Editorial

RAILWAY ELECTRIFICATION IN 1914.

Considerable progress was made during the past year in the electrification of steam railways and in the establishment of new electric lines. While the year did not witness the completion and actual operation of many such developments in Canada, substantial developments were manifested during the year both in electrification projects themselves and in the systems in vogue.

Relating to the former, the year has much to its credit in the progress of the great undertaking of the Mount Royal Tunnel and Terminal Company, for the Canadian Northern Railway. When the section of line between the cities of Mount Royal and Montreal is placed under service it will be entirely under electrical operation. The power used will be 2,400 volts, d.c.; 1,200-volt motors will be operated two in permanent series; the contact circuit will be of the overhead catenary type, and 60-ton multiple unit cars will be used, drawn by 80-ton electric locomotives.

Much attention has been diverted to the west since the spring of 1914. The Canadian Pacific Railway is putting a 5-mile double-track tunnel through the Selkirk mountains, traffic through it to be moved by electricity. The details of the electrification system have not as yet been completely decided upon.

The electrification of the London and Port Stanley Railway in Ontario; the extensive radial projects of the Hydro-Electric Power Commission of Ontario, and other projects and extensions of a similar nature in Quebec, Manitoba and British Columbia, all go to show that the year's progress in Canada was encouraging and of far-reaching importance.

Direct current electrification has been adopted in the United States in several notable instances during the year. One of these, the Butte, Anaconda and Pacific, a 2,400-volt, d.c. electrification, has recently been referred to in these columns. The Chicago, Milwaukee and St. Paul is equipping a subdivision of its line with 3,000 volts d.c. Besides these actual installations, some very important experimental work has been done with higher voltages. A great drawback to the use of high voltage direct current has been the difficulty of building high voltage motors for car equipments. This difficulty seems to have been largely overcome since an equipment consisting of two 100-h.p. motors has been operated successfully from an overhead trolley with voltages from 5,000 to 7,000 d.c. The tests were quite successful, both as regards motors and control, and the further development of this apparatus will be watched with interest. The apparatus has thus far been tested only in an experimental way; it is, however, shortly to be placed in actual service on a branch line of a large system where it can be given a thorough test. If it is found that direct current at a voltage of 5,000 can be utilized commercially for railway purposes without increasing the cost of equipment or of maintenance to an undue amount, there is no question but that such an equipment, together with the mercury arc rectifier for substation use, will have a large field.

The mercury arc rectifier itself has been an object of considerable advancement during the past year, particularly in its adaptation to heavy railway service. This to such a degree that electric railway men are elated over the results achieved, and look forward with interest to its successful commercial application. It is applicable either to d.c. or single-phase a.c. systems. In the former its place will be in the substation in place of the synchronous converters and motor generator sets which are now used to transform from alternating to direct current. Here its high efficiency under all conditions of load and its adaptation to any commercial frequency make it certain that if it proves to be a satisfactory piece of apparatus, it will be used very largely for substation work where direct current is applied to the trolley. By means of the rectifier any direct current locomotive can be adapted for operation from a single phase trolley by the addition of a transformer, rectifier, and a few additional pieces of control; thus, all of the advantages of transmission at high voltage alternating current will be enjoyed and all of the advantages of the direct current motor will be secured, together with the flexibility in speed control which results from changing the voltage applied to the motor.

Then, the single-phase system also claims material progress during 1914. Several extensive applications of this system are under operation in the United States, using the series compensated motor. There are, in reality, three alternative methods that may be employed. There is the commutator type motor, to which many improvements have recently been added tending to reduce maintenance cost and increase reliability of service. There is the splitphase locomotive, employing in the system a phase converter which serves the triple purpose of supplying polyphase current for the induction motors which are used to drive the locomotive, and also drives the ventilating fan and the air compressor. It is generally recognized that the induction motor has many admirable characteristics, chief among which are light weight and rigid design, high efficiency, and ability to automatically regenerate power on descending grades. This type of motor makes it possible to secure an output from a locomotive with a given number of drive wheels, which would be practically out of the question with the commutator type of single-phase motor on account of its larger dimensions. The use of this type of motor in heavy freight service on mountain grades is especially desirable on account of the automatic regenerative characteristics which enable a train to be operated down grade at a constant speed without the use of brakes. There is also the rectifier locomotive, using d.c. motors with rectifiers and single-phase transformers.

These three types of single-phase electrification enhance its value for heavy electrification for long lines where high voltage is essential. Thus both the d.c. and the a.c. single-phase systems have practically reached stages in their development that ensure for the future the successful application of each to the various kinds of traffic which it may be called upon to move. This is important in our Canadian electric railway development as the selection will then depend upon the conditions surrounding each individual project, rather than upon the established reliability of the service selected.