

copper minerals in joint-planes and along contacts. The mass of shattered slate forming the re-entrant in the dyke at the old mine formed an exceptionally easy channel for the solutions, and an unusual amount of alteration and of ore-deposition took place.

A few samples were taken from the chamber of the old mine. A general sample 8 ft. across the face at the south end of the workings the Dominion Analyst found to contain 1.03 per cent. of copper; a sample of ore from the "head" near the shaft contained 7.74 per cent. of copper and 3 oz. 9 dwt. 7 gr. of silver and less than 3 gr. of gold per ton. A veinlet, an inch thick, of solid mixed sulphides of iron and copper contained 22.93 per cent. of copper.

There is no means of determining what percentage of copper was contained in the rock mined, which in the ore shipped was reduced, probably by hand picking, to less than a quarter. Assuming that the ore shipped consisted of one-third rock and that no rich secondary copper minerals were present, the copper being in mixed sulphides similar to that assayed, then the ore shipped would contain about 15 per cent. of copper. On present-day standards this would be rich copper ore, for in the United States and elsewhere ore-bodies containing but 1 per cent. are profitably mined; but such ore-bodies are enormous, and mining and transport for fuel and by-products are cheap.

The first essential is to ascertain the size and value of the deposit; to do this the ore-body must be explored in depth and sampled. The contact of the dyke and the sedimentary rock should be prospected for other possible ore-bodies.

9. MAHARAHARA DISTRICT.

(By M. ONGLEY and J. H. WILLIAMSON.)

The Tararua-Rimutaka Range has been examined for minerals since 1861, and since 1887 traces of copper have been known at Maharahara in a set of red hematitic siliceous greywacke beds. The red beds extend from the Bay of Plenty to Cook Strait and along the Southern Alps and Kaikoura Range, and in places in them traces of copper have been found. As McKay wrote in 1891 in his report "On the Maharahara Copper-mine, Woodville, Hawke's Bay" (published in the Reports of Geological Explorations for 1892-3, No. 22; 1894): "These cherty hæmatite rocks may thus be said to contain copper throughout the whole range of mountains that forms the main geological axis and backbone of the North Island, and thus appears to be a stratified deposit, containing a small percentage of copper, which at Maharahara is more than the usual percentage." It is not known that the beds as a whole contain more copper at Maharahara, but it was found that in places the copper was concentrated in rare small lumps of iron-pyrites. A similar concentration near Cape Runaway with lumps of pyrite 20 ft. long was examined and reported on briefly in the annual report of the New Zealand Geological Survey for 1923. Where the rocks are faulted and crushed the metallic content is concentrated into masses of pyrite. No igneous intrusions have supplied additional copper, but the copper has been partly concentrated along the crushed beds. No concentration of value is known, and, though it is possible that some may yet be found, it is improbable. There is no true lode; the pyrite is scattered in lumps along the crushed beds, and all the evidence so far shows that the pyrite masses are small and separated by much barren ground.

As mentioned by McKay in 1891, there was an idea that the Maharahara ore was a slip from the range behind. He discredited this suggestion, and the evidence shows he was correct.

Hector discussed the discontinuous nature of the deposit, and said (Rep. Geol. Explor., p. xxvi, No. 20; 1890), "Mineral deposits of this kind are very difficult to trace and expensive to follow and require the ore to be very rich." Yet the field cannot be condemned, for the work so far has all been in the oxidized zone, and no information has been gained as to what lies below. Until the unchanged part is reached there is a chance of finding payable ore.

A list of geological literature on the district is given in the annual report of the New Zealand Geological Survey for 1914.

10. A NOTE ON THE NORTH END OF THE TARARUA RANGE.

(By M. ONGLEY and J. H. WILLIAMSON.)

While working at Pahiatua we observed the profile of the crest of the Tararua and Ruahine ranges, and while at Maharahara we took the opportunity to walk along the mountains towards the Manawatu Gorge and observe the structure. From near Pahiatua the crest of the ranges appears smooth, and gently sloping to the north from a long distance south of the gorge to some three miles north of it, with no sag at the gorge itself. A point three miles north of the gorge is the lowest part of the curve of the crest. From there it rises again to the north in a continuous somewhat steeper curve.

Looked at from the range north of the gorge, the crest, south of the gorge, is seen to be a smooth even surface, curving away to the west in a long gentle limb, dipping about 10°, and to the east in a shorter steeper limb dipping about 40°.

As the rocks of which it is composed are nearly vertical beds of greywacke and argillite, this even surface can only be an old plane of erosion folded into this shape.

Where this old eroded plane descends to the north it passes under an arch of fossiliferous Pliocene sediments which completely spans the range, so that no other rock is exposed. The structure here is a simple asymmetrical anticline of Pliocene beds, shorter and steeper on the east, plunging northward to the lowest point, and dipping away continuously into the low country on the flanks.