and at the same time a low voltage at the motors, since a transformer can readily be placed on the locomotive to reduce this trolley voltage for use at the motors. The alternating current railway system possesses the two main advantages of the direct current system, since the motor has the same speed torque characteristics as the direct current series motor and single phase circuits require only one trolley. In addition to possessing these two advantages, the alternating current system overcomes a number of limitations. With the alternating current the arrangement of high trolley voltage giving economy of transmission and low motor voltage giving minimum motor trouble, can be obtained by means of a transformer on the locomotive.

Long distance roads can be supplied with transformer stations instead of rotary converter sub-stations and contain no synchronous or moving machinery. The omission of synchronous machinery renders the service less liable to interruption, since momentary short circuits or similar troubles which might interrupt the service where synchronous apparatus is used, would in many cases cause no interruption in a system where such apparatus was not used and in case of a shut-down from any cause, service in a system without synchronous apparatus can be resumed more quickly than in the case of one in which it is necessary to synchronize a number of rotary converters before power can be put on the line. Owing to the ease and economy of voltage transformation with alternating current, any desired voltage may be applied to the motors without the use of resistance, motors may thus be run at full speed, or at any lower speed, and the power consumption at all speeds will be proportional to the energy actually expended in driving the locomotive, so that, since there are no rheostats, there will be no rheostatic loss. With the use of alternating current, electrolysis is practically eliminated.

In concluding this description of the various features of the single phase railway system as used at the St. Clair Tunnel, it should be borne in mind that the advantages accruing from this system are due primarily to the use of alternating current, rather than to any advantages of the alternating current railway motor over the direct current railway motor.

My aim being to give you a general outline of the electrification scheme employed for handling traffic through the St. Clair Tunnel, I will refrain from going further into the details of the apparatus employed.

SERVICE.

The tunnel service is carried out by the aid of block signals, telegraph and telephones.

The Westinghouse Electric and Manufacturing Company