

"After settling of the sulphides has taken place, the clear solution is decanted into the pump-ump and the sulphides are drawn into the filter-press sump. The consumption of sodium-sulphide per ton of ore is very variable, and depends principally on the amount of copper which has been precipitated with the silver.

"Sulphides.—Directions for handling the sulphides in the filter-press are furnished by the manufacturers of the machine. For reasons already stated, it is not the intention to discuss at present the various methods that may be used for converting the sulphides into bullion. In case the sulphides are sold to smelting-works, they should be roasted in a reverberatory furnace previous to their shipment. This roasting need not be a dead roast, and is principally intended to oxidize the free sulphur, a considerable percentage of which is mixed with the sulphides.

"Laboratory Work.—In a lixiviating-mill the following determinations should be made every day :—

- "(1.) Pulp assay of ore and salt mixture.
- "(2.) Determination of the percentage of the salt in the pulp.
- "(3.) From these data the value of the ore is calculated.
- "(4.) Determination of the percentage of soluble salts in roasted ore.
- "(5.) From these data the value of roasted ore, minus the soluble salts, is calculated.
- "(6.) Pulp assay of the roasted ore.
- "(7.) Assay of tailings.
- "(8.) In comparing the value of tailings with the value of roasted ore, minus the soluble salts, the percentage of silver left in the tailings is calculated.
- "(9.) Lixiviation tests of roasted ore with ordinary solutions.
- "(10.) Lixiviation tests of roasted ore with extra solutions.

"The result of No. 9 shows to what perfection the roasting has been carried, and that of No. 10 show what results may be expected in lixiviating on a large scale. By comparing No. 9 with No. 10 we learn how much the extraction of the silver will be benefited by the use of Russell's process. If the ore is treated raw most of these determinations are not required.

"In regard to the lixiviation tests it is advisable to adopt some definite practice. The following are recommended by Mr. Russell: The results of these tests, Mr. Russell says, will correspond with careful work on a large scale within $\frac{1}{2}$ oz. to $\frac{3}{4}$ oz. of silver per ton of ore. In order to avoid the weighing of the reagents a 20-per-cent. copper-sulphate solution and a 5-per-cent. sodium-hypsulphate solution are prepared; 100c.c. of the former would contain 20gr. of copper-sulphate, and 100c.c. of the latter would contain 5gr. of sodium-hypsulphite. A pipette holding 20c.c., and a measure for 300c.c. should be at hand. The quantity of hyposulphite solution used is always 300c.c., and that of copper-sulphate 20c.c. In preparing the extra solution the copper solution is added to the hyposulphite solution in a beaker. The following rules are also observed in any instance: The reagents are applied cold to the ore in a beaker, which is then heated, with occasional stirring, upon a moderately hot sand-bath until the solution reaches the temperature of 125° to 130° Fahr. The beaker is then removed, the ore allowed to settle, and the solution is decanted upon a filter, to which, at the end of the operation, all the ore is transferred. After washing with the warm water the filter is put into a drying-chamber, and its contents are finally assayed. If the ore has been roasted it is generally first treated with 300c.c. of warm water. The wash-water is decanted upon the filter, leaving the ore in the beaker, and the lixiviation solutions are then applied. How the lixiviation test with ordinary solution alone is to be made requires no further explanation.

"Mr. Russell uses the following three methods in making lixiviation tests with extra solution, each of which may be preceded by a leaching of the sample with water, in case the ore has been roasted :—

"(a.) The sample is treated with extra solution only.

"(b.) The sample is treated as follows: Add 20c.c. copper solution, and heat to 100° to 125° Fahr.; leave for five minutes, and then add 300c.c. hyposulphite solution, and heat to 125° to 130° Fahr.; decant upon the filter, and wash out, &c.

"(c.) The sample is treated with ordinary solution; decanted and heated with extra solution.

"For raw ores, method (c) is most frequently used; (a) often gives as good results; (b) is rarely used. Roasted ores are generally first leached with water; and only if not much salt has been used in roasting, and the sample only contains a small amount of soluble base metal salts, this operation may be dispensed with.

"For ore roasted without caustic lime, method (c) is most frequently used, but (a) may give as good results.

"If the roasted ore contains caustic lime, method (b) alone is used. Silver in the wash-water is determined by precipitating a measured quantity with sodium-sulphate, and assaying the precipitate."