

indebtedness to Mr. L. O. Beal, Captain Hutton, and Mr. H. J. Cope, for much valuable information and advice they imparted to me on many subjects comprised within the scope of this report.

I have, &c.,

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APPENDIX 1.

THE SADDLE HILL REEF, GREEN ISLAND, NEAR DUNEDIN.

This reef strikes E. 14° S., and dips northward at an angle of about 55°, crossing the country—a soft phyllite—both in strike and dip, the walls appearing pretty well defined. The workings being inaccessible, Mr. Eggers, a shareholder in the company, and who worked the mine last on tribute, gave me the following particulars respecting their extent and the nature and behaviour of the reef as far as opened. There are two vertical shafts on the ground which struck the reef on the underlay, one at 49 feet, and the other at 125 feet in depth, whilst an inclined shaft, in the line of dip of the reef, runs from the surface to the bottom of the first vertical shaft. From between this shaft and the deep shaft a considerable portion of the reef has been taken out, and at the bottom of the latter the workings extend 80 feet towards the east and 50 feet westward—the quantity of stone removed and crushed amounting, on the whole, to about 2,000 tons. There was not much water to contend with. The reef, which has a ferruginous casing on the hanging, and a clay casing on the foot wall, consists of alternating blocks of good and hungry-looking quartz, and such of mullock, dipping westward in strike at a rather flat angle. It was from the surface down to 50 feet about 7 feet thick, but increased to 9 feet, and even 12 feet, in parts of the lower workings. At the eastern face of these latter the good-looking quartz is only from 5 to 12 inches in thickness, the remainder being hungry-looking, but in parts rich in pyrites. At the western end there are 4 feet of good quartz on the foot wall, and 3 feet of a poor one on the hanging, with about 5 feet of mullock in the centre; good stone exists also for some distance under foot. As regards the auriferous quality of this good stone, it would yield about 14 dwts. per ton, but as it could not be specially selected, and a good deal of the poor stuff had to be taken, the average yield from the 2,000 tons crushed was only at the rate of 5 dwts. per ton. In its direction westwards from the workings, the reef disappears under the alluvial of the flat, and is not traceable up to a point about half a mile distant, where a small outcrop again indicates its presence. Towards the east it is also hidden for a distance of about 5 chains, but there, close to the battery, it crops out again, showing a thickness of about 7 feet, whilst a shaft sunk about 24 feet northward struck it on the underlay at a depth of 37 feet. It proved here to be about 4 feet thick, and the stone would, according to Mr. Eggers's estimate, pay about 7 dwts. per ton; but none of it has, as yet, been crushed.

The crushing machine is erected about 5 chains from the workings, and consists of 10 heads of revolving stamps of 4 or 5 cwts., in two batteries driven by a steam-engine with brown coal as fuel. One of the coffer is deep, the other shallow, and the stamps are fed by hand. The bunched gratings have 122 holes per square inch, but the holes are judiciously made considerably smaller than their usual size at this gauge, by the gratings being brought to red heat and hammered. As gold-saving appliances are used for one battery, an improved kind of amalgamated copper-plate table (three plates, each with a flat ripple in front, fixed step-like, the drop from one to the other being seven inches), succeeded by three blanket strakes of 14 feet in length, fixed at a pitch of one inch per foot; for the other battery serve the common amalgamated plate-table with shallow safety-ripples in front, from which the stuff passes over three blanket strakes 12 feet long, and having the same inclination as the others. The blanket-sand is treated in a small Berdan machine, from which it runs over a copper-plate strake. The crushing capability of the batteries is about 60 tons per week. Mr. Eggers was cognizant of a considerable loss of gold and floured mercury, on account of the large quantity of pyrites contained in the quartz. With 100 feet length of blanket strakes he thought he could save about three tons of this ore during a week's crushing. An experiment which he made with a sample of 300 lbs., by first roasting and afterwards treating it in the Berdan machine, gave 4 dwts., or at the rate of about 1½ oz. of gold per ton—a yield which, considering the imperfection of the trial (roasting having not been carried on far enough, and the Berdan being not a good amalgamator for the purpose), must be regarded as very satisfactory. Looking at the character and prospects of the reef, I certainly think it ought to be profitable to work, *i.e.*, on a larger and more systematic scale, and with the gold-saving appliances improved.

* This is omitted, having no special reference to the gold fields.