tower, and the remainder is conveyed down another tower 50 feet high, and by an exhaust fan is forced, through a conducting channel, into the bag-room. This conducting channel is floored with sheet zinc, and serves as a cooling-chamber, in which another portion of impure oxide collects.

The muslin bags in the bag-room are 30 feet long, and are attached to the sheet-iron tubes that convey the oxide from the cooling-chamber; so that they hang down perpendicularly. They are shaken by the bagman every four hours, and the oxide removed every twelve hours. After some preparatory treatment this oxide is packed and shipped.

The Spelter Works.—Both blende and oxidized ores (silicates and carbonates) are used in this branch of the work. The latter are roasted in large kilns, with one ton of coal to ten of ore. The diameter of these kilns, at the largest part, is about 10 feet. The roasting requires twenty-four hours. The roasted material is crushed with coal, 100 tons of ore to 40 of coal, and when sifted is ready for charging into the retorts.

The blende, after being roasted in heaps at the mines, is first crushed and then roasted as nearly dead as possible, in reverberatory furnaces, after being mixed with 40 per cent of coal dust. From one to two per cent of sulphur is, however, still left in the ore.

The retorts are made at the works of a mixture of fresh fire-clay and ground fragments of old retorts, and are 42 inches long, 9 inches in diameter outside and 6 inside. The condensers fitting by a level in the retorts, are 16 inches long, 6 inches in diameter at the largest and 3 at the smallest end (from outside to outside), the shell being a little over 3½ inch in thickness. Fifty-six retorts are placed in each furnace, in seven rows, eight retorts being in a row. Beneath the retorts is placed a row of six-so-called cannons to break the heat. These are 3 feet 4 inches long, and 7 inches in diameter, outside, and are not charged. The retorts rest at the back on ledges, and at the front on plates of firebrick 24 inches long, 9½ inches broad, and 2 inches thick, supported by vertical firebrick pillars 11 inches high. The furnaces are built in groups of four, the internal walls being entirely of firebrick, and the external ones of common brick, lined with firebrick. The walls of each furnace inclose a space 8 feet 3 inches by 2 feet 6 inches, the internal walls being about 18 inches, and the side walls 2 feet 6 inches thick. The slant at which the retorts are placed varies with the purity of the ore, but is generally from 3 to 6 inches from end to end. The furnaces have a framework of cast-iron to add strength, and flat iron plates are placed in front of the retorts to support the condensers, ladles, etc.

Forty pounds of the mixture previously mentioned, is charged every twelve hours into each retort, excepting those in the upper row, which are charged every twenty-four hours, with skimmings, impurities, etc., containing from 60 to 65 per cent of zinc. As soon as oxide of zinc is seen burning at the ends of the condensers, prolongs of sheet-iron, tapering to a fine point, are put on to the condensers, to save the escaping zinc. Every twelve hours the zinc is collected in ladles, and poured into moulds 7 inches by 24, and 1 inch deep, forming ingots which weigh from 40 to 45 lbs. each.

A block of four spelter furnaces costs about $5000, and one double reverberatory furnace for roasting, about $2500.

The process which actually takes place in the retort is the following: The air introduced with the charge causes an imperfect combustion of a portion of the carbon present forming carbonic oxide (CO), which reduces oxide of zinc to a metallic state, by taking oxygen from it, and forms carbonic acid (CO₂). We have then present in the retort, at a high temperature, oxide of zinc, carbon, and carbonic oxide. By the reduction of two atoms of zinc-oxide to a metallic state, one atom of carbonic oxide is converted into carbonic acid, and one atom of carbon into carbonic oxide, and so the process goes on, continually repeating itself till the contents of the retort are exhausted. The following formula may make the action clearer: \[2\text{ZnO} + \text{C} + \text{CO} = 2\text{Zn} + \text{CO} + \text{CO}_2\]

From carbonate and silicate ores containing 47 per cent of zinc, there can be actually extracted from 34 to 35 per cent, and from roasted blende