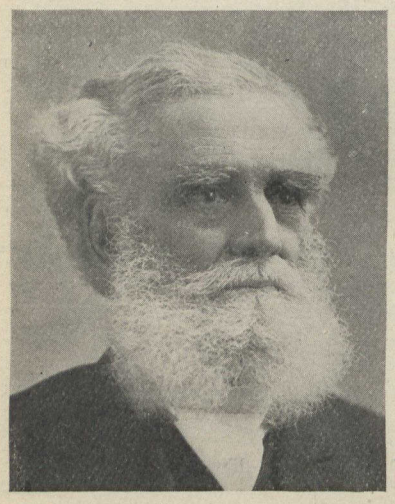
A Double Electrical Locomotive drawing a train out of the St. Clair Tunnel. This double engine will draw a train of 1,000 tons up a two per cent. grade at a rate of more than 10 miles an hour. The use of electricity has quadrupled the capacity of the Tunnel. PHOTOGRAPH BY J. WESLEY SWAN

A FUSS AND A TUNNEL



Mr. Joseph Hobson, C.E.,
Engineer, St. Clair Tunnel.

When an invitation reached me, asking that I be one of a party to go to Sarnia to witness the formal opening of the electrified St. Clair Tunnel, I wondered why the Grand Trunk were making so much fuss about the stringing of two or three wires through a bit of a hole in the ground. I had gone through the tunnel several times, usually being asleep at the time, Once I went through it in daytime. The porter closed all the air vents, shut all the doors, and lighted the lamps. There were a few minutes of darkness and that was all I knew about it. To ask a number of journalists to go from Montreal, Toronto, Buffalo, Detroit and Chicago to the little town of Sarnia just to see some officials go through the tunnel seemed to me to be something outlandish. Yet this very outlandishness attracted me and I went along to discover why Mr. Fitzhugh, and Mr. Davis and Mr. Bell should leave their busy offices and take their private cars up to this little border town. I said to myself that I needed a holiday anyway and that to take it as the guest of the Grand Trunk, would be economical and possibly entertaining.

Now I am filled with wonder that the fuss was not greater, and I shall tell you why. Supposing the Grand Trunk had built three more tunnels under the St. Clair River, between the United States and Canadian shores, it would have been a great undertaking and people would have marvelled. Four tunnels side by side under this boundary river, to accommodate Grand Trunk trains, would have been something remarkable. Yet the same result has been accomplished by making it possible for the one tunnel to do four times as much work as before. When steam-engines were used, only one train could go through the tunnel each hour. The coal-smoke and coal-gas given out by an engine hauling a big train, so filled the tunnel that it took an hour to clear it out and make it safe for the next train crew. If an engine were to break down in the tunnel, the train crew were in danger of suffocation and the passengers likely to suffer much discomfort. Now by the use of electricity, four trains can be run through every hour, and there is not the slightest danger to the life and comfort of crew or public. In fact, the party of inspection and the guests made the official trip through the electrically-lighted, clean-white tunnel in flat-cars, a feat utterly impossible under the old conditions.

Nor was the change from steam to electricity as easy as it appears. In the first place, to get an electric engine capable of hauling a 1,000-ton train through that tunnel was a task requiring much scientific knowledge and great mechanical skill. The contract was undertaken by the Westinghouse Electric and Manufacturing Company, who built a number of double-unit engines which they hoped would be able to draw such a train up the 2 per cent. grade which obtains in coming up out of the tunnel on to the general level of the shores. When these engines were tested it was found they would do their work satisfactorily. They will pull one of the big Grand Trunk trains up the grade at a rate of ten to fourteen miles an hour with apparent ease. The accompanying photograph shows one of these double-unit engines emerging from the tunnel with its load.

Of course the scientific problem also involved a decision as to the form of electric power, form of transmission and other similar items. Should it be a third-rail system or an overhead trolley system? Should it be single-phase or three-phase? If the trolley system, what kind of trolley? How should the trains be handled after the yard on either side was reached, so that the electric engine could be uncoupled and the regular steam engine be put in place for the rest of the journey? How should the power be generated? These and a hundred smaller questions were asked and answered. It was finally decided to use alternating current, with a three-phase system for the distribution of power required for pumping water out of the tunnel, and for other motors required in the round-houses, with a single-phase distribution for locomotives and general lighting. The single-phase locomotive is comparatively new for work of this kind so far as America is concerned, but it has been much used in Europe. The New York Central has 41 of these locomotives in use, each with four 250-horse-power geared motors. The tunnel locomotives have three motors instead of four, but of the same power. The Mariazell Railway in Germany has 23 single-phase locomotives with two 175 horse-power motors each. Each half-unit Tunnel engine may be used separately, but when two are used together they are under one control. The equipment has been in continuous operation since May 17th, and this service is said to be the heaviest railway service handled by electricity in the world. The equipment was not, however, taken over from the contractors by the Grand Trunk until about ten days ago.

The power plant, while not notably large, is one of the most complete. It is located on the Port Huron bank of the St. Clair River, about 100 feet distant from the centre line of the tunnel. A car-line along the rear of the building and a dock, provide for bringing in coal by rail or water. The coal is all handled, crushed and fed by machinery, the Jones Under-Feed Stokers being used. The ashes are also discharged and taken away by gravity. Two Westinghouse Parsons turbo-generators are installed, though one is sufficient to generate all the current required. All the latest and best subsidiary appliances are installed in a model building.

One interesting feature of the proceedings at the formal taking over of the plant was the presence of Mr. Joseph Hobson, the venerable engineer under whose guidance the tunnel was originally built. The tunnel shell consists of cast-iron rings, built up in sections, the inside diameter being about nineteen feet. It took two years to build and was completed in 1890, one year under contract time and at a saving of $300,000 below the estimated cost. From portal to portal, the tunnel is 6,032 feet. The Sarnia approach, or deproach, is 3,300 feet and the Port Huron approach 2,500 feet. The total length is thus over two miles. Mr. Bion J. Arnold, the engineer directly in charge of the work, paid a high compliment to Mr. Hobson for the magnificent work which had been done eighteen years ago. The Grand Trunk officials congratulated the Westinghouse Company for the excellent installation which it had made. The general public will congratulate the Grand Trunk on the final engineering triumph which makes its double-track road from Montreal to Chicago, one of the best in the world. C.