

north and east of Mount Cameron, and this would be too difficult to follow. I propose therefore to keep the line on the south-west side, and, crossing the Tutakuri at a favourable site near 16 miles, at a height of about 60ft., to rise on to the terrace on the north bank, making use of the channel of a small creek which has worn down the terrace; and then, after grading up through some slopes of from $2\frac{1}{2}$ to 1 to 2 to 1, to tunnel through some of the precipitous spurs of Mount Cameron, a limestone hill, and, crossing in one 120ft. span a deep chasm with perpendicular *papa* sides, above the Ardlussa Station, to come out on the Ardlussa Downs and strike the Waihou at about 21 miles on section. Then, following up the Waihou, as before described, to its source, the line would cut through the low saddle, where a road has been formed, on the watershed of the Mangatutu, and cross that stream at the site indicated on plans at $30\frac{1}{2}$ miles. Then, skirting round behind Groom's old station and through another small saddle, the line follows up the Mangatutu Stream, principally on its western side, as far as the Puketitiri Bush. As the grade has to be kept high from 31 miles to 33 miles, the bridges at the crossings would have to be excessively large, so that it is better to keep on the one side if possible in limestone-rock cutting.

From 34 miles to the summit the work will be of a lighter character. The level of the saddle in the bush is 2,070ft. There is another way of reaching the Puketitiri Bush shown on plans, viz., by recrossing the Mangatutu at 31 $\frac{1}{2}$ miles, and following up the Manaroa Creek to its head, from which a fairly good line could be got by skirting round some downs and through the Puketitiri Bush. The Manaroa is much easier to follow than the Mangatutu, being nearly straight, and having sloping sides of 2 or 3 to 1; but the gradient would be even worse, and the deviation would make an extra length of $2\frac{1}{2}$ miles of line. After leaving the bush (which is mostly on a flat, and contains some fine trees of black and white pine, rimu, and a little totara) the line descends on the right bank of the Anawhehua, through fairly good ground for benching, to the saddle at 39 $\frac{1}{2}$ miles, where a tunnel 25 chains long is required. As mentioned before, this creek is blocked in, and escapes through an impracticable gorge. From the tunnel there will be some very difficult grading or sideling of from $1\frac{1}{2}$ to 1 to 3 to 1, in order to drop down to the Mohaka Bridge site at 43 miles 10 chains. This is one of the worst portions of the line: it must be kept well up on the hill-side on the left bank at about the height above the creek indicated on section. The slopes of the railway banks will require rubble-pitching to diminish their length. The Mohaka Bridge site is the same as described in Mr. Ellman's report, and is about 20 chains above some old Maori whares. The banks are about 80ft. apart, and the line for rail level would be at about 40ft. above the river. Also, a better grade is got by going to this site and back again down the river, with an ascending grade on the north side reaching the Repia by a cutting through a high terrace and some more sideling work. In the Repia the line soon enters a deep gorge, and for at least eight miles—viz., from 46 miles to 54 miles—it is necessary to cross and recross the stream at an average of five times to the mile. The outer edge of each bend is usually perpendicular rock for perhaps a hundred feet, then there is a slope of about $\frac{1}{2}$ to 1 for another hundred feet or two, and above that again from 1 to 1 to 3 to 1 for a total height of say a thousand feet, sometimes much higher. On the inner edge of the bends, which the water does not wear into, the slopes are about 1 to 1, terminating usually at the foot in a flatter spur of from 2 to 1 to 3 to 1. By keeping the line at an average of 40ft. or 50ft. above the stream these spurs may be cut through or tunnelled. Small stretches of flat may occasionally be utilized, but heavy rock-cuttings will be the rule. The bush consists chiefly of Fagus, the so-called black and red birch. The line emerges from it at 53 miles and follows the creek to 54 miles, when it begins to rise up to a terrace flat, which it reaches at 57 miles and continues along on the south-west side of the creek, the work being easier as the volume of the stream diminishes, until the summit-level of 2,680ft. (or about 2,600ft. for formation-level) is reached at 64 miles 10 chains. This point is on the watershed between Hawke's Bay and the Bay of Plenty, and is a conveniently low saddle above Lake Pouarua, whence the Rangitaiki River issues. The line skirts round and through some low pumice downs, and drops down on to the open pumice plains at 66 $\frac{1}{2}$ miles, following near the Rangitaiki to the Taupo Road, and then in the general direction of the road over the watershed of the Rangitaiki and the Waikato Rivers, at a height of 2,445ft., until the small village of Opepe is reached; then, skirting round Mount Tauhara, a continuous grade of 1 in 50 will enable the line to drop down to the Waikato, crossing near the Huka Falls. To obtain sufficient length of line to get a uniform grade, it may be necessary, in surveying the line, to skirt round with a wider sweep and with more curves than I have indicated on plans, but the country is sufficiently open to admit of this.

Instead of following up the Repia it was proposed to take the line up the Mohaka to where the Taharua runs into it, and then to follow up the Taharua to its head on the open pumice plains, as shown in Drawing No. 4. I do not think that any advantage would be gained by this route, for the following reasons: The banks of the Mohaka are, on the whole, quite as difficult for a line as in the Repia, on account of the abrupt spurs from the Kaweka on the west and from Te Matai and Big Ben on the north-east side, which rise precipitously above the river. The length of the line up the Mohaka, from the proposed bridge-site to the junction of the Taharua, would be about sixteen miles of very difficult work; but in the Repia a distance of fifteen miles from the same point is sufficient to take the line out of any difficulties, excepting the cuttings at the head, at 64 miles. On the other hand, after traversing equally difficult ground in the Mohaka for sixteen miles, there are two miles of bad ground at the lower end of the Taharua. The bridges in the Mohaka would be at least as numerous as in the Repia, but larger and much more expensive: on account of the big boulders there would be a difficulty in constructing piers by driving piles, so that a single span of 120ft. would often be necessary, instead of one of 60ft. or 80ft., as in the Repia. On account of its larger drainage area the floods in the Mohaka are much worse than those in the Repia, and piers would interfere with the passage of trees in flood-time. The level of the junction of the Taharua with the Mohaka is 1,935ft., and the open watershed at its head 2,475ft., or 200ft. lower than that of the Repia; so that the Taharua gradients would be somewhat better. The total length of the two routes would be about the same.