

stamp mill at that place gave him nearly 15 dwt. of gold to the ton, while not over 8 dwt. had been previously extracted, thus showing a loss of nearly two-thirds of the gold present. At the Port Philip and Colonial Company's mines in Victoria, Australia, where careful assays of the tailings are regularly made, they are found, while the mean product of the quartz is about 9 dwt., to contain on an average 2 dwt. of gold. Of this, however, a considerable proportion is recovered; the tailings are concentrated in buddles, by which the sulphurets, carrying the greater part of the gold, are separated from the lighter quartz. These concentrated tailings, which contain, according to assays, from three to four ounces of gold to the ton, are roasted, and then ground with mercury in a Chilian mill, by which means eighty-five per cent. of the gold present is extracted. The whole cost of this process in Australia, including washing, roasting, and amalgamation, amounts to about \$13.00 the ton.

That a large amount of the gold from some of the Nova Scotia mines is enclosed in the sulphurets, and thus to a greater or less degree escapes the action of the mercury, would appear from the assays of the mispickel or arsenical pyrites. A sample of several pounds weight of this, from Montague, yielded to Prof. Silliman \$276 of gold to the ton, of which about two-thirds only were coarse gold. The pyrites extracted by washing from the tailings of two lodes at Tangier gave respectively \$93 and \$125, and that from another vein in the same region not less than \$180 to the ton of two thousand pounds. (See Prof. Silliman's Report on the Tangier District.)

Notwithstanding these results, the tailings are generally entirely neglected in the Nova Scotia mines, and with them, no doubt, large quantities of gold are lost, which might be advantageously extracted by concentration and roasting, followed by amalgamation either in the Chilian mill, the Wheeler or Hepburn pan, or, perhaps, better still, by the use of Plattner's process, in which the gold is dissolved out from the roasted ore by the use of chlorine. Prof. Silliman has suggested that the arsenic may be profitably extracted from the mispickel by roasting in properly constructed furnaces. By this means it might be made to yield half its weight of white arsenic, which has a considerable commercial value, and would probably pay the expense of roasting the ore. By thus condensing the arsenic, the injurious effects which would otherwise result from the escape of the poisonous arsenical vapors into the air, during roasting, would be prevented.

The system of amalgamation in the batteries, generally adopted in Nova Scotia, is in many regions replaced by other methods, in which the whole or a large part of the gold is extracted from the pulverized quartz by washing. In the plan generally adopted, and for a long time practiced in South America, the rock is crushed beneath stamps, with the addition of water, but without mercury, and the material escaping from the batteries is made to flow over inclined tables covered, with coarse woollen blankets, or with bullock skins dressed with the hair on. These skins or cloths are removed from time to time, and the heavy material, rich in gold, is removed from them by beating and washing in vats arranged for its collection. At the Morro Velho mine, in Brazil, according to Phillips, 67 per cent. of the gold in the quartz is at once extracted by this process. Of the remainder a portion is lost in the slimes, but the greater part is obtained by grinding the concentrated tailings in arrastres, and washing again as before. From the rich material which collects on the cloths or skins the gold is extracted by amalgamation.

In other parts of South America the grinding of the tailings in the arrastre is performed with the addition of mercury, and the residual gold is thus amalgamated. The arrastre is a rude tub or basin of stone, having an upright shaft moved by horse-power, and carrying four arms. To these are attached, by chains, large blocks of hard stone, beneath which, as they revolve, the material placed in the basin with water is slowly ground to powder. The various iron amalgamating pans now in use are perfected forms of the arrastre, and some of them, as the Hepburn & Peterson pan, are said to be so constructed as to be very efficient grinders.

In the Grass Valley region, in California, the system of mechanical washing is also adopted, and for this purpose the sand and water issuing from the batteries are made to flow over a succession of tables, inclined at an angle of three or four degrees, and covered with a coarse gray cloth woven for the purpose. In this way about nine-tenths of the gold obtained from the rock are extracted. The waste is then passed over tables with amalgamated copper riffles, by which a farther portion of gold is retained, and finally washed in buddles to collect the auriferous pyrites present. The arrangement just described is