

hicle Company, recently returned from the South, said he found the principal cities ready to adopt electrics and most large centers already have good garages. The service in Baltimore is of a high type; about 80 trucks are in operation. Mr. Hillman claimed that the income to central stations from current sold for charging is about 30 per cent more than from electricity sold for cooking and heating, because of the high demand in the latter case.

Henry Goodman, of Buffalo, disagreed with the project to allow money to central stations to provide for future service on cars sold.

Day Baker, of the General Vehicle Company, held that the motor cars and trucks give best satisfaction in cities where central stations actively co-operate, as for example in Salem, Lowell, Hartford, Worcester and New Bedford. The adoption of trucks by the express companies in Boston has stimulated the business there.

J. S. Codman, of S. R. Bailey & Company, A. D. Putnam, of Worcester Electric Light Company, and Converse D. Marsh, of New York, participated in further discussion. Mr. Anderson, of Detroit said he was willing to devote funds to central stations for the repair and care of cars where it is impracticable to send a man from headquarters.

The afternoon was devoted to an outing by trolley to Bass Point and Lynn, where a part of the company inspected the motor and turbine departments of the General Electric Company's works. A baseball game was played between representatives of the Boston Edison Company and a nine captained by D. C. Tiffany. The evening was given over to a Shore Dinner and meeting of the Motor Car Club.

Cost System in Electrical Contracting.

At the final spring meeting of the Chicago section of the American Institute of Electrical Engineers and the electrical section of the Western Society of Electrical Engineers, held Monday evening, May 26, this being a joint meeting of the two bodies mentioned, a very interesting paper on "Cost Systems in Electrical Contracting," prepared by Leo Dalkart, of Moline, Ill., was read. The author being unable to attend, the paper he had prepared was presented by J. H. Warder, secretary of the Western Society of Engineers.

The author stated that many electrical contractors have no cost system at all; their practice is that if they lose money on one job they try to realize a compensating gain on some subsequent installation. The reason

for the lack of a cost system on the part of some contractors has sometimes been inability to procure one that would fulfill the requirements, because those men who have worked out good systems are frequently very reticent in the matter of letting their competitors know what the details of the system are. The paper then went on to discuss the difficulties in estimating electrical work. It was stated that material costs could be estimated rather closely without great difficulty, but the estimate on labor was liable not to be very accurate. The question of overhead expense and the proper distribution of items of cost was then gone into in some detail, curves being shown which exhibited variations in different items of expense throughout the twelve months of the year. Mr. Dalkart argued that there should be a man-hour overhead element in an estimate on the overhead cost on most jobs the contractor undertakes. The overhead is not the same on a job which consists mostly of labor as on one amounting to the same sum where there is little labor and much material.

The paper was discussed briefly by Ralph H. Rice, chairman of the Chicago Section of the American Institute of Electrical Engineers, John A. Wicum, a Chicago electrical contractor, J. H. Warden, A. S. Pardee, S. Montgomery, and C. D. Wesselhoeft. Mr. Rice said that costs should include the expense of making estimates. He spoke also at some length of the necessity of reliable data as to the depreciation of apparatus and materials.

Mr. Wickum emphasized the importance of proper cost keeping in electrical contracting, and spoke of a system which the National Electrical Contractors' Association has prepared. He said this system made it possible for the contractor to discover at any time just what the condition of his finances were, and what the work on any job undertaken was amounting to.

Mr. Pardee thought that too much time was spent, when estimates are being made, on inconsequential items; it seemed foolish to him, for example, for an estimator to state that a prospective job which he had figured would amount to, say \$39,652.33. A statement of this kind is deceptive; it leads one to imagine the estimate is more accurate than it really can be made. Mr. Montgomery discussed the mistake of charging against overhead expense items which could easily be charged up directly to some particular part of a job.

The next joint meeting of the two organizations will be held early in the fall.

RAILWAY ELECTRIFICATION.

Annual Meeting of the American Institute of Electrical Engineers.

