washington Street, Gloucester, to connect the company's main line with the local power station property. The local authorities have given consent to the work.

Boston (Mass.) Elevated Railway.—The structure of the new Forest Hills extension of the Boston Elevated Railway, which was recently described in the ELECTRIC RAILWAY JOURNAL, has been completed. The erection of the steel work has taken about two years, including the development of the different sections south of Guild Street. Track has been laid from Guild Street to the Arborway. The Forest Hills station has still to be erected, and the concrete arch construction over the Arborway and changes at the Dudley Street Terminal, making that a way station, are not yet completed. At the latter point the new Washington Street platform for southbound elevated trains is about finished, and structural steel work is under way for supporting new surface car platforms at the elevated level. Changes are also being made on the surface car inclined approaches to the elevated station. At the northern terminus of the subway inbound elevated trains and surface cars have been shifted about 20 ft. to the west of their former routes to permit track construction in connection with the Washington Street Tunnel outlet. Preparations are being made at Pleasant Street station for the ultimate restoration of the surface car inclined tracks, giving access to the Tremont Street Subway, in connection with the withdrawal of the present elevated trains, their transfer to the Washington Street Tunnel, and the restoration of surface car traffic in the subway.

Mexico, Perry & Santa Fe Traction Company, Mexico, Mo.—The directors of this company met in Mexico and reorganized. Mathias Crum was elected president and G. W. Gaither secretary. S. L. Robinson, formerly the president, was retained by the company as general manager, and R. E. Race, auditor and fiscal agent, was made a director. This company was formed in the fall of 1906 for the purpose of building an electric railway from Perry to Mexico. In the summer of 1907 work of grading for the road began, but in the spring of 1908 work was discontinued. About 25 miles of the right of way had been obtained under the old management, besides a franchise for building the line in Audrain, Monroe and Ralls counties and the franchise for the city of Mexico. The new company, in addition to finishing the road between Perry and Mexico, proposes to extend the line to Columbia. This matter will be taken up at once with the citizens of Columbia and Boone counties.

Springfield (Mo.) Traction Company.—A corps of surveyors have begun work on the survey of the proposed route for an extension of the tracks of the company south on Dollison Street three blocks, from Monroe Street to Lombard Avenue, thence east one block to King's Highway, where the track will reach the center of the State normal grounds, on the western side. The proposed trackage will be an extension of the Monroe Street line, embracing approximately 1500 ft., and a single track will be laid. The City Council will be asked to grant a franchise for the proposed extension at the next regular meeting, and it is the intention of the company to have the proposed extension completed by Jan. 1, 1909.

St. Louis, Monte Sano & Southern Railway, St. Louis, Mo.—The annual meeting of the stockholders of the St. Louis, Monte Sano & Southern Railway, held this week, postponed the election of the 15 directors to serve during the ensuing year until Nov. 10. The following statement has been given out by the general counsel for the company: "The contention of the Clayton County Court, when the company was cited to appear before it and show cause why its franchise should not be revoked was that the company should build a 4-ft. 10-in. gage road, but as the State statutes provide for the construction of a standard gage, and as only standard gage is recognized by the court, we were simply abiding by the statutes in building a 4-ft. 8½-in. gage. When these features were brought to the attention of the court the proceedings issued by the court were stopped and an amended franchise is now in course of preparation, and we have agreed to have the Lemay Ferry road complete within four months after the amended franchise is issued."

***Great Falls, Mont.**—It is reported that W. W. Withee and W. S. Cargill contemplate the construction of an electric railway, running west from the town of Conrad for 25 miles.

Omaha & Council Bluffs Street Railway, Omaha, Neb.—It is said that this company is planning to double track its line to the city limits of Florence in the spring.

