

tend to keep them steadier upon the tracks, to relieve them of the rolling motion, and thereby be easier upon the rail and road bed. One improvement often is followed by others as a sequence, and this seems to be a case of that kind. There are other places and many of them in the great G.T.R. system where electric traction should prove to be both a benefit and a blessing. Take for instance that climb out of Hamilton going west. What a difference an engine capable of a 50,000 draw bar pull, and can maintain a 10 mile speed up a 2 per cent. grade would make there. We would get up that grade and never know it. Use electric power where it will do the most good then put on the steam locomotive where she has the conditions to make the best showing. Then again look at that spot from St. Catharines to the bridge right next door to the greatest development of electrical power in the world. Here would be an ideal section to make a start on, a stiff grade to climb and numerous trains, both freight and passenger. Electric locomotives of the St. Clair Tunnel type would make a revelation on that piece of road. There are many places upon all our railroads that are ideal spots for electrical zones, and many of them will be utilized in the near future.

I do not suppose that the changes from steam to electric can be made in a jump: it must evolve, and on the way many difficulties will appear. Some of them may be serious and troublesome to overcome. Others will be easily righted. It goes a long way toward winning a race to get a good start, and it seems the single phase alternating current series motor has arrived and made a good start. Permitting as they do a high trolley voltage and the use of transformers upon the locomotive to reduce the trolley voltage suitable for use at the motors and the fact that these motors have the same speed and torque as the direct current series motor has. The high trolley voltage gives good economy in long distance transmission and only requires one trolley, while the low motor voltage gives a minimum of motor trouble. It appears the coming troubles will only be of a minor character, in as far as the locomotive itself is concerned. We may expect most of the troubles to come from external and climatic causes, none of which should prove to be unsurmountable. The goal to be reached is so important that many sacrifices must and will be made before perfect success can be claimed. But the many advantages will more than repay the efforts. If we can increase the traffic by one-third on the present trackage, a very large gain in earning power will be established. If the wear on rails and road bed is reduced, another gain can be made. If we can get double the draw bar pull for each pound of coal burned, besides burning a cheaper coal, another large saving will be effected. The maintenance cost for the electric locomotive should be