

in finding any quartz lode that is payable. The whole of the country is very broken, and the different strata of rock are turned and twisted in every direction: so that very little reliance can be placed in finding the reef at a low level, as the quartz lode that was found near the surface in the Golden Crown Company's ground may have been a slip or slide from the top of the range. On my last visit to this field, in December last, I went through all the workings of the Golden Crown Mine, and the appearance of the quartz-lode then was entirely different to what it was at the time of my former visit. The vein or lode does not appear to be continuous for any length; but it is more like blocks of quartz thrown up here and there, giving it all the appearance of a slip. The present tunnel is scarcely at a low enough level to test the hill thoroughly, and even if it cut a quartz lode containing gold it has a fair chance of being almost equally as broken as it is near the surface.

MIDDLE ISLAND.

WESTLAND: TOTARA.—The principal gold-workings in this district are at Ross, Donaghue's, and Woodstock. On my former visit the Ross Extended Gold-Mining Company had commenced to sink their shaft below the level of the drainage tail-race, which is 90ft. under the level of the surface. This tail-race is constructed at as low a level as will drain the water to high-water mark on the sea-beach: it is about a mile in length, and the upper portion of it is a tunnel, constructed 3ft. 6in. wide and 6ft. high in the clear, having props and caps placed 4ft. apart from centre to centre, and close-lathed throughout. The main shaft is now 312ft. deep, below the original surface, and is 12ft. by 8ft. in the clear, having three compartments, viz., two for winding, and one compartment for the pumps. At the level of the tail-race there is a large chamber constructed, in which are erected two hydraulic engines with cylinders each 18½in. in diameter and 9ft. stroke, under a head of water of 314ft. At the time of my former visit there was only one engine erected; but when the shaft was sunk to a depth of 165ft. below the level of the tail-race the quantity of water there was to contend with was too much for the single engine to raise. The two engines are about 116 horse-power, and are working four sets of pumps 14½in. in diameter, and it requires them to be worked at their maximum speed to keep down the water. There are likewise a double-cylinder hydraulic engine for raising and lowering the pump-rods and columns, and at present the drift from the sinking of the shaft is hauled up in buckets by a reversible overshot water-wheel, 30ft. in diameter; but as soon as the sinking of the shaft is completed cages will be used and a reversible turbine water-wheel for winding. This reversible turbine-wheel is erected and ready for use: it is of special construction, patented by Camille Malfroy, of Ross, the mining manager for the company, and the only reversible turbine-wheel there is in the colonies. It is simple in its construction, easily set in motion, very compact, perfectly under control, and can be stopped almost instantaneously, as far as can be done without causing a sudden jerk on the teeth of the gearing wheels. The dimensions of this turbine-wheel are as follow: Diameter, 3ft.; depth or width of wheel, 13in.; depth of orifice, 3½in.; and number of orifices, 16. It is a wheel specially adapted for winding purposes, and reflects credit on its inventor for the ingenuity displayed in its construction. This company, with having so large a quantity of water to contend with, have experienced great difficulty in sinking their shaft, and in getting men to work in it: they have had to pay 12s. per day of six-hour shifts to each man employed, and a bonus per foot in addition. As this is the only deep shaft in alluvial workings in New Zealand which is sunk through a peculiar formation, a description of it may be interesting, showing the different strata gone through. For the first 20ft. below the surface the formation is a heavy drift gravel, then a layer of loose drift about 3ft. thick containing a good deal of water, thence a gold-bearing stratum about 4ft. 6in. thick, thence 50ft. of very tight heavy gravel, thence another gold-bearing stratum about 6ft. thick, thence 40ft. through five distinct strata of mullocky clay and loose drift containing a heavy body of water, thence another gold-bearing stratum about 6ft. thick, thence for the next 52ft. through three layers of clay and stones, two layers of conglomerate, one layer of loose watery drift, and three thick layers of heavy gravel and boulders containing a little gold, thence another gold-bearing stratum about 5ft. 6in. thick, thence for the next 90ft. through three heavy layers of gravel containing a little gold, two layers of clay, and one layer of conglomerate, thence another gold-bearing stratum about 4ft. in thickness, thence through 7ft. of gravel containing a little gold, thence another gold-bearing stratum 5ft. thick, thence for the next 37ft. through one layer of mullocky clay, one thin layer of terrace or Maori bottom, and two layers of gravel containing a little gold, thence another gold-bearing stratum 4ft. thick, thence coming on the gravel, and are still sinking. They have therefore gone through seven different beds or strata containing gold that is supposed to be payable for working on a wholesale cheap method. The depth of their shaft is now about 212ft. under sea-level, and no sign of any properly-defined bottom, such as slate or sandstone, has yet been met with. A sketch-plan of this company's hydraulic pumping engines, and section of shaft, showing the various strata gone through, was kindly forwarded to me by Mr. Camille Malfroy, copies of which are hereto attached. A description of these hydraulic pumping engines is as follows: The supply-pipe is made of wrought-iron 22in. in diameter and 1,400ft. long, to the distributing chamber or cylindrical tank, which is made of boiler-plate half an inch thick, and rivetted together the same as a steam-boiler; this chamber is placed on the surface near the mouth of the shaft, and from it a cast-iron pipe 12in. in diameter is led down the shaft to the chamber where the engines are placed, where it is reduced in branches to 7½in. in diameter. The balance or differential piston-valves, which represent the slide-valves, to admit and discharge the water to and from the main cylinder, are 7½in. and 10in. in diameter respectively: these pistons are worked by another small piston in a cylinder forming a portion of what is termed the "octopus," on account of its numerous branches. The motion is given to the engines by a sliding crank motion connected to the plunger-pole (marked L), and by a second crank (marked M), which is connected to the piston-rod in the cylinder of the "octopus" (marked C). This turns a small quantity of water on the large end of the differential-piston (B), driving it down until the smaller end of the piston is below the aperture connecting the main cylinder (A) with the supply-pipe (E); the pressure of water then causes the piston in the