Albany, N. Y.—The Court of Appeals on Oct. 6 declared valid the charter of the New York, Westchester & Boston Railroad, which proposes to operate an electric railway in The Bronx and Westchester County. The decision was in a condemnation proceeding. The court decided further that as part of the original route is not now in the possession of the railroad company, before it can build the line along that part of the route which covers the land it is proposed to condemn the company will have to get a certificate of public necessity from the Public Service Commission. This does not affect the portions of the road already built.

Buffalo Southern Railway, Gardenville, N. Y.—This company has just awarded a contract to the Pinckerton Construction Company of Philadelphia for the construction of a six-mile extension from Seneca Street and the city line along the Aurora plank road to the private right of way owned by the Buffalo Southern. The company now operates a 20-mile system near Buffalo, extending from the city line to Hamburg, Orchard Park, Ebenezer and Lein's Park. It is the intention to build another 10-mile section later that will bring the line into East Aurora. It is said that construction on that line may be started this fall or next year.

Coney Island & Brooklyn Railroad, Brooklyn, N. Y.—At a meeting of the West Side Taxpayers' Association last week, President S. W. Huff, of the Coney Island & Brooklyn Railroad, was present and outlined the company's plans in reference to the proposed parking of Coney Island Avenue. Mr. Huff said that if the railroad company's proposition for the improvement of Coney Island were accepted, the work would be commenced this coming winter, and that he hoped that the improvement would be completed before the heavy traffic of next summer. Mr. Huff stated that the railroad company proposed to put a parkway through the center of Coney Island Avenue, 24 ft. in width, and to curb the outer edge of the parkway; that the parkway would be sown with grass and kept in a first-class condition. In order to provide for proper room for vehicles at the side of the parkway, the sidewalks would have to be set back 10 ft. This would give a 23-ft. vehicle way on each side of the parkway. The cost of the establishment of the parkway, the curbing of the parkway, and setting back of the curbing and recurbing of Coney Island Avenue, from Park Circle to Neptune Avenue, is to be borne entirely by the railroad. The cost of this improvement, as regards the railroad company, Mr. Huff said, would be approximately $300,000.

New York, N. Y.—J. P. Hornaday & Company, New York, are building a 12-mile road between DeKalb, Miss., and the Mobile & Ohio Railroad at Sucarnoochee. The company desires bids on grading, 12 miles of rail, ties and other construction material.

Oregon Electric Railway, Portland, Ore.—This company has completed its system from Portland to Hillsboro and has begun operating passenger trains between the two cities. It is expected that within a short time the line will be completed and opened to Forest Grove, a total distance of 26 miles from Portland.

Sapulpa (Okla.) Interurban Railway.—It is stated that this company is preparing to extend its lines through to the Glenn Pool oil field and on to a connection with the Midland Valley Railway at a point in the Glenn Pool. Freight will be handled over this line. It is expected that work on the extension will be started in the next few days as the survey has been made and a part of the grade established. E. C. Reynolds, general manager.

Altoona & Logan Valley Electric Railway, Altoona, Pa.—It is stated that this company will shortly begin the building of a new line of track on Fifth Avenue from Twelfth to Twenty-seventh Street. It will be constructed of steel ties imbedded in concrete and heavier rails and will be the first line of track that has been so constructed in this part of the state. The contract has been awarded to H. G. Hinkle, of Altoona.

Lancaster & York Furnace Street Railway, Lancaster, Pa.—This company is said to be preparing plans for the building of an extension to its system from Millersville

through Manor and Lancaster Townships to North Queen Street, Lancaster. The entire distance is 6 miles.

Jeannette, West Newton & Monongahela Valley Street Railway, Jeannette, Pa.—The contract for the grading and building of this proposed electric railway has been awarded to the A. W. Sperry Company. The intention at present is to build the road from Jeannette to West Newton and later to the Monongahela Valley.

Pennsylvania & Maryland Street Railway, Elk Lick, Pa.—This company has been given permission by the State Department to extend its line from Garrett to Johnstown.

Pittsburg, Harmony, Butler & New Castle Railway, Pittsburg, Pa.—The State Department has granted this company the right to extend its system for a distance of 6550 ft. in Butler.

