conclusions of the former may be of very little value. In conclusion, the writer wishes it to be clearly understood that this communication is not so much intended to set forth all the methods and precautions needed in estimating ore in sight, many of which can only be determined on the spot, as to urge the importance of having all the observations of fact relied on so set out in the report and accompanying plan that anyone competent to do so may check the results. The effect of such a course will probably be to induce greater care on the part of those responsible for the estimates, and at the same time increase the confidence of those for whom the estimates are made by affording a clear indication of what is meant by "ore in sight" in each particular case.

## THE TREATMENT OF TAILINGS BY THE CYANIDE PROCESS AT THE ATHABASCA MINE, NEAR NELSON, B. C.†

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As this plant is the first ever erected in British Columbia for the treatment of tailings by the cyanide process, and as the ores of this mine are of a character not unusual among gold ores of this Province, it is probable that a description of the principal features of the plant, and of the methods employed in its operation, may be interesting.

These works were designed after a careful study of the process, in a small experimental plant, for a period of six months. During this period ten percolation tests on charges of tailings of 1,100 lbs. each, eight percolation tests on similar charges of concentrates, and twenty-six tests on concentrates in a revolving barrel, were made besides laboratory experiments.

The ore consists of a quartz gangue, containing a little lime and variable quantities of the sulphides of iron, lead and zinc. The following figures, giving the analyses of the ore before milling, and of the tailings after milling, which constituted the material to be cyanided, are based on the daily samples taken during February and March, 1901.

ANALYSES OF ORE AND TAILINGS.

| | February | | March | |
|---|---|---|---|---|
| | Ore. Per cent. | Tailings. Per cent. | Ore. Per cent. | Tailings. Per cent. |
| Zn | 1.93 | 0.91 | 1.92 | 0.91 |
| Fe, | 7.04 | 2.65 | 8.16 | 3.03 |
| Pb, | 1.63 | 0.20 | 1.24 | 0.21 |
| CaO, | 4.97 | 2.46 | 1.56 | 1.43 |
| S, | 5.99 | 1.71 | 6.02 | 1.75 |
| $Al_2O_3$, | 3.20 | 3.20 | 3.45 | 3.40 |
| $SiO_2$, | 74.20 | 85.00 | 74.30 | 86.10 |
| | Oz. Per ton. | Oz. Per ton. | Oz. Per ton. | Oz. Per ton. |
| Au, | 1.68 | 0.32 | 1.34 | 0.27 |
| Ag, | 1.32 | 0.38 | 1.34 | trace. |

The plan was designed to have a capacity of 30 tons per diem, with a 5-day period of treatment, including the charging and discharging of the leaching-tanks. Some changes which have been introduced, and which will be described later, have so reduced the period of treatment that the plant may now be considered to have a capacity of 50 tons per diem.

It is located on a steep hillside, and Figs. 1 and 2, showing the plan and side elevation, will explain its general arrangement.

At every step of the process, except the pumping of the spent solution from the sumps to the solution-tanks, the materials are always moved by gravity. In order to secure this result large excavations had to be made in difficult ground, and heavy masonry had to be provided for retaining walls and tank foundations; the total excavation being about 10,000, and the aggregate of granite masonry about 1,250 cubic yards. The cost of this work was great, and the total cost of the plant amounted to $31,096.79. Every effort was used to secure solidity of construction, and nothing but good material and workmanship was employed throughout.

The plant was located to receive the tailings direct from the mill, in two distributing-tanks, 14 feet in diameter and 10 feet in height. The tanks are fitted with annular launders around the rim and are filled with water before the admission of the tailings; the overflow is carried off in the annular launders, and thence in iron pipes to the waste-launder under the leaching-vats.

In order to control the proportion of slimes allowed to escape, a slimes arrester is provided. This consists of a sheet of iron, 10 in. wide, fitted inside each tank, about 1 inch from the staves, extending all the way round, and held in position by 8 iron brackets. This sheet is arranged so that it can be raised entirely above the level of the tank, or lowered and immersed until the upper edge is but slightly above the level of the water. In this position it is most effectual in arresting the outflow of slimes. The exact position of the sheet can be regulated to suit the character of the ore under treatment.

The tailings are distributed in these tanks by eight-arm distributors, working automatically. The tanks are fitted with filters and are connected, beneath the filter, with the waste-water receiver, which is in turn connected with the vacuum pump. The filters are protected by perforated boards against injury in shovelling out the tailings. When the tanks are full, the supernatant water is siphoned off, and connection is then made with the waste-water vacuum-tank for about twelve hours. At the end of this time the tailings are so nearly dry that a shovelful thrown into the vat below breaks up into a loose pile of sand. (The importance of this fact will be shown later).

The distributor-tanks are placed over the leaching-tanks, on a frame partly of steel and partly of timber, in such a way that each tank can be discharged by three side doors into any one of three of the leaching-tanks. Our usual practice has been to accumulate about 35 tons in a distributor-tank at one time; after drying, these can be discharged by shovelling at a cost of about eight cents per ton.

The leaching-vats are five in number, arranged under the distributor-tanks as described above, and shown in Fig. 1. They are 18 feet in diameter and 4 feet in height, are fitted with cloth filters and center discharge doors, rectangular in shape, tightly closed up by bolts, and removable from the inside. Around the door frame is a wooden frame to which the filter cloth is attached; and, before the sands are admitted, a wooden cover is admitted over the iron door, having a pyramidal top to facilitate the current of the solution. The outlet pipe for the solution connects with the bottom of the vat and runs either to (1) the strong gold tank; (2) the weak gold tank; (3) the waste-water vacuum tank; (4) directly to waste. The pipe connections are such that any or all of the leaching-vats can drain through any or all of these channels simultaneously and independently. This is a very important provision for saving of time in the operation of the plant. Both solution and water are admitted to these tanks on top of the sands, and distributed through a floating box with perforated sides.

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