paper "On the Rocks of the Hauraki Goldfields," * besides having access to the memoirs and works of Becker, Judd, Zirkel, Von Cotta, and others.

The rocks of this goldfield present many puzzling features to the geologist. They are unlike any others in New Zealand, or, indeed, in the Southern Hemisphere; and their characters can only be accurately determined by means of the microscope, supplemented by careful field observations.

When I first examined this district, in the end of 1889, I came to the conclusion that the gold-bearing rocks were all of pyroclastic origin. At that time my knowledge of the field was principally of that portion lying to the seaward of the Moanataiari Fault. My more extended surveys of recent years have proved the existence of not only breccias and tuffs, but also of solid lavas, thus confirming the conclusions of Professor Hutton.

Geological Structure.

I have shown on the accompanying geological map two lines of section, to illustrate the geological structure, and the distribution and direction of the main system of reefs. One extends from Rocky Point, beyond Tararu, to Totara Point, south of the Kauaeranga River; the other from the Thames foreshore north-eastward to Punga Flat. The horizontal and vertical projection of the sections is on the same scale as that of the map. The geological formations, reefs, and mine-workings are thus shown in their true places with respect to the surface-contours and sea-level. The shafts, cross-cuts, and reefs shown in the cross-section along the foreshore from Kuranui Hill to the Karaka Stream were reduced by me from the working-plans of the mines in that area prepared and surveyed by Mr. H. D. Bayldon, mining engineer. A study of this section will therefore afford accurate information respecting the relative positions and depths of the different shafts, the number of reefs, and the depths to which they have been traced, as well as the extent of the unworked gold-bearing ground. The section to Punga Flat will show the nature and extent of the changes effected by the principal faults; while a study of the map itself will afford an appreciation of the number of reefs and the character of the country to be met with in an extension of the Moanataiari adit-level, as well as the positions and linear extent of all the main lodes on the field.

The section from Rocky Point to the Kauaeranga supplies the key and explanation of the geological structure of the whole goldfield; and, in view of deep-sinking, I shall give a detailed description of the facts and features displayed between these points.

Rocky Point to Kauaeranga River.

The basement rock of the district is exposed as a small patch on the beach, between high- and low-water mark, in the first small indentation to the north of the fishing-rocks at Rocky Point. Here it consists of blue and yellowish-grey slaty shales, but on the coast-road north of Waikawau these are found to be associated with slaty breccias and greywackes. The blue shales are somewhat broken and disturbed, the dip varying from S.S.W. to W.S.W. at flat angles, varying from 26° to 30°. In former years the outcrop was over a chain square in extent, but at the present time it is only a few square yards, having become covered up by recent accumulations of beach-sands and gravels. Another small outcrop of the blue slaty shales is exposed in the bed of Waiohanga Creek, about half a mile distant on the line of strike, and at an elevation of about 400ft. above the sea.

A few chains north of Rocky Point the slaty shales are followed, apparently quite conformably, by a great thickness of pale yellow or grey-coloured siliceous shales or mudstones, which rise into steep rocky cliffs, and form Rocky Point itself, as well as the outlying fishing-rocks and islets. These mudstones are much jointed and broken, and show evidences of having been at one time much disturbed and crushed. They exhibit no distinct lines of bedding or stratification, but in a few places the lines of different coloured materials would indicate a dip to the S.S.W., or the same as that of the underlying blue shales. About 3 chains south of the point—that is, on the side facing Tararu—they are curved, bent, and tilted up at high angles, and terminate very abruptly and steeply against the overlying volcanic breccias. At their base they possess a bluish-grey colour when seen in the solid, but they weather for a great depth to a yellowish-grey colour. They are highly pyritous, and occasionally interlaminated with thin layers of grit, consisting of small rounded particles of hard mudstone, mostly of uniform size. The blue shales also contain similar grit-bands, as well as nests and veins of pyrites.

The age of these old mudstones and slaty shales is still a matter of much doubt. Up to the present time they have yielded no distinct fossils, and the only remains that could be considered of organic origin are some small, dark-blue tube-like markings in the lower blue shales, which may be referred to annelid- or worm-trails. These markings are, however, too obscure to fix the age of these rocks, and, until more satisfactory evidence is obtained, they may be regarded of Lower Secondary or Upper Palæozoic age, most probably the latter.

Passing southward, towards Tararu, at the point where the yellowish mudstones abruptly terminate, they are followed by a hard blue, or bluish-green andesitic tuff or ash-rock, which abuts against and overrides them, resting both on the mudstones and shales. Where it rests on the blue slaty shales it contains small fragments of shale and masses of jasperoid quartz. But on the Tararu side, for the first 30ft. from the mudstones, it is almost free from foreign matter. At the old quarry-face, a few yards beyond this, it becomes quite brecciated with numerous angular fragments of blue shale, varying from $\frac{1}{4}$in. to $\frac{1}{2}$in. in length, but in some layers the fragments are over 3in. in diameter, and so abundant as to form a slaty breccia.

When solid and free from slaty particles this tuff possesses a dark greyish-blue colour, and shows a finely crystalline structure, and might readily be mistaken for a solid lava. It decomposes rapidly when exposed to the influence of rain and other atmospheric agencies. It first assumes a

* "Proceedings of Australasian Association for the Advancement of Science," 1888, p. 245.