

to the possibilities of quartz-reefing. For some years past the extensive alluvial fields have had a much greater attraction for the investor and speculator than the quartz-reefs of the district; but, as has been suggested in previous reports, the gradual exhaustion of alluvial ground will naturally cause attention to be directed to the quartz-reefs, and especially so since of late years considerable advances have been made in the treatment of ores which do not freely yield their gold by amalgamation. This latter feature is characteristic of the quartz of the Carrick Range; and, with a view to the determination of a practical method for its treatment, a sample of good quality ore for assay was obtained, the value of which was found to be upwards of £6 per ton. Following this up, a bulk sample of stone—taken from various workings and mixed together, so as to get a fair average sample—was treated by the Government Analyst (Dr. Maclaurin), who reports as follows:—

“ Quartz from Carrick Range, near Bannockburn, Otago.

“ The sample consisted of hard and somewhat glassy quartz, with dabs and veinlets of a greyish mineral with silvery white fracture. This mineral had approximately the following composition:—

	Per Cent.
Iron	56·6
Arsenic	24·4
Antimony	1·3
Sulphur	17·7
	100·0

“ No gold was visible in the stone, but panning-off showed a little free gold.

“ The whole of the sample forwarded (about 2 cwt.) was roughly crushed and mixed, quartered, &c., in order to get a fair average, and a large sample was finally crushed dry to pass a 30 mesh. This sample, which was used in all the subsequent experiments on the ore, had the following fineness:—

	Per Cent.
Passed 30, but rejected 60 mesh	39·5
„ 60, „ 90 „	31·5
„ 90, „ 120 „	12·0
„ 120, „	17·0
	100·0

“ Its assay value was as follows:—

	Dwt. gr.	Value.
		£ s. d.
Gold	17 8 per ton	3 9 4
Silver	3 3 „	0 0 4
		£3 9 8

“ *Concentration.*—The first point to be considered was the suitability of the ore for concentration. This investigation was carried out in the following manner: 48,000 grains were panned off in a dish, and yielded 640 grains of concentrates, or 1·33 per cent. of the sample taken. These concentrates contained 73·7 per cent. of the total gold in the sample, and were worth £191 11s. 3d. per ton. In other words, 75 tons of ore would yield 1 ton of concentrates, worth £191 11s. 3d.; moreover, these concentrates were by no means “clean,” as they contained 44·8 per cent. of sand. When working on the large scale, and with a good form of mechanical concentrator, it should be possible not only to increase the percentage of gold recovered, but also to decrease the bulk of the concentrates.

“ *Amalgamation.*—This was carried out by making the ore into a pasty condition with water and rubbing up in a mortar with mercury. The mercury, however, soon became dull (‘sickened’), and potassium-cyanide solution had to be added to keep it bright. The extraction by this method was 55 per cent.

“ *Chlorination.*—7,000 gr. (1 lb.) were treated with chlorine water for forty hours, but the extraction was only 33 per cent.

“ *Cyanide Treatment.*—Three samples of 1 lb. each were taken. A was treated with 600 c.c. of a 0·5-per-cent. solution of potassium-cyanide; B was treated with 500 c.c. of a 0·35-per-cent. solution of potassium-cyanide; C was treated with 500 c.c. of a 0·26-per-cent. solution of potassium-cyanide. These solutions remained in contact with the ore for 116 hours, after which they were run off, and succeeded by the following washes:—

	Per Cent.
400 c.c.	0·10
200 c.c.	0·05
200 c.c.	Water.

“ The solutions were evaporated and the gold recovered, with the following results:—

The gold recovered from A showed an extraction of	72·3 per cent.
„ B	66·4 „
„ C	62·7 „

“ At the same time there was a consumption of 6·4 lb. of KCN in A, 4·5 lb. in B, and 3·6 lb. in C per ton of ore treated.

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