Pittsburg (Pa.) Railways.—It is said that this company will at once start reconstruction work on the Forbes Street line. The company is preparing to lay new rails and reballast the roadbed.

***Titusville (Pa.) Utilities Company.**—This company is reported to have been formed with $6,000,000 capital, and will take over all the public utilities of Titusville and be the center for interurbans to radiate in all directions. A line will be built to Cambridge Springs, and a branch of this will go to Union City. Another line will go to Franklin, and a through line will be built south to Butler and connect for Pittsburg, while an air line will be constructed from Butler to New Castle, a distance of 25 miles.

Augusta & Edgefield Electric Railway, Edgefield, S. C.—The incorporators of this company have awarded the contract to survey the line to Jones, Requarth & Kelsey, of Charleston. The survey will cover two routes, one from Augusta to Newberry, via Edgefield and Saluda; the other from Augusta to Edgefield and one to Greenwood. A finance committee has been appointed to collect funds to defray the cost of the survey. [E. R. J., Aug. 22, '08.]

Nashville (Tenn.) Interurban Railway.—Construction work was begun on this proposed electric railway on Oct. 11, when the first spike was driven by Mayor Brown on the Franklin Road at the Tennessee Central crossing. The entire roadbed has been graded with the exception of a few hundred feet. H. H. Mayberry, president.

Gainesville, Whitesboro & Sherman Railway, Gainesville, Tex.—This company has awarded the contract for the building of its standard gage electric railway to J. P. Hornaday & Company, of New York. The road, when completed, will be 39 miles long and will extend from Gainesville through Whitesboro to Sherman.

Temple, Tex.—At a final conference last week between W. D. Boyce, of St. Louis, and leading citizens of Temple, in the interest of the projected electric railway which is to connect Temple with Marlin and Waco, the people of Temple decided to subscribe to the capital stock of a company whose capitalization will be $200,000, which will be organized for the purpose of building the line. Temple's portion of this amount will be from $50,000 to $75,000. The meeting chose Charles M. Campbell and James E. Ferguson as directors of the company to represent the interests of Temple. A committee of active citizens was appointed to start work securing the needed right of way and a franchise in Temple. [E. R. J., Oct. 10, '08.]

Uvalde (Tex.) Street Railway.—It is stated that this company has started actual construction of its line from the Uvalde depot to the main plaza, a distance of 2 miles. The ground over which the track runs is comparatively level, but little grading will be done. There will be about 6 miles of construction work to be done this fall and winter. John T. Smith, manager.

Big Bend Transit Company, Spokane, Wash.—It is stated that this company intends to begin the grading of its line before the end of this month. The surveys have been practically completed and 47 of the 72 miles of its route have been purchased or are under option. The company expects to have in operation by Sept. 1, 1909, a line extending from Spokane to Davenport, with a branch to the junction of the Spokane and Columbia Rivers. Construction work will be under the direction of L. F. McCoy, chief engineer. The power station which the company proposes erecting will be located at the Narrows, 1½ miles above the mouth of the Spokane River.

Spokane & Inland Empire Railway, Spokane, Wash.—Jay P. Graves, president of this company, is reported to have made an announcement that the Hayden Lake line will at once be extended to the south end of Pend D'Oreille Lake.

POWER HOUSES AND SUBSTATIONS

British Columbia Electric Railway, Ltd., Vancouver, B. C.—The Electric Railway Journal is advised that this company is about to increase the capacity of its Lake Buntzen power house by 10,000 hp. Two steel pipe lines 1800 ft. long and 52 in. at the lower end will be built. Another 5000-kw unit will also be installed. This unit will consist of one 5000-kw generator, which will be supplied by the Dick, Kerr Company, London, England, and a 10,500-hp Doble impulse water-wheel; the latter will be supplied by the John McDougall Company, Montreal, the Canadian licensee of the Abner Doble Company, San Francisco. The water-wheel will consist of four separate wheels, two mounted on the shaft on each side of the generator, and there will be two jets on each wheel. There will be three 2500-kw step-up transformers installed and these will be of the air blast type.

