

the miracle has been brought about by the tremendous improvement in, and the reduction in, the cost of transmission of power, rather than in the reduction in cost of its production.

"If the industrial plants could be located immediately at the power site, or at the pit mouth, the cost of transforming the power into electric energy would be saved. All plants cannot, however, be so located, and even in the limits of one shop, it is more advantageous and economical to transmit the power electrically than by shafts, pulleys and belts. In the steam locomotive, the power is produced immediately at the point at which it is to be used, so that the advantages of easy and cheap transmission are, in a great measure, lost.

**Advantages of Electric Locomotive** "After this is said there still remain many decided advantages which the electric has over the steam locomotive. Therefore, there are many decided economic reasons for the adoption of electric traction on our railways, just as there are many and decided reasons against its adoption.

"Some of the reasons in favour of its adoption are quite evident. Coal in all the great central area of Canada is entirely lacking; water-powers are abundant, and, even under equal conditions, hydro-electric power is cheaper than steam.

"The cost of maintenance of the electric is only a fraction of that of the steam locomotive. The steam locomotive requires hours in the round-house after a long run before it can be again fit for road service, whereas the electric can be sent out again almost immediately after its arrival. The road can thus be operated with fewer units. Electric locomotives can be so connected that they may be operated in pairs under one crew without any loss of power; steam locomotives can not.

"On long ascending grades the electric locomotive with the strength of the power house at its back, retains its full power and freshness to the very summit. The steam locomotive can not. On long descending grades, the electric motor can return to the power line, power derived from the train's momentum. All this is lost in the case of the steam locomotive. As far as operating expenses due to power are concerned, the electric locomotive has every advantage, and is capable of effecting many and decided savings.

**Advantages of Steam Locomotive** As far as capital charges and maintenance of roadway are concerned, the advantages are all with the steam locomotive. The cost of electric installation is heavy; therefore, the fixed charges are materially greater.

"On a large portion of the railway mileage in Canada, it would be necessary to develop new water-powers without any market other than the railway. The railway load fluctuates not only from month to month, but from hour to hour. It is almost a certainty that the power development would require to be three or four times as great as the average load; hence, comparatively expensive power. The maintenance of the roadway is materially