

the fine thirty revolutions, this low speed varying as the diameter gives a circumferential speed nearly equal to the speed of the falling ore. The result of this is that there is no dragging nor grinding of the ore, but simply a cracking. The importance of this feature in not producing slimes cannot be overestimated.

A table of mesh determinations made of an average sample of ore is as follows, the size of screen being 16-mesh (heavy rolled wire). The screens through which the sample was passed were all of fine wire, and there was little difference in size between the 16-mesh mill-screen and the 20-mesh sample screen:—

	Per Cent.
Stayed on 20-mesh	3.7
Stayed on 30-mesh	34
Stayed on 40-mesh	16
Stayed on 60-mesh	16
Stayed on 80-mesh	9
Stayed on 100-mesh	6.2
Through 100-mesh	15.1
Total	100.0

It will be noticed that the proportion of fine material is relatively small.

All belts used in the crushing-house for elevating ore are of "Leviathan" belting (made of prepared cotton duck), with one exception. This belting seems little or no worse for five months' wear, while one 8 in. 4-ply rubber belt has been nearly cut to pieces in the same time. The hard, tough, yet non-cracking surface of the "Leviathan" belt seems to make it an ideal conveyor of ore.

Every precaution is taken in the sampling and crushing department to avoid the sometimes considerable loss in dust. All ore is dampened before being crushed, the floors are sprinkled with water two or three times to each shift. The discharges from the fine rolls, elevator to screens, screen-bins, &c., are all connected with an exhaust-fan which delivers the dust into a hopper, from which it may be drawn off as desired.

From the screen-bins the ore is carried on a belt conveyor provided with flanged sides to the feed-hopper of a 40 ft. diameter Pearce turret roaster, similar in general design to those used elsewhere, except that the latest improvement in cooling the rabble-arms by water instead of air is made use of. Accompanying this innovation forged-steel teeth are employed for stirring the ore in place of the usual blades. These improvements are of very great advantage; no useless cold air is admitted to an ore that needs little air but very great heat; the arms retain their shape, being comparatively unaffected by the heat; while the teeth will last a year or two, thus doing away with the expense and annoyance of putting in a set of arms every week or so. In roasting concentrates, sulphides, &c., the deterioration of the air-cooled arm is not nearly so rapid, and the air is a very necessary adjunct; but in roasting such ore as is under discussion a very great heat is required—far greater than the former ores would stand without melting. With the old style of rabble-arm and blades any slight variation in the relative height of each arm above the hearth will cause an unequal distribution of the ore, and it will pile up either on the outside or inside of the hearth, resulting, of course, in an imperfect roast; with the forged-steel teeth this never occurs, each tooth seeming to act independently of every other one. The teeth are shaped in the form of a plough-share. They were at first used in a nearly flat form, but they had a tendency to carry raw ore around the hearth in one revolution. As soon as the present angular shape was adopted they gave perfect satisfaction. The furnace is provided with three fire-boxes; Northern Colorado or lignite coal is the fuel employed, occasionally mixed with Rock Springs coal if necessary.

A feature of the roasting department that deserves especial attention is that the roasted ore as it leaves the hearth is automatically cooled, carried in a screw conveyor to the boot of an elevator, which delivers it to the hoppers above the chlorination-barrels. The cooler consists of an iron box set in the hearth at the point of discharge, provided with 2 in. tubes, through which the ore is gradually drawn down to a feeding-plate—actuated by trips on the moving gear on the roaster—into a screw conveyor which delivers, as stated above, to an elevator leading to the chlorination-house. The cooling is accomplished by keeping the tubes surrounded by cold water. This device, during six months' actual work, has proved itself to be a thorough practical success. It does away with the first cost of a cooling-floor and the great expense for labour in moving 50 tons of ore every twenty-four hours. It is true that the ore is not delivered absolutely cold from the cooler, but it has never been hot enough to damage the elevator-belt or to cause the least anxiety as to fire. Water is allowed to drip on the ore at several points as it passes through the screw conveyor, the quantity being adjusted so as to just keep the dust down and not wet the ore so that it will not discharge from the elevator. This serves as a further protection against fire.

The chlorination-house comprises five floors set vertically above each other. On the top are three 5-ton hoppers; on the floor below are set three 5-ton lead-lined barrels of the usual type, except that they are provided with Rothwell's sand filter—illustrated and described in the *Engineering and Mining Journal* of the 19th October, 1895—instead of asbestos. The filter consists of a layer of coarse quartz 6 in. deep, kept in place by a slotted wooden bottom and a perforated lead sheet on top; the whole is securely braced and held in place by 2 in. by 6 in. slats wedged tightly under wooden strips bolted to the barrel. Through this medium, using 20 lb. to 40 lb. water-pressure, a charge can be filtered in from sixty to ninety minutes. The sand at first used was far too fine, and it was found necessary to use 2-mesh quartz, the idea being to let some of the slimes through, getting rid of them in the settling-tanks, and thus prevent the filter from clogging up.

Below the barrels are the solution-tanks, four in number, each of capacity sufficient to hold the solution from 25 tons of ore. On the same floor are likewise two settling-tanks and two precipitating-tanks of the same capacity. The use of a Montejus tank for transferring the solution