United Railroads, San Francisco, Cal.—It is announced that this company will erect a combined power station and car house on the North side of Pacific Avenue. It will be a one-story galvanized-iron building, 53 ft. x 127 ft. The power house will be equipped with cable-driving machinery from the McAllister Street power station, which will be driven by a 270-kw d.c. motor taken from the Hayes Street power house. The cable will be 1 5/16 in. in diameter and about 12,600 ft. long.

Washington, Arlington & Falls Church Railway, Washington, D. C.—A. J. Porter, of Clarendon, has been awarded the contract for the erection of a substation at Lacey station on the five-acre tract recently purchased by the company.

Illinois Traction System, Champaign, Ill.—This company is reported to be making plans for stations and substations to be built at Clinton. The building will be of brick, 30 x 80 ft., and will cost $5,000.

Albany & Hudson Railroad, Hudson, N. Y.—It is announced that this company will enlarge its power station at Stuyvesant Falls, additions being necessary to provide for increasing business and for emergencies. The company has appropriated $75,000 to cover the cost of this new work, which will consist of the installation of one 1500-kw turbo-generator set, one frequency changer set, an extensive addition to the present boiler house with new boilers, stack, condenser, exciter and other appurtenances. The work on the boiler house will be started within 10 days, and the whole installation is to be completed by June 1 of next year. The stack will be of radial brick construction, 135 ft. high, with an inside diameter of 6 ft. The increase of the steam plant will be 72 per cent, and the boiler house capacity will be increased by 26 per cent.

Brooklyn (N. Y.) Rapid Transit Company.—Contracts were signed the past week for the new substation which this company is about to erect on its property on the south side of Thirty-sixth Street, just west of Fifth Avenue. The new substation will consist of a single high story, with mezzanine gallery, its outer dimensions being 60 ft. x 100 ft. It will be constructed of repressed brick and terra cotta and its walls will be lined within with white porcelain tiles, thus making the building fireproof in every detail. With its equipment of batteries and transformers and switchboard it will cost $200,000. The station is to be ready within five months.

Toronto (Ont.) Street Railway.—This company has just placed an order with the British Insulated & Helsby Cable Company, Limited, Montreal, to supply and install the three-core extra high tension feeders in connection with its extensions.

SHOPS AND BUILDINGS

Illinois Traction System, Champaign, Ill.—This company is said to have just begun work on a steam heating plant in Decatur. The station will furnish heat for the company's interurban shops. It will be 44 ft. x 51 ft., and will be one story high. The company has also begun work on a frame station at Cerro Gordo. This structure will be 14 ft. x 55 ft., and will cost $1,500. Plans for a passenger and freight station at Monticello are now being completed by the company. This building will be of brick, 26 ft. x 55 ft., and it is estimated will cost $3,000.

Interborough Rapid Transit Company, New York, N. Y.—It was reported that the Interborough Rapid Transit Company has completed plans to erect a tall office building at the southeast corner of Court and Joralemon Streets, Brooklyn. The new building, it was said, will be 13 stories in height and will have direct connection with the Borough Hall station of the subway. Several floors will be devoted to the offices of the Interborough and the remainder of the building offered for rent.

Philadelphia (Pa.) Rapid Transit Company.—Plans are being prepared by this company for a one-story concrete addition to the car house at Twenty-sixth Street and Allegheny Avenue. The addition will be 80 ft. x 500 ft.

Manufactures & Supplies

ROLLING STOCK

Buffalo, Lockport & Rochester Railway, Buffalo, N. Y., has been authorized by the Public Service Commission to issue evidences of indebtedness to the maximum of $200,000 for the acquisition of 15 interurban passenger cars and 2 express and baggage cars. The cars are to be purchased by the Buffalo, Lockport & Rochester Rolling Stock Company, which proposes to execute a mortgage to secure the payment of bonds to an amount not exceeding $200,000.