The annual meeting of the American Institute of Electrical Engineers was held in New York City on the evening of May 20, and was called to order by President Ralph D. Mer-shon.

The report of the tellers in the election of officers was then presented and the following were declared elected: president, C. O. Mailloux; vice-presidents, H. H. Barnes, Jr., J. A. Light-hipe and C. E. Scribner; managers, B. A. Behrend, Peter Junkersfeld, H. A. Lardner and Lewis T. Robinson; treasurer, George A. Hamilton.

The annual report of the Board of Directors was also presented but was not read.

The meeting was then turned over to the Railway Committee, whose chairman, Frank J. Sprague, was then called to the chair. The first paper presented was by H. M. Hobart, and was entitled, "2,400-Volt Railway Electrification."

2,400-Volt Railway Electrification.

The requirements of a railway load are of such a character that electricity can in many instances be profitably sold at a price, delivered to the substations, of less than one cent per kilowatt-hour. It is no longer of interest to railways to concern themselves with the large capital outlays associated with the manufacture and transmission of electricity. Their concern is merely with the relatively small outlay which they will incur for substations and for the distribution system; and with the relatively large capital outlay for electric locomotives and for the electric equipment of motor-car trains. The predominating item in the capital outlay is that for rolling stock and against this a credit can equitably be allowed since the replaced steam equipment can be used up on non-electrified divisions. Consequently in investigations undertaken with a view to comparing the cost of electric operation with the cost of steam locomotive methods, the chief items involved relate to operating expenses and to the annual charges associated with the capital outlay for substations, distributing system and rolling stock. It can often be conclusively demonstrated that electric operation is economically superior to steam locomotive operation, even for divisions where the traffic consists of an irregular and sparse service of freight and express passenger trains. 2,400-volt direct-current operation was advocated, with two motors in series and substations 30 miles apart. Estimates of equipment and operating costs were given.

Charles P. Kahler then presented a paper entitled "Trunk-Line Electrification."

Trunk-Line Electrification.

This paper outlines the steam-railroad conditions in the West and gives an idea of some of the results which would occur with electric operation of

the steam railroads. One important point brought out is the characteristic of the electric locomotive to operate overload for short periods and thus be able to haul heavier freight trains over the undulating grades on most steam railroads than is possible with a steam locomotive. The data given showing the distribution of steam-railroad engine service show that it is possible to keep a steam locomotive in service only a small portion of its time, which would not be the case with electric locomotives, which have no fire boxes or boilers to be cleaned out. In the example taken, it is shown that only about half as many locomotives would be required to handle a given traffic by electric operation as by steam operation. A method of analyzing the comparative operating expenses and fixed charges of trunk-line railroads by steam and electric operation is given in a very complete manner. While the financial showing made for electric operation is good, attention is called to the fact that the most important objection to the electrification of steam railroads is the heavy first cost. The purchase of power from power companies and co-operation with them in the matter of building high-tension transmission lines, would considerably reduce the first cost of electrification. A proposed railway was laid out for 15-cycle, single-phase operation, and equipment and operating costs compared with steam. Although the initial expense is large, the saving in operation would pay 10 per cent on the investment.

Mr. Sprague opened the discussion, calling attention to the fact that both authors had found electrification feasible, although different systems were involved. Both eliminated the power station, leaving the question of generation to commercial organizations. He thought the supply at 15 cycles, single-phase, called for by Mr. Kahler, might introduce difficulties.

A. H. Armstrong pointed out that investments made today are not based on the traffic of today, but on the traffic of tomorrow, and the question of cost should be worked out on that basis. Single-phase operation is most attractive where traffic is meager, since the cost for substations and feeder copper are a minimum. On the other hand, operating cost and repairs are greater with single-phase motors. The advantages of both could be combined by transmission with single-phase and the use of mercury-arc rectifiers on the locomotive. Rectifiers have now been built in steel containers with a capacity of 1,000 kilowatts. Another way is to install the rectifier in substations, replacing the rotary converter. The volume of traffic would determine the choice between these. The single-phase commutating motor will soon become a thing of the past. Such a rectifier has been operated upon one of the locomotives for the Butte, Anaconda & Pacific Railroad, built at Schenectady, with satisfaction; 5,000-volt direct-current apparatus has

also been built and tested with gratifying results.

