

cross and grade up the left bank, to the Anini-Waimaha saddle, the lowest point of which I explored and observed.

From Anini main camp I took a flying-camp and seven carriers, using the stock-track, and observing the country in various directions from the several camping-places. Two days' march beyond Anini we struck the works of the stock-track, and shortly afterwards reached the open country. From Mr. Skeates, overseer of the stock-track works, I received much information relative to routes and tracks, and we were otherwise much assisted by the kindness of that gentleman. From the stock-track clearing the route to Wharekopae lay through heavy scrub of various kinds, and fern. We had now the great advantage of open country, and could view and observe the levels of the several master-points of the railway route without actually going on them.

From the Hangaroa River the route takes up the valley between the Mokonui-Aorangi Range on the left and the Kupenga-ataramainuku Range on the right. After getting into the Wharekopae drainage this route leads down a minor branch of that river, but the descent is so great that I determined to explore a route *via* the main Wharekopae Stream and the Ngutuwera Valley to the west of Mokonui-Aorangi. This I did later on, but found the difficulties much greater, and I believe the first-named route is the better one.

From Wharekopae I rode into Gisborne and procured further data from the Survey Office there, and I have to express my thanks to the officers of that department for their assistance and courtesy towards me.

I made no attempt to examine in detail the route between Wharekopae and Gisborne, further than to observe that the route would be of very gradual descent down the Rivers Wharekopae, Waikohu, and Waipaoa, all through settled country, much of it closely settled.

On returning to the Anini main camp *via* Maungatapere and the Ngutuwera Valley above mentioned, I received your instructions of date 21st February, to explore the Gisborne-Opotiki route, and not to go into too much detail in connection with the work then in hand. I therefore decided not to take any absolute levels of the several ridges through which it was possible that a detail survey might show tunnels to be required, but to be content with a close observation of these places.

I made all haste to the observation of the western half of the route. Here I was much assisted by the Waikaremoana road-tracks and works, and the numerous Native tracks, some of which are available for horses. I examined the main range from Maungapohatu to Huiarau, and the ridge dividing the Whakatane drainage from that of the Okahu, which leads into the Whirinaki. I believe I have noted all the important and salient features there, but I should have liked to have spent another two weeks on this part. As it was, I hurried over it, in order to have time to examine the Opotiki route. The want of accurate topographical features on the maps was particularly against me here. For instance, the old Native settlement of Te Mimi is, as shown on sheet No. 5 of the Auckland four-miles-to-the-inch maps, just four miles too much north of its real place, according to the District Surveyor of Gisborne. This explains much of my perplexity in trying to locate various features in that direction from Maungapohatu.

I camped at the point where the Waikaremoana Road crosses the Huiarau Range, and examined the country backward towards Maungapohatu and westward towards the Ruatahuna hills and rivers. I then moved to Heipipi, on the Whakatane, and examined the Mangakirikiri branch from Papuera to the ridge, and the Mimiha, a day's march up the valley. I then made all haste back to Rotorua and Auckland, to take up the exploration of the Gisborne-Opotiki route.

Having thus described my movements in making this reconnaissance survey, I now beg to give a short, and I hope a clear, description of the line between Gisborne and Rotorua.

Referring to that part of your instructions, as quoted above, which relates to the curves being not less than $7\frac{1}{2}$ chains radius, I must premise that, under such a condition, the line could not be made at reasonable cost, but would be of a most expensive character. In grading along many of the mountain-sides, scored as they are with deep ravines set as close together as the sharp, precipitous ridges will allow, and with cross-section slopes running up to 1 to 1, a limit of $7\frac{1}{2}$ chain curves would mean that in such parts one-half of the line would be in tunnel and the other half on viaduct. If a grade-line were set out in surface contour on such places, it would be at once seen that the curve-limits and speed at present in vogue on the colonial railways cannot be adopted on the mountainous parts of this line without very far exceeding the limits of cost generally kept in view; but by the adoption of curves and speeds used on what are commonly known as light railways—viz., curves of a minimum of $1\frac{1}{2}$ chains radius, and speeds of a maximum on these curves of fifteen miles per hour—this line may be made at a very small cost. My reconnaissance is equally applicable to both these systems, as the route would be the same whatever scale of construction may be adopted. I have kept in view gradients of 1 in 50 to allow of compensation in curvature, and on this basis the line is quite feasible.

I wish to make it clear at this point that I do not, in using the term "light railway," mean any reduction of the standard gauge, as I hold it to be an ascertained fact that, down to the limit of $1\frac{1}{2}$ chains radius of curvature, the colonial gauge will admit of suitable rolling-stock travelling at the rate of fifteen miles per hour. The configuration of these ravines and dividing-spurs, while they demand the minimum radius mentioned, is particularly well suited for the use of parabolic or transition curves, which are so conducive to the comfort and safety of traffic on such railways.

DESCRIPTION OF THE LINE.

The line may, consequent on the configuration of the country, be divided into three sections.

1. Gisborne to Wharekopae, or to a point a short distance below the Ngatapa wool-shed. About thirty-five miles of easy grades and curves. This section calls for very little remark. It will be best located in the river-valleys of the Waipaoa, Waikohu, and Wharekopae. It would