TRADE NOTES

I. R. Nelson & Company, Newark, N. J., announce that they have just closed a contract with the Trenton & New Brunswick Railroad to repaint its cars.

The Russell Car & Snow Plow Company, Ridgway, Pa., is distributing through its advertising representatives, the Kline Advertising Agency, very useful reminders, in the form of leather-covered card cases.

American Blower Company, Detroit, Mich., has a limited supply of leather-covered pocket-size Manuals for Engineers, compiled by Prof. Charles E. Ferris, of the University of Tennessee, which it will supply to engineers and contractors on application to the company.

Massachusetts Chemical Company, Walpole, Mass., has moved its New York office from 237 Broadway to the Hudson Terminal Building, 30 Church Street. A. G. Cozzens is sales agent, as formerly. At the new address the well-known line of electrical tapes, insulating fabrics and compounds and molded rubber goods is carried to fill emergency orders. The former telephone number, 3440 Cortlandt, is retained.

Sprague Electric Company, New York, N. Y., reports large sales recently made of the Sprague electric mono-rail cranes, for use in transferring coal, ashes, sand, lime and other material of like nature. The apparatus is simple, requiring only one electric controller to govern all operations of loading, hoisting, traveling, lowering and dumping. The controller handle is so constructed that by changing its position the carrying bucket is hoisted, lowered, opened or closed by one movement by the single attendant. The mono-rail cranes are used to advantage in the handling coal and cinders in many large power houses.

Stuart-Howland Company, Boston, Mass., has leased the adjoining building, Nos. 1, 2 and 3 Winthrop Square and 12 to 36 Otis Street, and has recently moved its store and office to that address. This gives the company greatly increased space, and as there are about 13,000 ft. on each floor, with more than 325 ft. of street frontage, the quarters are unusually light and admirably adapted for the purpose to which they are put. The company has gone to considerable expense in fitting up each department and its facilities are said to be unsurpassed. The company has recently acquired several valuable agencies, has increased its stock and reports recent business to be considerably in advance of last year.

D. C. & Wm. B. Jackson, Madison, Wis., and Boston, Mass., announce that they have removed their Western office from Madison, Wis., to the Commercial National Bank Building, Chicago, and that William J. Crumpton will be in immediate charge of their Chicago office. The firm is prepared to design electric light, power and railway plants and power transmission systems and to supervise construction, and to manage and supervise electric light and power properties and gas plants, and examine and report on engineering projects and on the conditions existing in established properties and the opportunities for their improvement. Financial reports on the physical value and the earning capacity of industrial enterprises will also be prepared for bankers and underwriters.

Allis-Chalmers Company, Milwaukee, Wis., reports that the earnings for the year ended June 30, 1908, after deducting cost of manufacturing and selling, taxes, insurance and other general expenses, dividends on preferred stock outstanding of the Bullock Electric Manufacturing Company and ordinary provision for doubtful accounts, were $2,573,960; and that the net earnings, after deducting the expenditures for maintenance, repairs and renewals on buildings, machinery, plant, tools, etc., reserves for depreciation on buildings, machinery, etc., interest on bonds and notes payable, and the special reserve, were $615,814. Beginning with the second quarter and continuing for half of the fiscal year, owing to the severe contraction in general business throughout the country, the volume of the company's sales averaged about one-half of normal. During the last quarter there was a gradual and steady increase in orders booked. Noteworthy success is reported in the sale and operation of the company's new lines of production, namely, gas engines, steam turbines, hydraulic turbines and electrical apparatus.

ADVERTISING LITERATURE

W. S. Rockwell Company, New York, N. Y.—This company describes its crucible metal, furnace for copper, bronze, brass, aluminum, silver, gold, iron, steel, etc., in the pamphlet just issued. The furnace is designed for oil or gas fuel, either of which costs less than coke or coal. A table is given of the standard sizes of the furnace.

