

silver. In the case of base ores, however, the process is more expensive and complex. After the ore has been hoisted from the mine it is conveyed in hand cars to the upper part of the mill, where it is put through large iron crushers, which reduce it to about the size of walnuts. From the crushers it drops to the drying floor, where all the moisture it contains is evaporated, and where it is mixed with a proportion of salt varying from 8 to 14 per cent. of its weight, the amount of salt depending on the baseness of the ore. When thoroughly dried it is shoveled under the stamps, large perpendicular iron bars weighing 900 pounds, which are raised by machinery and permitted to drop on the ore below at the rate of about fifty strokes per minute. The effect, of course, is to crush the ore to powder, in which condition it is taken automatically to the roasters. These are huge hollow cylinders revolving slowly and filled with flames of intense heat conveyed from the furnaces below by means of a draft. As the cylinders revolve the action of the heat drives off the sulphur in the ore, liberates the chlorine in the salt, and a chemical change takes place in the nature of the silver in the ore, making a chloride of what was formerly a sulphide of silver, and rendering it susceptible of amalgamation with quicksilver the same as the silver in the "free" ore above mentioned. From the roasters the pulp is then conveyed by tramway to the pans, large tubs filled with water, in which quicksilver is placed with the pulp. The mass is then violently agitated so that every particle of the silver chloride comes in contact with the quicksilver, by which it is taken up. The whole is then conveyed to the settlers, another series of tubs in which the water settles, and from which the quicksilver is drawn in the form of amalgam. This is afterwards subjected to heat, volatilizing the quicksilver, which is afterwards condensed for use again by means of cold water pipes, leaving the silver in a pure metallic state, to be melted into bars and shipped for coinage.

The process by which the copper ores are smelted is simple enough. Like the silver ores of Butte they are of a sulphurous composition and require to be roasted before their metal contents can be put into marketable shape. The copper ores of Butte are either desulphurized by what is called heat roasting, or by being put through reverberatory furnaces, *i. e.*, long brick ovens, into which heat and flame are introduced to drive off the sulphur and other impurities. After this initial treatment the ore, which had, of course, been previously crushed and "rolled" to the fineness of sand, is dumped into the matting furnaces, where it is reduced to a molten state for the separation, as far as possible, of the worthless ingredients from the metal base. The metal is then drawn off into sand cavities, where it cools and becomes copper matte. It generally assays from 55 to 65 per cent. of copper and what silver the ore contained, though the Parrot Company, by new and improved processes, produces a matte carrying only 2 per cent. of impurities. Several of the Butte companies ship ore in a crude state, as it contains from 40 to 76 per cent. of copper, and pays handsomely to ship without smelting.

THE SILVER MINES AND MILLS.

Alice.—This mine has been extensively developed. The three-compartment shaft has reached a perpendicular depth of 800 feet. At intervals of 100 feet cross cuts intersect the ledge, and drifts have been run east and west for distances varying from 500 to 1,000 feet, opening up a regular and continuous vein of ore for extraction. The Magna Charta, owned by the same company, is similarly developed to a depth of 600 feet, and for three years past has contributed sixty tons per day to the mills, an amount which it could readily double if required. In the development of these two properties the most improved appliances have been employed. The Cornish pump is a magnificent piece of machinery. It cost \$40,000, and is a monument alike to the splendid enterprise of the Alice Company and to the mechanical skill of the great machinery firm of Fraser & Chalmers, of Denver, Chicago and New York, who built it. It appears in the accompanying engraving of the interior of the Alice hoisting works. The pump saves the company \$50 per day for wood, and guarantees it against possible loss by reason of the flooding or other accident to the old style of pump used below the surface. The Alice mills are two in number, one containing twenty and one sixty stamps. They are chloridizing or roasting mills, and daily treat 100 tons of ore, from which the bullion proceeds vary from \$80,000 to \$90,000 per month. The company employs 300 men and pays out monthly from \$40,000 to \$50,000 for wages and local supplies. Dividends amounting in all to \$525,000 have been paid.

Lexington.—This great property was sold a few years ago to a French company, and has since paid \$540,000 in dividends. The shaft is now 650 feet deep and is still going down. For four years past the property has produced \$1,000,000 per annum, and in the 400 and 500 foot levels alone enough ore is in sight and available for extraction to supply the mill for two years without further exploration. The mine is well equipped with a costly and powerful hoisting plant, air compressor and steam drills, and every other appliance to insure vigorous and economical work. The mill is the most complete in the Western Territories. It contains sixty stamps and daily crushes sixty tons of ore, varying in value from \$40 to \$70 in silver. The Lexington is justly regarded as one of the richest, most extensive and most permanent properties in the Territory. The excellence of its management is conceded by all.

Moulton.—Butte has every reason to be proud of the Moulton mine and its management. The property is developed to a depth of 500 feet, and is traversed by three separate and distinct ledges. For three years past a steady product of forty tons of good ore per day has been maintained. Three years ago the company was indebted in the sum of \$140,000. Since that time the mine has been systematically and thoroughly developed, the debt has been paid off, \$75,000 have been paid in dividends, and the company treasury to-day contains \$100,000 free from every incumbrance. Such, in brief, is the history of one of the silver mines of Butte. The Moulton mill