

N. W. Storer, chief engineer of the railway department of the Westinghouse Electric & Manufacturing Company, thought that neither the d. c. locomotive nor the three-phase locomotive will meet the requirements of the railways of the country. The single-phase locomotive seems to offer the greatest possibilities. He thought that by using 15 cycles a saving of at least \$5,000 could be made in the cost of locomotive over one for 25 cycles, rather than the \$1,000 mentioned by Mr. Stillwell. He also thought that very satisfactory lighting could be secured with 15 cycles by using a low-voltage lamp with a heavy filament.

Wm. McClellan, of Westinghouse, Church, Kerr & Company, endorsed the overhead trolley and favored 15 cycles. He did not think it necessary to carry standardization too far. The present steam railroads do very little in the way of exchanging locomotives, but the companies ought to standardize enough to exchange cars. For instance, it is very desirable to standardize the train line so that cars equipped with the same system of multiple-unit control could be operated together. He said that his company had found it very difficult to get entirely satisfactory figures of steam operation. The figure of 1½ cents on the New York Central electric locomotive, it should be remembered, was secured under the surveillance of expert engineers and might not perhaps be a fair comparison.

W. I. Schlichter, of the General Electric Company, favored 15 cycles, but thought that one must consider the question of ultimate cost as some items would be larger. The generator may increase in cost from 15 to 50 per cent, as the speed with 15 cycles will be somewhat of a problem in connection with turbine work. He also pointed out that although the output of the motor is increased 35 per cent this is during acceleration, and that the continuous output of the motor is not correspondingly increased. For long runs, therefore, not so much will be obtained by the lower frequency.

A STANDARD ROADBED FOR COLUMBUS

After testing many roadbed formations, a number of which are still under portions of the system, the Columbus Railway & Light Company, of Columbus, Ohio, has adopted a standard method of construction. Whenever any portion of the system is renewed hereafter, the standard foundation will be put in, until the entire system is laid on this foundation. E. O. Ackerman, engineer of maintenance of way of the company, says the company's present method of construction gives a permanent foundation and has been approved by the city engineer's department.

This foundation is of solid concrete formation, with concrete girders 18 ins. deep under each of the rails. The rails are anchored to steel ties, which are bedded in about 6 ins. of the concrete. Mr. Ackerman admits that this gives a rather rigid track, but this is the feature that is approved by the city engineer, who objects to too much elasticity on account of its destructive effect on street paving. Mr. Ackerman says there is no renewal or extension work on hand at present, but it is expected that when the Central Market system is taken over by the Columbus Railway & Light Company, there will be considerable work done on its lines to bring them up to the standard of the Columbus Railway system. It is also expected that a third rail will be laid on a considerable portion of the Central Market system, so that the Columbus Railway cars, which are broad gage, can be operated over its lines. The Central Market will not be made broad gage, because of existing contracts by which standard gage interurban roads enter the city over its lines. The Central Market also has

a contract with interurban roads that have their own lines into the city by which it furnishes the city service required of the interurbans by their franchises.

ELECTRIC TRACTION IN VENEZUELA

A short interurban line between Caracas, the capital, and the neighboring town of El Valle has been changed from steam to electric traction by the Caracas Electric Tramways Company.

The line was originally a narrow-gage road, 68 cm (2 ft. 3 ins.) wide, and as 3 ft. 6 ins. had been decided on as the gage for the city lines, it was necessary to widen the old track to enable the El Valle cars to run into the city. To avoid shutting down the traffic, a third rail was laid to the new gage, and new ties were also placed throughout.

Electric power is purchased from a local transmission company and is received at the railway station at 5000 volts. Here the voltage is reduced by three oil-cooled transformers connected in delta to 460 volts for running a 150-hp, three-phase motor which is belted to a direct-current generator. The overhead line consists of 00 grooved wire with bracket construction on iron poles. The line has a great many curves.

The cars are of the eight-bench open type, with G. E.-58 motors and K-10 controllers. The bodies and trucks were supplied by the J. G. Brill Company. The whole of the electrical material was supplied by the General Electric Company. The entire construction was carried out with native labor under the supervision of E. H. Ludford, the Caracas Tramway Company's manager.

The conversion of the existing horse lines of the city of Caracas to electric traction is at present being actively pushed forward by the London branch of J. G. White & Company, and the Central Railway has also electrified the first section of its steam road with material supplied by the Allgemeine Elektrizitäts Gesellschaft, of Berlin.

TRANSFERS IN ST. LOUIS

The new transfer system which went into effect in St. Louis, Jan. 1, as the result of the consolidation of the United Railways and the St. Louis & Suburban systems, necessitated thirty different transfers and introduced radical changes in the general transfer scheme. Transfers are now punched according to directions, and round trips for one fare are made impossible. According to records at the offices of the United Railways Company, more passengers transfer to and from the Olive Street line than any other. On a normal week day about 23,000 transfers will be taken in by conductors on that line. The Jefferson Avenue line is next with 19,000 transfers. Grand Avenue conductors receive about 18,000 transfers, and Broadway line conductors about 15,000. Easton Avenue comes fifth with 13,000. Other lines range from 2000 to 10,000.

The Compania Electrica de Alumbrado y Traccion de Santiago, of Santiago de Cuba, which plans to build about 16 miles of standard-gage electric railway in Santiago and vicinity, has begun the construction of the system and expects to have the lines in operation in October, 1907. Practically all the material was purchased in the United States. The officers of the company are Eudaldo Romagosa, of Havana, president; Jose Marimon, Santiago de Cuba, vice-president; Dionisio Peon, Havana, secretary and treasurer; E. J. Chibas, Santiago de Cuba, general manager; A. W. K. Billings, Havana, consulting engineer in charge of construction.