Mica Insulator Company, New York, N. Y.—This company has issued catalog No. 25. It is the most complete publication of its kind that the company has ever issued and contains much useful data for users of Mica insulation. It is compiled so as to facilitate correctness in ordering goods. The title is "Electrical Insulating Materials."

Cooper Hewitt Electric Company, New York, N. Y.—This company has issued Bulletins Nos. 19, 20 and 21. No. 19 supersedes Bulletin No. 15, dated September, 1907. Its subject is the Cooper Hewitt lamp for direct-current, indoor use, and the types K and H. Bulletin No. 20 describes types P and U automatic starting for indoor use. Bulletin No. 21 describes the automatic starting indoor lamp for alternating current.

Jeffrey Manufacturing Company, Columbus, Ohio.—Bulletin No. 27 of this company dated September, 1908, has for its subject the Jeffrey coal-washing plant equipment, which is illustrated by half-tones and line engravings, showing the operation of the Jeffrey screens and coal washers and weighers. The company has also issued Bulletin No. 22, in which are described its operating tipples and shaking screens for coal mining operation.

General Fireproofing Company, Youngstown, Ohio.—This company has issued an attractive pamphlet entitled, "General Information." Among its products listed are expanded steel lath, expanded metal lath, allunited steel studding, trussit, pin connected girder frames and cold twisted lug bars. The company calls attention to its allunited steel furniture, including office equipments. It manufactures and carries in stock for immediate delivery expanded metal and sheet steel clothing lockers of every desired type. It has furnished some 18,750 of its ventilated sheet steel lockers for United States army posts and has also supplied similar lockers to many street railway companies for use of their employees.

A. Allan & Son, New York.—This firm has just issued the second of its series of bulletins, which, when complete, will form an exhaustive catalog of the Allan metals. The introduction is entitled, "The Heart of the Engine and the Seat of the Power," after which it is told how the pistons are constructed for Allan metals, how Allan metal is supplied, and how to apply it. In conclusion, it is said for Allan metal that it provides and maintains a polished cylinder, thus reducing friction to a minimum. The approximate weights are given of a ring of Allan metal, ¾ in. thick, for a given width groove and diameter of piston. The catalog is an excellent example of the trade publication de luxe.

National Coke & Coal Company, New York, N. Y.—This company has issued a pamphlet in which testimonials are presented regarding its Astoria coke with a view to furnishing information as to the value of the coke for industrial and domestic purposes. The coke is sold only by the National Coke & Coal Company, and is manufactured at the plant of the Astoria Light, Heat & Power Company, probably the most modern and complete gas works in the world. The efforts of the company are to produce a clean, smokeless, high-grade fuel, containing a minimum of ash, with the highest percentage of heat yielding constituents. The Astoria coke is said to be specially adapted for use in high-pressure boilers, in small hot water heaters, etc. It makes a quick, hot fire, burns to a thin gray ash, and requires little attention.

General Electric Company, Schenectady, N. Y.—In Circular No. 3702, this company describes its new Type CR feeder regulator and the benefits to be derived from the use of such apparatus in connection with alternating current lighting systems. This regulator is designed for operation on single-phase 220-volt, 60-cycle circuits, and may be used with either hand or sprocket control. In Bulletin No. 4621 the company illustrates and describes its luminous arc lamp for multiple circuits. The Form 2 lamp is intended primarily for use in foundries, machine shops, freight houses, etc., where a large unit is desired, and combines high efficiency with low maintenance cost. The lamp is made for 110 and 220-volt direct current circuits, the 110-volt being suitable for any line voltage from 100 to 125, and the 220-volt lamp for voltages from 200 to 250. This company has also designed a multiple luminous lamp for use on direct current

power circuits and as a head light on interurban cars and mining locomotives, which is illustrated and described in the bulletin.

