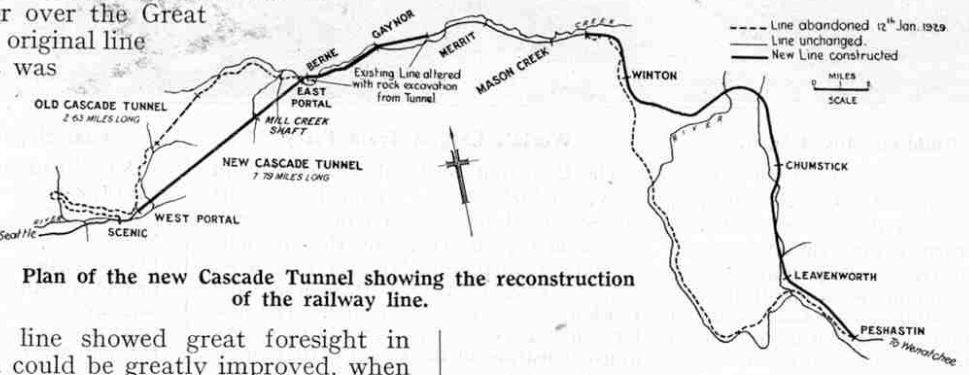
Piercing the Cascade Range

Record Tunnelling by American Engineers

By E. Flaxman

ONE of the greatest and most interesting engineering feats undertaken since the War was brought to completion last year with the opening of the New Cascade Tunnel and the Chumstick Valley Line on the Great Northern Railway of the United States.

This railway runs from Lake Superior to Puget Sound on the Pacific coast, and therefore it must pass through or over the Great Cascade Range. The original line across the mountains was built in 1890-92, and was carried over the summit by a series of switchbacks. In 1900 these switchbacks were replaced by a tunnel 2.63 miles in length. The builders of the first line showed great foresight in selecting a route that could be greatly improved, when occasion demanded, by the provision of a longer tunnel.

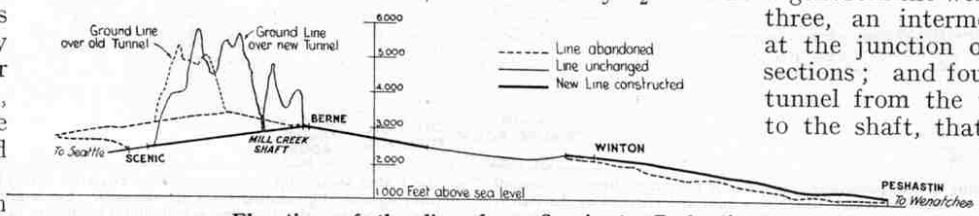


Plan of the new Cascade Tunnel showing the reconstruction of the railway line.

The density of the traffic over this railway increased rapidly, and presently it became desirable to obtain a still easier line at a lower elevation. In 1915-17 surveys were made with a view to the construction of another tunnel, and several schemes were put forward for consideration. One of these schemes involved the construction of a tunnel 17 miles in length! If this plan had been carried out the tunnel would have been by far the longest in the world—excepting of course, the London Tube Railways—the present record being held by the Simplon Tunnel through the Alps, with a length of 12.45 miles. Whether this scheme would ever have been adopted is doubtful, but in any case the whole matter had to be deferred, because in 1917 the United States entered the Great War.

In 1921, when matters had settled down to a more or less normal condition, the question again came up for consideration, and four years later the scheme that has now been completed was adopted as being the most satisfactory in every respect. It involved practically the entire rebuilding of 43 of the 50 miles of line between Peshastin and Scenic, and the construction of a perfectly straight tunnel 7.79 miles in length on a gradient of 1 in 64. From an engineering point of view the work is of exceptional interest. It is the longest railway tunnel in the American Continent and the fifth longest in the world; the other four, which are all in the European Alpine district, being the Simplon, 12.45 miles, the St. Gotthard, 9.28 miles, the Loetschberg, 9.03 miles, and the Mont Cenis, 7.98 miles. In addition, the Cascade Tunnel was driven at an extraordinarily high rate of speed and was completed in record time.

In December 1925 a start was made on the tunnelling work commencing at the west portal on the 14th of that month, and at the east portal 15 days later. The railway company were particularly anxious that the work should be completed in three years, and this made it essential to find other points from which excavation could be effected.



Elevation of the line from Scenic to Peshastin.

The construction scheme provided for both a main tunnel and a pioneer tunnel. At a distance of about 2½ miles from the eastern end the line of the main tunnel crosses a deep rift in the mountains, where there runs a river known as the Mill Creek. A shaft was therefore sunk at this point, giving two more faces, one in each direction, from which the work could be pushed forward.

In order to follow the progress of the work it is necessary to have a general idea of the construction scheme. This really consisted of four parts—one, a section of the main tunnel nearly 2½ miles in length from the eastern portal; two, a section of the main tunnel nearly 5½ miles in length from the western portal; three, an intermediate shaft at the junction of these two sections; and four, a pioneer tunnel from the western end to the shaft, that is, parallel with the 5½-mile section of the main tunnel and, of course, of the same length.

The general scheme was to sink the shaft and drive out from it in both directions after commencing in the usual manner from the portals. While these operations were in progress another drift was to be sent out southward from the shaft, and a small pioneer tunnel driven west alongside the line of the main tunnel to connect with that being driven east. From this pioneer tunnel cross-cuts were to be driven at intervals to connect with the line of the main tunnel in order to provide more working faces.

The intermediate shaft was necessary for many reasons, the chief of which was, of course, the need for expediting the work to the utmost possible extent.