F. E. Wynne presented a number of diagrams to emphasize the points brought out in Mr. Kahler's paper. He discussed the paper in detail and also took up a number of points in Mr. Hobart's paper. He thought some railroad engineers would not accept all the figures given in the latter.

E. R. Hill pointed out the interest that railway men generally are taking particularly in electrification, the advantages of which are recognized particularly on heavy mountain grades, where there is a great saving through increase of capacity by increasing the speed, and through reliability of service, and thus the earning power of the property is increased. He mentioned the electrification of the Norfolk & Western Railway between Bluefield and Vivian, W. Va., as an example.

W. S. Murray pointed out the necessity of assuming appropriate conditions for each in carrying out comparisons between electrical and steam operation. The operation of a steam road can often be improved by changing the schedule. The elimination of the firemen through the use of oil-burning locomotives and automatic stokers will enable the steam locomotive to surpass the electric in sustained tractive effort, although the latter has the advantage for sustained power.

Written discussion was submitted by A. H. Babcock, who pointed out that the hypothetical cases considered differed from the actual cases occurring in Pacific Coast practice. He made reports on a great many of the mountain railroads of the West and did not find Mr. Hobart's statements substantiated in these cases. Power companies did not find the railway load attractive, with its large fluctuations, and would not offer a rate which was suitable. Any rate for energy greater than 0.5 cent is prohibitive. The annual load-factor seldom rises above 20 per cent, and loads as large as 45,000 kilowatts may be thrown on and off of a system. From discussion with Eastern engineers he decided that the conditions were entirely different in the two parts of the country.

F. W. Carter submitted written discussion stating that the figures used for electrical operation were rather too favorable; whereas the steam figures were based on actual experience and therefore represented working conditions.

H. Y. Hall and G. W. Welch also submitted written discussion in which the cost figures were analyzed and showed that these would have to be increased to agree with current practice in the West. They conclude, es-

pecially in Mr. Hobart's paper, that the estimated costs for overhead construction and substation equipment are very much too low, and hence the electric operating costs are also too low. On the other hand the steam figures are, if anything, too high.

After adjournment a smoker was held in the Institute rooms.

Institute Board Meets.

On the afternoon of May 20 the Board of Directors of the American Institute of Electrical Engineers held a meeting, at which it authorized the holding of an Institute meeting in Philadelphia, Pa., under the auspices of the Philadelphia Section, on Monday, October 13.

Fifty-seven members were transferred to the grade of Fellow, 144 Associates were transferred to the grade of Member, five new applicants were elected to the grade of Member and 149 to the grade of Associate; 99 students were ordered enrolled.

A. F. Ganz was appointed a member of the Board of Examiners.

The Board approved an amendment to the by-laws of the Edison Medal Committee, which will permit the presentation to be made at any time and place during the year which may be arranged by the officers, instead of at the annual meeting in May. Arrangements are, consequently, being made to present the 1912 medal to William Stanley at the annual convention of the Institute in June.

F. L. Hutchinson was reappointed secretary for another year. Annual reports of all committees were presented and abstracts of these incorporated in the annual report to the Board of Directors, which was approved.

Examination for Electrometallurgist.

The United States Civil Service Commission has announced an open competitive examination for electrometallurgist to fill a vacancy in the Bureau of Mines at a salary of \$1,500 to \$1,800 per year. The duties of the position are to conduct investigations and inquiries into metallurgical problems, the investigation of ores with reference to treatment and especially the possibility of treatment by electrometallurgical processes.

Ratings will be based upon practical questions in electrometallurgy, general education and scientific training, professional experience and fitness.

As only one application for examination was filed at the previous examination, there is a splendid opportunity now for eligible men to secure immediate appointments through this examination.