Electric Service Supplies Company, Chicago and Philadelphia.—The Keystone Traveller for October, published in the interest of this company, is a special issue in honor of the convention of the American Street & Interurban Railway Association at Atlantic City. For this reason the cover is decorated with a mermaid rising from the sea. Attention is called to the company's exhibit at Atlantic City, particular stress being laid on the new pay-within car. The company says the car has recently been developed and adopted by one of the largest operating companies in the country. The claim is made for it that it prevents boarding and alighting accidents, its sliding doors and fold-steps, actuated either automatically or by a simple manual device, making it impossible for passengers to get on or off the car while it is in motion. Ordinary cars can be easily converted to the pay-within type. The company has prepared a special bulletin on the pay-within car, which it will send to any one on request. The automotoneer is again called to the attention of electric railway managers who desire to decrease accidents caused by quick starting, and prevent fast feeding by conductors who ignore the instruction of the company in regard to rapid acceleration.

ELECTRIC RAILWAY PATENTS

UNITED STATES PATENTS ISSUED OCTOBER 6, 1908.

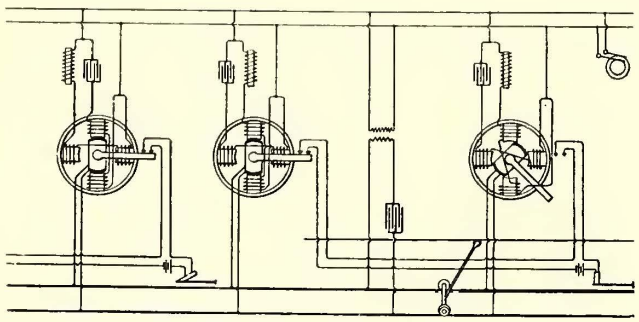
[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 41 Park Row, New York.]

Automatic Air Hose Coupling, 900,132; Nelson Toy, Weir, Kan. App. filed April 7, 1908. Relates to means for guiding the coupling heads when the cars come together, means for yieldably supporting said heads in operative position, and means for connecting the electric conductors of adjacent cars so that telegraphic or telephonic communication may be established between the cars.

Safety Guards for Cars, 900,187; Martin Meyer, Omaha, Neb. App. filed Jan. 2, 1908. A longitudinal guard rail depending from a bracket at the top of the car to a position in front of the platform or platforms. May be readily swung upward by the conductor.

Guard Rail Spacing Block, 900,209; Frederick W. Rizer, Chicago, Ill. App. filed Feb. 4, 1908. A guard rail block formed with a plurality of lateral bearing faces arranged in pairs, the faces of each pair being disposed in parallel relation and the width of the block between the bearing faces of each pair varying with respect to the width thereof between the bearing faces of the other pairs.

Electrical Railway Signal System, 900,273; Thomas M. Freeble, Latrobe, Pa. App. filed June 7, 1907. Relates to a block signal system whereby signals are displayed in a locomotive cab, brakes may be set and power turned off automatically.



Block Signaling System—Pat. No. 900,370

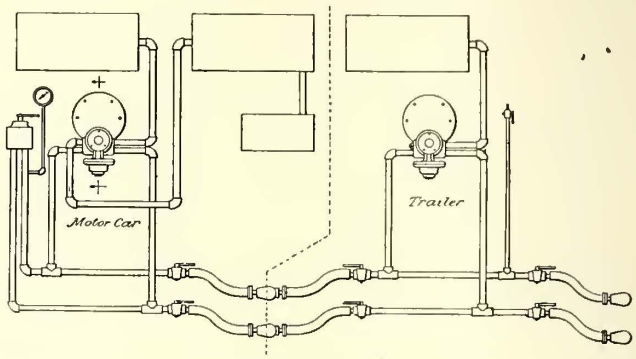
Rail Bond, 900,298; Archie W. McConnell, Anderson, S. C. App. filed Aug. 4, 1908. Has a bond and a plate positioned between said bond and the rail joint and a casing disposed about said bond.

