

to the guide-timber with eight $\frac{7}{8}$ in. bolts, the grooves in the guides are lubricated with a preparation of black-lead and linseed-oil, mixed warm, in such proportions as to form a soft paste. Oak guides last eighteen months, and those made of pine only about four months.

"*Mortars.*—Two kinds of single discharge mortars are used in the district. Each consists of one solid casting. The bottom and sides are so thick as not to need any lining, this thickness decreasing very considerably as the feed is approached. The outside walls are vertical, with the exception of the discharge, which projects somewhat. The top is closed by two pieces of 2in. plank, which rests on legs $\frac{3}{4}$ in. wide, cast in the mortar 2in. below the top. These planks have each five semi-circular recesses, which, when placed together, form holes for the passage of the stems. In addition to these five large holes, two smaller ones are bored for the two 1in. water-supply pipes placed between stamps 1 and 2 and 4 and 5. Two mortars are placed close together, as the stamps in both are set in motion by one cam-shaft. In order to reach the mortars, &c., a passage-way is left between every two pairs of batteries. From it passes upwards a 2in. pipe between each pair of batteries. The water-supply is derived from a 3in. main running along the front of the batteries. With this is connected a 2in. horizontal pipe, from which four 1in. pipes branch off at right angles, two for each mortar. In addition to this water-supply there is a 1in. pipe at each passage-way, close to the mortar, coming from the 3in. main. A hose is attached to this to clean the apron-plates, and for other purposes. The points of difference between the two mortars lie in the inside dimensions of the lower part of the mortar, and in the arrangement and number of the inside amalgamated copper plates.

"(1.) The Homestake mortar (Figs. 1, 2 and 3), weighing 5,400lb., is 54 $\frac{1}{2}$ in. high and 54 $\frac{1}{2}$ in. long. The feed-opening, beginning 6 $\frac{1}{2}$ in. below the top, is 24in. long, 4 $\frac{1}{2}$ in. wide, and 7in. deep. On entering the mortar it remains 24in. long and 7in. deep. At the bottom of the feed, forming the continuation of the incline, over which the ore passes into the mortar, is a lip 4 $\frac{1}{2}$ in. wide and 1 $\frac{1}{2}$ in. thick, designed to discharge the ore against the upper half of the stamp head. The lower edge of the lip is 14in. above the inside bottom of the mortar. As the lip wears out first it might be well to cast it thicker, as has been done in the Caledonia mortar. Taking the front view of the mortar, we find, 15 $\frac{1}{2}$ in. from the bottom, the discharge-opening, 48 $\frac{1}{2}$ in. long and 21 $\frac{1}{2}$ in. high. The frame is inclined outwards, about 10° from the vertical. On the short sides of the discharge-opening are grooves to receive the chuck-block, screen-frame, and curtain, which are held in place by keys and sockets. The chuck-block is also fastened at the bottom by two horizontal keys, supported by lugs on the outside lip of the mortar, below the discharge. Viewing the mortar in cross-section, we have the two bottom flanges 3in. high and 5in. broad. The bottom of the mortar—the mortar-bed—is 7 $\frac{1}{2}$ in. thick, and the sides at the bottom of the dies 3 $\frac{1}{2}$ in. The inside dimensions are at the bottom 10 $\frac{1}{2}$ in. and length 50in. Formerly the width was 14in., but in order to increase the crushing-capacity it was reduced—the height to issue of mortar, not of pulp—8 $\frac{3}{4}$ in.; width at this point 13 $\frac{1}{2}$ in., at the top of the discharge 20in., and at the top of the mortar 16in.; total inside height, 47in. The casting is $\frac{3}{4}$ in. thick from the top down to the feed opening, on three sides, the back being a little thicker. A mortar lasts four years wearing, pretty uniformly at the sides and back.

"(2.) The Caledonia mortar weighs 5,700lb., is 57 $\frac{1}{2}$ in. high, and 54in. long. The feed-opening beginning 15 $\frac{1}{2}$ in. from the top, is 3in. wide and 11in. deep, extending the entire length of the mortar, having a strengthening-rib in the centre. At entering the mortar it is 50 $\frac{1}{2}$ in. long and 7 $\frac{1}{2}$ in. deep. Here the lip 2 $\frac{1}{2}$ in. thick and 8in. wide, measured on the incline, begins. The bottom of the lip is 15in. from the bottom of the dies. As in the Homestake mortar, the ore is discharged towards the head of the stamp. The lip also serves as a protector to the amalgamated copper plate below it. The discharge-opening in front is 50in. long by 17in. high, and begins 20in. above the bottom of the flange. Its frame is also inclined outward, about 10° from the vertical. The grooves on the sides, receiving only the screen-frames and curtain, are simpler in construction than those of the Homestake mortar. The lugs for the horizontal keys are the same. Taking the cross-section, we find the flanges 3in. thick and 4 $\frac{1}{2}$ in. wide. The mortar-bed is 7in. thick, and the sides and the foot of the dies 4 $\frac{1}{2}$ in. The width at the bottom is 10in., length 50 $\frac{1}{2}$ in., and the height 14in. to the issue of the mortar and pulp, where the width is 16in., increasing to 19in. at the top of the discharge, and the top is only 13 $\frac{1}{2}$ in. wide, the total inside height being 50 $\frac{1}{2}$ in. The casting from the top of the mortar to the feed-opening is $\frac{3}{4}$ in. thick. A mortar lasts six years, and wears out more at the short sides than at the back.

"In comparing the two types, we see that they differ in the feed-opening as already stated. The feed-lip also differs, that of the Caledonia being thicker and wider than the other. The increased width is necessitated by the presence of the amalgamated copper plate below the lip. The mortar itself is also wider at the issue for the same reason. The depth of the Homestake mortar is 8 $\frac{3}{4}$ in., and that of the Caledonia 14in., the latter corresponding with the height at which the pulp occurs. In the Homestake mortar the issue is raised by the insertion of the chuck-block 16 $\frac{1}{2}$ in. above the bottom of the dies, thus giving, with a shallower mortar, a deeper issue of pulp than in the Caledonia.

"*Dies.*—The Homestake management cast its own dies. The quality of the iron used is between gray and mottled, the top of the cylindrical part being chilled. The foot-plate has bevelled corners and is 10in. long, 10 $\frac{1}{2}$ in. wide, and 1 $\frac{1}{2}$ in. thick. The cylindrical part, or "boss," is 9in. in diameter and 5in. high. The level of the die is 10in. below the discharge, which takes place over the chuck-block. The die weighs 121lb.—one-seventh of the weight of the stamp—and lasts six weeks, crushing 189 tons. By that time the cylindrical part has become slightly convex, and is worn down to 2in. from the foot-plate, its weight being reduced to about 30lb. Thus 48lb. of iron are consumed for every 100 tons of rock crushed.

"The Caledonia mill buys its dies outside, which are of chilled white-iron. The foot-plate has also bevelled corners, is 10in. wide by 9 $\frac{1}{2}$ in. long, 1 $\frac{1}{2}$ in. thick, the cylindrical part being 8in. in diameter and 5 $\frac{1}{2}$ in. high. While the dies of the Homestake mortar fill its bottom completely, those of the Caledonia fit perfectly in the width only, there being a space of 3in. in the length that has to