Free Milling and Chlorination of Gold Ores at North Brookfield, Queen's County, N.S.

Numerous descriptive articles have been published from time to time regarding the new milling and chlorination plant at North Brookfield, but it has been thought that a more detailed description of the plant, (which has cost over $80,000 to erect) and the process might be of interest to the readers of the REVIEW, and more particularly that section of them representing the gold mining fraternity of Nova Scotia. The question in issue was the most economical method of getting the largest possible percentage of gold from an arsenical pyrites which has given an average of $14 to $16 per ton of ore crushed, leaving varying values in the tailings running, so far as assayed, never less than $6, and frequently running much higher. Before erecting the new plant much ore was left below ground, and on the dump, which would not pay to crush but which now will pay well. The result of utilizing all this hitherto waste material will be that the value per ton of ore treated will not be greater than of old, but the available quantity of crushing material will be at once increased and the cost of mining and milling decreased. Cyaniding has been tried here and proved a dismal failure, although recent experiments would indicate the possibility of cyanide proving successful on this ore. Mine operators, however, would do well to be wary of anyone with a scheme or patented process, either on Cyanide or Chlorination, as both principles have been so long known and worked with various improvements and modifications as to render it extremely doubtful if any one individual has a right to any more profits than his own services are worth in extracting gold by either process.

Generally the method of treating the ore is by stamping the ore wet, passing the pulp over electro silver plated copper plates and then saving the sulphurets by means of the Improved Triumph Concentrators. The resulting concentrates are roasted in single hearth reverberatory furnaces and then subjected to barrel chlorination by the Thies process—a process without patents, which is used with many adaptations by a large number of successful mines, in the mining regions of the United States, and other parts of the world.

The mill, with power and capacity for 40 stamps, at present fitted with 20, is placed directly over the working shaft. Th shaft is perpendicular for 100 feet and then dips south to the depth of 400 feet at an angle of 23° cutting the pay chute on the fissure vein which has given to Brookfield its yield of gold. The shaft also dips north, cutting a large main lead at about the same angle, thus enabling the products of both leads to be hoisted to one deck on the top of the mill. The ore is hoisted to the iron-clad deck by a double cylinder steam hoisting engine placed on the ground floor of the mill, the whole arrangement being such that the engine-man hoists and dumps the self acting skip of one ton capacity without assistance from the deck-man. The ore is shovelled from the deck into a 10 x 15 Dodge rock breaker placed below the level of the deck, whence it is fed through shoots into any desired ore bin. A waste rock car runs beneath the deck to take waste over a tramway elevated 50 feet high. In fact although this mill is in a low swampy place the most ample elevation has been given, by means of a massive stone foundation, for the concentrators below the stamps and for the deposit for years of both waste rock and tailings. On the lower floor are two sixty-horse power boilers, the main engine, the hoisting engine, 20 stamps with 8 foot silver plates and a large amalgamating room fitted up with hot and cold water, panning tubs, iron sheathed table to handle amalgam set retort, smelting furnace, and clean-up barrel. The whole building, including the large concentrator room, is heated with the exhaust steam and is lighted by two 5 K. W. dynamos, which likewise transmit power for the chlorination and furnace houses. The stamps are 900 pound stamps, run on a 5 to 6 inch drop, 92 to the minute; 30 mesh wire screen is used. The mortars are narrow, single discharge, the latter being about 8 inches. Experiments are being made however, at present with a 20 mesh screen the object being to strike the medium between making too much slimes and saving too little gold by amalgamation. After the tailings leave the plates they pass through modifications of the Rittinger pulp sizers, where the pulp is divided into four sizes, and thence over 8 triumph concentrators. The over-flow from the last sizing box runs through a slime box where considerable slimes are collected assaying thus far about $30 to the ton. Whether or not these slimes can be treated by roasting and chlorination has not been determined. The managers are aware that the question of sizing before concentration has been, and is much discussed, but having tried both methods the conclusion thus far for the Brookfield ore is in favor of sizing. After leaving the slime boxes the tailings are converyed through sluices lined with riffles to the dump. A very small amount of concentrates are obtained from the sluices. The losses after leaving the concentrators are apparently largely from slimes and from sulphurets so exceedingly fine as to float. The concentration is done on eight Improved Triumph Concentrators 4 x 12 feet with smooth rubber belts. (This machine was patented by Mr. W. A. Sanders, now manager of the Equitable Mining Co., at Caribou Gold Mines, Nova Scotia and by him sold to the Joshua Hendy Machine Co., of San Francisco). They are set at an inclination of 2½ inches in 12 feet and receive 230 shakes per minute. The load is distributed over the endless rubber belt which travels about four feet per minute, at a depth of about 5-16 of an inch and of about the consistency of paint. Great care is necessary to keep even speed and not to allow pulp to become too thick or too thin. These two points added to the absolute necessity for cleanliness are the three most important points in running the machines, and it may be added most difficult to obtain. The average value of the concentrates now being made is about $65 per ton; assays, however, made by Mr. F. H. Mason, of Halifax, have run, on pure sulphurets from this ore, as high as 6 ounces per ton. From the concentrating room the sulphurets are hauled on the tramways by electric power to the furnace house. Here there are three single hearth reverberatory furnaces each 8 x 70 feet, with a capacity of two tons each per twenty-four hours. Each furnace is worked by two men to a shift of twelve hours. These concentrates contain, according to Mr. Mason, about 28 per cent. of sulphur and 16 per cent. of arsenic, practically all of which is eliminated in roasting. The ore when cooked is run onto a brick cooling floor whence, when cooled, it is elevated by chain bucket elevator to the top of a 5 storey frame building containing four chlorination barrels, 16 filtering tanks, four storage tanks, 16 precipitating tanks, two settling tanks, two acid tanks and one tank in which to make ferrous sulphate. The ore is discharged from the elevators into cars containing one ton each, wheeled along over the desired barrel and dumped through a hopper into the steel barrel 60 inches long, 42 inches in diameter and lined with lead 12 pounds to the square foot. The entire charge consists of 125 gallons water, 15 lbs. chloride of lime, then the ore and last 40 lbs. of sulphuric acid 66° Beaume. The barrel is at once hermetically closed and revolved at 20 revolutions per minute for five hours. The barrel is then discharged through a lead lined half circle in the floor to a filter tank on the floor below. There are four of these lead lined filter tanks to each barrel, each being 6 x 8 feet by 18 inches deep in front and 17 inches back. The bottoms are covered by specially made mineral tiles 8 x 12 inches, perforated, and having 1½ inch gutters underneath. On top of these