Rail Joint Fastening, 900,325; Amos F. Sweigart, South Hampton, Pa. App. filed Sept. 10, 1907. The fish plates are so constructed that the inner one engages the under side of the head, the web, and extends around one-half of the base of the rail, while the outer fish plate has, in addition, an upwardly extending portion fitting closely against the head and level with the tread of the rail. Both fish plates have members depending beneath the rails provided with registering bolt holes. The rails are notched to receive tenons on the fish plate to prevent lateral displacement of the latter.

Rail Clamp, 900,328; Joseph M. Vail, Bryan, Ohio. App. filed April 12, 1908. A clamp for clamping rails to a metallic I-beam tie.

Block Signaling Device, 900,360; William Fechner and Albert Henry Fechner, Goliad, Tex. App. filed July 23, 1907. A trolley mounted on a locomotive and designed to be swung from one side to the other by mechanism mounted within the cab, so that the trolley may at all times be in proper position for engaging signal carrying wires positioned at one side of the track.

Block Signaling System, 900,370; John S. Holliday, Wilkinsburg, Pa. App. filed Feb. 21, 1908. A block signaling system, the track rails of which are electrically continuous for all currents, synchroscopic relays each having a movable element connected across the track rails and means for impressing signaling currents upon the track rails, said currents being in phase in each block with the current in one field winding of the relays for that block.



Air Brake System—Pat. No. 900,639

Block Signal System for Railways, 900,456; James T. West, Bockingham, N. C. App. filed March 25, 1908. A block signal system having a track divided into block sections and locomotives provided with signal devices which are connected in circuits with the block sections of the track, the signal device on one locomotive or vehicle being set according to the movements of another locomotive or vehicle which may be moving either in the same or in an opposite direction.

Rail Bond, 900,488; Fred H. Daniels and Charles H. Sturdevant, Worcester, Mass. App. filed Dec. 1, 1906. The rail has a hole at its bottom in which the terminal of the bond is received, the latter being expanded therein by a pin.

Means for Securing Railroad Rails to Ties of Railroad Beds, 900,570; Oscar J. Morris, Laramie, Wyo. App. filed March 4, 1907. The tie has a metallic plate on its top with holes through which is driven a spike having a notch formed therein next to the head of the spike, said notch engaging the tie plate when the spike is driven into the tie.

Brake Shoe, 900,600; Charles S. Shallenberger, St. Louis, Mo. App. filed June 5, 1908. Comprises face and back-offsets so formed and disposed relatively to each other that the face and back surfaces of such offsets are parallel with and equidistant from each other, and the back surface of a face offset would if extended intersect the face surface of a back-offset.

Brake Shoe, 900,601; Charles S. Shallenberger, St. Louis, Mo. App. filed June 24, 1908. Consists in the combination of a metal face-insert, of a back-insert comprising a ductile metal plate having a central longitudinal flange on its back and on its face a plurality of supporting projections in engagement with the back of the face-insert, and a metal body cast upon such inserts.

Air Brake System, 900,639; Bert Aikman, Chicago, Ill. App. filed Dec. 9, 1907. The object of this invention is to so arrange the piping control that the motorman's valve may serve as a common means for making all connections desired and to provide quick release mechanism which will allow rapid, local release of the brake cylinders and brakes controlled thereby.

Railway Tie, 900,648; Harry C. Bennetch, Cocalico, Pa. App. filed Oct. 10, 1907. A tie and rail supporting seat mounted for a free inclining sliding movement relative to the tie, so that the rails may normally yield laterally under certain conditions.

Rail Support, 900,667; George M. Cote, Pittsburg, Pa. App. filed July 27, 1907. A member adapted to bear against the rail and provided with an arm adapted to extend through an aperture in the tie, said arm having a longitudinally slotted hole therein, and a bolt extending upwardly through said slotted hole and also through a loosely fitting hole in the top of the tie.