

lead, as is easily understood from the way by which they are obtained, and are free, or very nearly so, from quartz. The middle products of the triple table go over the same table again, till they are clean. Their quantity is included in the total figure of second-class slimes. The tailings from the single tailings go through a buddle, and the headings from the buddle over the triple table. The tailings from all the jiggers go through another buddle; the headings are twice re-treated in a dressing-buddle. The clean concentrates thus obtained are termed buddle concentrates; their quantity amounted to 26 tons, their value to £795. One ton buddle concentrates contained in average 7oz. 15dwt. of gold, and 29oz. 5dwt. of silver; value £35 7s. The total weight of buddle concentrates amounted to only 5.6 per cent. of the total of concentrates produced. As the materials from which the buddle concentrates are obtained are the tailings from the other concentrating-machines, their small percentage speaks for the efficient working of the whole plant. The tailings leaving the works pass through a large ripple-box, from which the headings are again brought into the works and passed through the dressing-buddle. They give an insignificant quantity of concentrates, which is included in the above-stated buddle concentrates. The working of the concentrating plant, and the system on which the operations are carried out, will be easily understood from the attached table. As results from the table, all by-products or middle products (products not finished in one—the first—operation) undergo a repeated treatment, and all tailings are worked over and over again before they are finally discarded. It is due to this system that the concentration of the Sylvia ore is brought to its present perfection. The whole of the crushing and dressing plant worked constantly with the greatest precision, and no money had to be spent on alterations or repairs.

“It is only natural that the working of machinery never seen before on this field, and hardly ever used for concentration of gold-ores anywhere, required a time of apprenticeship for the men employed in the sheds. The employés, however, soon got used to the work, which is by no means arduous. The whole of the machinery, crushing, and concentrating, is attended to per shift by one amalgamator, doing duty as well of shift-boss; one feeding-boy; one lad attending to jiggers and sundry work; and one man at the slime-tables. The working-expenses amount to £4 7s. per twenty-four hours, or to 3s. 6d. per ton of ore when 25 tons of quartz are put through. Such expenses include cost of crushing, amalgamating, and concentrating. The cost of crushing and amalgamating amounts to 1s. 8d.; so that the cost of concentration is covered by 1s. 8d. per ton. The above figures include wages only. The present Sylvia concentrating plant has been erected as an experimental one, with the view of increasing its size in accordance with results and circumstances. The same number of men now employed could almost superintend a plant of double the extent, when the costs of crushing, amalgamating, and concentrating would be still further and considerably reduced.

“The question as to whether loss is occurring by the washing-away of extremely fine gold and very finely-divided but valuable galena, has occupied my attention to a degree. It has been found that the loss thus occurring is of such trifling nature as to be of no account. The experiments have finally established the claim of the Sylvia plant to be one thoroughly adapted to its purposes; and, on the other hand, the results shown by the above figures prove that an ore, refractory and low-grade, which yields 80 per cent. of its assay-value in 8 per cent. of its weight after concentration, must necessarily be a concentrating-ore. The results of experiments on chemical treatment of such low-grade ore as represents the average of last year’s crushing-dirt do not warrant any alteration in the general treatment as carried on by the present system. Extremely rich ore, as is occasionally found in pockets or bunches in the mine, does not require any concentration, but is extracted after previous reduction to a fine state of division. The whole proceedings in the dressing-sheds are regularly and scientifically controlled. The value of crushing-dirt and tailings is regularly ascertained by assay, a system which would be valuable for many establishments to adopt where attempts at gold-saving are carried on with indifferent appliances, when defective machinery and methods would be soon superseded by better ones. The attached plates will further illustrate the Sylvia Company’s concentrating plant and its working. My full description of the machinery itself may be found in the New Zealand Government Mining Report, 1891. (See C.—4, 1891.)

“It was originally intended to dispose of the concentrates by sale in the highest market; but the low prices offered for the low-grade jigger and second-class slime concentrates made an extractive treatment on the spot not only desirable and preferable, but an imperative necessity. The expenses for bagging, carting, shipping, insurance, and treatment abroad are so great that they will seriously interfere with the exportation of all complex ore excepting such as are of high value.

“I investigated, in my position as managing director and metallurgist to the Sylvia Company, the question of local treatment of the concentrates, and decided on the adoption of the cyanide-of-potassium extraction process. Considering the most complex character of the concentrates—a mixture of galena, zinc-blende, iron-, and copper-pyrites—it was *a priori* not certain that, without previous roasting, a solution of cyanide of potassium would effect anything like a satisfactory extraction of gold and silver; but not only experiments on a small scale, but the eminently successful treatment of about 350 tons of such material, have proved the efficiency of such treatment, of which I am pleased to record here the results. After previous trials made with the process on an experimental scale, I was intrusted by the board of directors with the construction and erection of a plant for cyanide treatment of concentrates, which has since proved a success both chemically and mechanically. I attach two plans, with the following description of the plant, which consists of three large agitators, three vacuum filters, a grinding-pan, cyanide-solution tank, tanks for gold-solution, vacuum and other pumps, and other minor appliances. It is capable to put through, according to the quality of the material, up to 20 tons per twenty-four hours. The whole plant is of local manufacture. The filtration of the concentrates, after terminated agitation, and their complete liberation from gold-cyanide solution, has been a difficult problem to solve in those few places where the agitation process has been extensively carried out. The construction of my vacuum filter, of which I also enclose plans, has easily overcome all difficulties. Its application has vastly contributed to make the cyanide process a success with the Sylvia Company.