

General particulars of work under various headings are as follows:—

Fencing: Thirty-two and a half per cent. of the total length of 56½ miles has been completed. Much of the remainder is being left until the high batter slopes of cuttings and embankments have become consolidated.

Culverts: These vary in size from large reinforced-concrete ones of 80 square feet cross-sectional area down to 1-ft.-diameter pipes. The total length of all culverts installed is 4,044 ft., representing roughly 85 per cent. of the larger and more expensive types and about 55 per cent. of the smaller pipe culvert class. Most of the culverts remaining to be laid will not be needed until the work is further advanced. They can be installed more economically in the later stages of construction.

Water Drives: At a number of earth fillings the steep contours of the ground rendered ordinary culvert-construction impracticable and water drives were installed. These are small-bore tunnels in solid earth or rock through which the stream is diverted to a safe outfall away from the base of the filling. Nearly all of these are big enough to allow two or more persons of average height to walk through abreast in an upright position. They vary in size from 110 square feet to 24 square feet inside cross-sectional area, and run up to 200 yards in length. They have all been completed, the total length being 3,927 ft., or roughly three-quarters of a mile.

Earthwork: Of the total estimated quantity of 1,371,288 cubic yards, 944,588 cubic yards, or over 68 per cent., has been completed. A large proportion of this is hard sandstone or papa rock. With only 32 per cent. remaining, many of the cuttings and fillings are completed or approaching completion.

The most spectacular earthwork job is a short high bluff on the Waikokopu Cliffs, which is being benched back for safety purposes to a height of 180 ft. Also there are fillings of 102 ft., 92 ft., and 103 ft. depth respectively in the central hill section. The first of these fillings is practically completed. The other two are commencing to rise from their broad bases. To protect the low fillings along the Waikokopu Cliffs, sections of substantial concrete sea-wall have been found necessary. The total length required is 1,490 ft. Of this, 1,100 lineal feet, or 73·7 per cent., is completed.

Tunnels: The three major tunnels are named Waiau-Tikiwhata, Coast, and Waikoura. They are 3,278 yd., 1,016 yd., and 1,544 yd. long respectively. There are also ten small tunnels totalling 1,015 yd. in length.

The small tunnels present no outstanding problems as far as can be judged at present, and they should be completed under ordinary New Zealand methods well before the time the rails are due to be laid through them. Already one tunnel of 96½ yd. has been fully excavated and concrete-lined, and five others, totalling 590 yd. in length, have been holed through with 10 ft. by 8 ft. bottom headings.

The Waiau-Tikiwhata and Waikoura tunnels were of such length as to be governing factors in the progress of the whole railway-works and special consideration had to be given to the question of expediting their rate of construction. Fortunately the sandstone at both ends of each tunnel was found to be sound enough to enable the adoption of a system new to railway tunnels in this country. This consists of the excavation of the full tunnel with the upper arched portion carried only a very short distance ahead as a working bench without any advance headings. It makes for considerably greater speed in good ground, as the tunnellers have much more room in which to work, and explosives can be employed to greater advantage. The timbering used in this system is cut in segments to fit the arch, and is much lighter to handle than the heavy bars used in the usual bottom-heading method. To obtain the maximum advantage of the full-tunnel-bench method it was decided to use electrically operated scrapers and slides for loading the spoil on to trucks, which will be hauled away by electric-battery locomotives.

Three of the four faces of these two tunnels have now been carried in under the new system for several chains, and work is proceeding so smoothly that very fast driving is indicated when the scraper units go into action in the