

objects of the plant—in fact, its value to the mining public. Regarding the amalgamating appliances in direct connection with the mortar-box at present in use, they consist of two silver-plated and amalgamated copper-plates divided by a very shallow and narrow quicksilver riffle, and at the end of the second plate of a deeper quicksilver riffle from which the crushed material runs on to two blanket strakes. In the working it has now invariably been found that the shallow dividing riffle and the succeeding copper-plate retained but a small percentage of gold, while the deeper quicksilver riffle at the end caught a much larger quantity. This points distinctly to the advisability of interposing between the copper-plates, instead of the present shallow riffle, a so-called deep-drop riffle, say, of 8 in. drop, such as are used in sets of three with great satisfaction in some of the best crushing-mills in Victoria, and in cases quite to the exclusion of copper-plates. The second copper-plate would need to be only a few inches broad, and be followed by a shallow catch-riffle, following which again would come the blanket strake, some 4 ft. to 5 ft. larger than at present—an addition much needed for a more satisfactory saving of pyritous material. All these alterations and additions, which I beg strongly to recommend, can easily be effected, and at but a small expense—say, about £3. Regarding the value of the plant to the mining public, it consists, in my opinion, not so much in extracting the highest possible percentage of gold from any parcel of ore sent, but rather in the information imparted to the sender in the report accompanying the gold extracted. For he will find indicated in this report, as deducible from the results of the various assays, cyanide tests, and observations made in course of the trial, the most advisable treatment on the large scale for ore of similar character as the parcel sent, which may be by wet-crushing and amalgamation and use of the berdan, or the cyanide process for the concentrates, or by direct application of the cyanide process—*i.e.*, by dry-crushing and leaching of the crushed stuff by cyanide solution of a certain strength. There seems to be a belief amongst some Otago mining men that the direct use of the cyanide process, as just explained, is advantageous for auriferous quartz of every description, but this is a great mistake. For the ore of most, if not perhaps all, auriferous reefs of Otago occurring in schistose rocks, the direct process is quite unsuitable, and causes loss, owing partly to the general great diversity in the size of the gold particles enclosed therein, partly to its mullocky character or admixture of schistose rock. While the finest gold particles may yield to the cyanide solution in a few hours, the larger ones might require up to several days for this action, and consequently there is no limit fixable for the time of satisfactory leaching. And mullocky ore, or such mixed with schist, forms slimes so unctuous and impermeable that hardly any cyanide solution will filter through, even by the use of a strong exhaustor. For these reasons senders of ore parcels should not unreservedly demand the use of the direct process for their ore, as was done in some cases, but leave the advisability of its application to the judgment of the operating metallurgist; for, if they do so, it stands to reason that they have to be satisfied with the results of the extraction, however unfavourable these may turn out.

The work done for the public since the date of my last year's report—25th November—by Mr. P. Fitzgerald, and since his departure by Mr. A. Mosley, in assays, analyses, and with the testing plant, and by myself, in the determination of minerals and rocks, was as follows:—

*Assays and Analyses charged at Fixed Rates.*

(Executed by Mr. Fitzgerald.)

December 14, 1895.—Two assays, one of quartz and one of concentrates, for gold; for Mr. R. Allen, Invercargill.

January 14, 1896.—Four assays of four samples of quartz for gold; for Mr. Gilbert, Christchurch.

January 15.—Four assays of four samples of quartz for gold; for Mr. Donald Reid, Dunedin.

March 31.—Assay of sample of quartz for gold; for Mr. R. Brunton, Waipori. Assay of sample of sandstone for gold; for Mr. Gilbert, Christchurch. Two assays of two samples of quartz for gold; for Mr. Reeves, jun., Dunedin. Assay of sample of quartz for gold; for Mr. Donald Reid, jun., Dunedin.

April 2.—Six assays of six samples of quartz for gold; for Mr. R. Lee, Dunedin.

April 9.—Cyanide test of concentrates for gold; for Mr. Donald Reid, jun., Dunedin. Assay of sample of quartz for gold; for Mr. G. H. Oatway, Dunedin.

April 14.—Four assays of four samples of pyritous quartz for gold; for Mr. G. H. Oatway, Dunedin.

April 15.—Assay of sample of concentrates for gold; for Mr. Proctor, Dunedin. Three assays of three samples of quartz for gold; for Mr. R. Lee, Dunedin. Assay of sample of pyritous schist for gold; for Mr. H. R. Wilkinson, Dunedin. Assay of sample of garnet sand for tin; for Mr. Pearce, Dunedin.

April 20.—Assay of concretionary iron-ore for gold; for Mr. Kirk, Dunedin. Assay of sample of sandstone for gold; for Mr. Kirk, Dunedin. Assay of sample of clay for gold; for Mr. Kirk, Dunedin. Assay of sample of marcasite for gold; for Mr. Kirk, Dunedin.

April 21.—Analyses of five samples of coal; for Mr. G. M. Barr. Thirteen assays of thirteen samples of quartz for gold; for Mr. A. Lorie, Dunedin.

April 23.—Assay of sample of quartz for gold; for Mr. R. Allen, Invercargill.

May 15.—Assay of concentrates for gold; for Mr. Proctor, Dunedin.

May 20.—Assay of sample from an alluvial deposit for gold; for Mr. Kirk, Dunedin. Nine assays of nine samples of quartz for gold; for Mr. P. Laing, Dunedin.

May 23.—Two assays of two samples of quartz for gold; for Mr. J. Trent, Christchurch.

May 29.—Two assays of two samples of quartz for gold; for Mr. P. Laing, Dunedin. Six assays of six samples of quartz for gold; for Mr. C. E. Pinder, Dunedin. Two assays of two samples quartz tailings for gold; for Mr. C. E. Pinder, Dunedin. Analysis of samples of shell marl; for Marshall's Pharmacy.