

thrown entirely against the screen; that of the wider Caledonian mortar is divided between the screen in front and the recess at the back.

"The upper part of the discharge of classes of mortars above the screen-frames is closed either by an inch-board, or by a canvas curtain, or piece of old belting suspended from a lath. This curtain or belt hangs down and meets the screen in the mortar. It has the advantage over the board, inasmuch that the amalgamator can readily pass his hand into the mortar and remove any chips of wood, &c., floating on the water or adhering to the inside of the screen. We have seen that in the Homestake the pulp is driven with force against the screens. In order to break its fall upon the apron-plate, a splash-board is fastened to the frame of the latter, thus preventing any amalgam collected there from being washed away. The Caledonia mortar has no splash-board, as the pulp does not pass through the screens with sufficient force to endanger the amalgam collected at the head of the apron-plate.

"*Stamps.*—The stamps used by both companies are of the ordinary pattern. They weigh 850lb., about 16lb. to the square inch of crushing-surface, and their centres are from 9 $\frac{3}{4}$ in. to 10in. apart. (For dimensions and other particulars as to different parts see table already given.) The stem tapers 6in. at both ends, so that when it breaks, usually where it enters the head, it may be reversed. At the Homestake mills a stem lasts about three years before new ends have to be welded to it. The Caledonia mill requires for its sixty-stamp mill about five stems yearly. The tough cast-iron head is without the wrought-iron rings, which are often used at the upper or lower end. It has the usual keyways for the removal of the stem and shoe. These are parallel instead of being at right angles as usual. To fasten the head to the stem the latter is let down through the guide-holes and the socket of head placed directly beneath it; the stem is then lifted and dropped and driven with a hammer if necessary. Then the stem and head together are dropped several times on a piece of timber placed beneath until they are quite firm. At the Homestake mills a head lasts five years, after which the socket has become so enlarged that the stem cannot be securely fastened in it any longer.

"Both the managements buy their heads from outside foundries. To fasten the shoe to the head, the shank is surrounded by small wooden wedges tied around it with a string; the shoe is put in place, and the stem and head are allowed to drop. Thus the shank is wedged into the recess of the head, and by raising the whole, and allowing it to drop several times, the shoe becomes thoroughly fastened in. To prevent it from injuring the die a piece of planking is placed on the latter. At the Golden Star mill a very neat arrangement is in use for fastening the wedges to the shank of the shoe. After the wedges have been placed around the shank a strip of canvas is wound around them and tacked to each wedge, forming a sort of collar, which can easily be slipped over the shank of the new shoe. This simple arrangement saves a great deal of time and labour on clean-up days, when a good many shoes have to be replaced.

"After being some time in use in the battery a shoe becomes slightly concave at the base, but wears, on the whole, more evenly than the die. At the Homestake mill a shoe lasts two months, crushing 270 tons of rock. It is then worn down to 2in. from the base of the shank, and weighs 40lb. This corresponds to a consumption of 37lb. of iron to every 100 tons of rock crushed. At the Caledonia mill a shoe lasts three months, and crushes 300 tons. It is replaced when worn down to 1in., and weighs 35lb., which corresponds to a consumption of 35lb. of iron for every 100 tons of rock. It may be asked why the Caledonia mill, which buys both its shoes and dies, does not use steel, which is so much more durable, and, consequently, cheaper, especially if the heavy freight-charges are taken into consideration. The answer is that, because steel lasts so much longer than iron, steel shoes and dies would continue in use after they had become uneven. This would reduce the crushing-capacity of the battery, and thus in the end would be no saving at all.

"In order to secure the tappet to the stem, the wrought-iron gib is first put into the recess. The tappet is then slipped over the stem, and, when it has reached the desired place, is secured by keys which pass at right angles between the gib and the iron shell of the tappet surrounding the stem. All the tappets of the Homestake mills have two keys; those at the Caledonia have some two and some three. Both faces of the tappet are used as working-faces. In wearing down they become uneven, and ridges are formed. The tappet then has to be removed and planed off in a lathe before it is fit for further use. Once in three years, when the two faces have worn down 1 $\frac{1}{4}$ in., the tappet is renewed by a new one. Case-hardened tappets and cams have been tried at the Homestake mills, in the expectation that the hardened working-surfaces would last longer; but the tappets cracked and became useless, as they could not well be planed off. Steel tappets and cams have not been tried. It takes from six to eight hours to change the tappets and cams of one battery.

"At the Homestake mills the drop is 9in., the number of drops per minute 85, and the order in which the stamps fall is 1, 3, 5, 2, 4. At the Caledonia mill the drop is 12in., the number 74, and the order 1, 3, 5, 2, 4 and 1, 4, 2, 5, 3. The Caledonia mill has such a hard rock to pulverise that it is forced to have a higher drop, and, consequently, a smaller number of drops per minute. The Caledonia mill has two different orders of drop, which is quite unimportant, as they both comply with the same requisition—namely, that no stamp shall be immediately followed in falling by either of those next to it.

"*Cams and Cam-shaft.*—The stamps are lifted by cams fastened to a shaft, which rests in boxes. These are supported by shoulders in the front of the battery-posts, to which they are bolted. Ten cams are keyed to one cam-shaft, which is set in motion by the cam-pulley. The cams are double-armed, and are made of tough cast-iron, having the form of the involute of a circle—slightly modified at the end—the radius of which is equal to the distance from the centre of the cam-shaft to the centre of the stamp. The hub of the cam, which is on the off-side of the stem, is not strengthened with the wrought-iron band shrunk on it, which is often used, but is cast sufficiently thick to stand the strain. At the Homestake mills the cams have a working-face 2in. wide and 3 $\frac{1}{4}$ in. deep. The strengthening-rib, beginning at the end of the cams, gains in depth towards the hub, where it is 9 $\frac{1}{4}$ in. deep. The hub itself is 3 $\frac{1}{4}$ in. thick. The distance from the centre of the hub to the