

The Maria lode traverses a great mass of volcanic material, of which the upper part is a spherulitic rock decidedly more siliceous than the underlying rocks. This rests on a massive andesite that overlies a great thickness of andesitic breccia, in places containing bands of well-bedded fine-grained subaqueous tuff. All these rocks have been propylitized—that is, altered by heated solutions rising through fissures, and presumably derived from great bodies of underlying molten rock. Lodes occur only in the propylitized rock, and in any district they carry ore-bodies only in some varieties of propylitized rock. Such “kindly” country differs in appearance from country in which the lodes do not carry ore-bodies, although the difference is not easy to describe. But “kindly” country has a much wider distribution than ore-bodies, and its presence cannot be held to prove that lodes traversing it will contain ore. Thus the three boreholes drilled from crosscuts in the hanging-wall of the lode in No. 15 level, to prospect the Maria vein below the lowest workings, in each case penetrated “kindly” country before reaching the lode, which, where passed through, consisted of barren quartz of average thickness.

Ore-bodies similar to those occurring at Karangahake are generally admitted to have been formed by descending surface waters concentrating ore-material contained in pre-existing poorer lodes or disseminated through masses of rock. The evidence for such an origin for the Maria lode is strong, and includes the following:—

- (1.) The veins of quartz and bands of silicified country decrease greatly in number in depth. Instances are known of quartz veins changing in depth to fissures filled with broken rock and pug. Had the material been deposited by ascending solutions the number of quartz veins should remain the same or increase with depth.
- (2.) The quartz forming the bulk of the vein-material varies greatly: some is chalcedonic; the rest is crystalline, ranging from very fine to coarse; some replaces calcite, some country; none has been seen showing the strain phenomena considered to be characteristic of quartz deposited by hot solutions rising from below. At Golden Cross, near Waitekauri, a quartz lode in depth changes to a calcite lode; this suggests that the replacement of the calcite proceeded from the surface downward.
- (3.) Rich ore occurs more commonly on the hanging-wall side of the lode. Ore-bodies tend to be associated with leaders and fractures that leave the main lode, or with changes in the direction of the lode, where leaders generally continue into the country in the same course as the lode. Faults are often associated with ore, which tends to occur on their hanging-wall side. These phenomena are more likely to have occurred if the depositing solutions were descending than if they were ascending.
- (4.) The distribution of the mixed sulphides in the rich ore of the Bonanza section suggests that they were deposited by descending solutions. The greatest proportion of the least soluble sulphide occurs in the upper part of the ore-body, and the greatest proportion of the most soluble in the lowest part. In fact, the unoxidized portion of the ore-body is roughly zoned horizontally according to the relative solubility of the various sulphides.

The bottom of the Bonanza ore-body has undoubtedly been reached. The rich ore that occurs associated with a small fault in the Dubbo section at the southern end of No. 15 level may continue some distance lower, perhaps even to No. 16 level. The drive south from the winze that passed through this ore will prove whether this is the case or not. Explorations of the lode below the ore worked in the other sections of the mine have exposed at most but trifling patches of ore, and the prospecting-work undertaken can have missed no large ore-body. North and south along the vein several of the drives are said to have been extended well into unfavourable country. The Maria lode has been thoroughly prospected, and the only ore remaining is in small extensions of the known ore-bodies of the Bonanza and Dubbo sections, now practically worked out. That this ore can be extracted at a profit is doubtful.

The Maria lode is the best-defined and most persistent in the Karangahake district, and has yielded the bulk of the ore won. The many crosscuts from the workings confirm the hypothesis that it carries ore to a greater depth than any other vein. Therefore exploration of any of the other veins will in all probability be quite as unsuccessful as that of the Maria lode. The view that lodes of the type found at Karangahake become in depth unprofitable to work is confirmed alike by theoretical reasoning and by practical experience in all mining districts where lodes of this nature are found.

8. ALEXANDER RIVER REEFS, REEFTON GOLDFIELD.

(By P. G. MORGAN).

In accordance with instructions given by the Hon. the Minister of Mines I made an inspection of the Alexander River district between the 17th and 20th May, 1921. The observations made during the visit are embodied in the following report:—

SITUATION.

The Alexander River reefs are situated in a narrow belt of argillite and greywacke (the “slate” of the miner) between Stevenson’s Flat, on the Inangahua River, and the so-called Big Grey or Pohaturoha River (the main branch of the Grey River). To the west this belt is bounded by a granite area culminating in Bald Hill (3,898 ft.), and eastward by another granite area of rugged