

be divided up between the five dies. The distance from the bottom of the screen to the top of the dies is 6in. The die weighs 160lb.—about one-fifth of the weight of the stamp—and lasts three months, crushing 300 tons of hard rock. The cylindrical part is then worn down within 1in. of the foot-plate. The worn-out die weighs about 38lb., making the consumption of iron 40lb. for every 100 tons of rock crushed.

*“Amalgamated Copper Plates.”*—These are placed along the entire length of the mortar. In the Homestake mortar one plate is set to the discharge-opening. In the Caledonia mortar there are two plates, one under the discharge, and the other beneath the lip of the feed-opening. The Homestake mills use the so-called chuck-block (see half-elevation, Figs. 2 and 3), placed against the lower flange and the two side-flanges of the discharge. The chuck-block consists of a 2in. plank, bolted to the back of a 1½in. board, and extending from 2in. to 2½in. above it, its inside edge being rounded off, and over this and along the inside face a ¾in. copper plate is fastened with iron screws. The recess formed on the top of the front board, 1½in. wide, and from 2in. to 2½in. deep, is taken up by the lower part of the screen-frame. Between this and the front board is placed a strip of carpet to form a tight joint. The frame is held in place by a vertical piece of flat iron, bolted to the centre of the front board, a horizontal wedge being driven between the two. The front board has an iron facing along its lower half, and two vertical strips towards the ends, to protect the wood against the two horizontal and the two vertical wedges with which it is fastened to the mortar. To the back—beneath the 2in. plank having the sheet copper—is tacked a strip of rubber cloth, which helps to make a tight joint between the wood and the flange of the mortar. Two chuck-blocks are in use. When the dies are new a block 7in. high is inserted, and when they have worn down 2in. another chuck-block 5in. high replaces it. Thus the height of the discharge is kept nearly uniform. The distance between the face of the shoe and chuck-block—2in.—is rather small. The violent motion of the battery water drives the sands against the copper plate, and scours off amalgam that has been caught on it. Thus comparatively little amalgam can settle on this plate. Wooden chuck-blocks last six months. After this period the copper plates have to be removed and put on new blocks, or they are scraped very carefully, put aside, melted, and sold. Mr. R. Graham, the millwright of the Homestake mill, has therefore replaced in his mill the 2in. plank to which the copper plate is screwed by ¾in. iron, to which the ¾in. copper plate is rivetted with copper rivets; the face of the 1½in. wooden board with ¾in. iron: thus the distance between face of shoe and Graham's chuck-block is 3½in., instead of 2in. This iron chuck-block lasts as long as the mortar, and more amalgam collects on it than did on the plate attached to the wooden one. Of the free gold recovered, 55 per cent. is caught on this inside plate.

“The reason the Caledonia mill has amalgamated copper plates at both back and front is that the ore melted is not oxidized at all, which makes it harder to extract the gold. The aim is to keep the pulp longer in the battery, and thus counteract the refractory character of the ore. The plate in front is 5in. wide, and the one at the back 8in., both plates being made of copper ¾in. thick, and are simply bolted to the mortar, the lower edges of the plates being 9in. above the foot of the dies. Of the free gold recovered, 60 per cent. is caught on these inside plates.

*“Screens.”*—Both diagonal-slot and wire screens are used in this district, with the exception of the Father de Smet mill, which uses partly No. 30 brass-wire screens. All Homestake mills use diagonal-slot screens, made of heavy Russia iron, the needle, No. 7, corresponding to a thirty-mesh wire screen, the width of the slot being 0.024in., the thickness of the iron being No. 24½ American wire-gauge, and its weight 0.987lb. per square foot. The slots are ½in. long, and there are eight to the inch. The punched surface of the screen is 48in. by 7in., a margin of 1in. being left around the screen making its size 50in. by 9in. A screen of this description lasts two weeks. The wooden frame is 4ft. 4in. long and 11½in. deep, has a strengthening-rib 6½in. long down the centre. In fastening the screen to the frame the lap is first tacked on to hold it in its place; then a piece of rubber cloth 2in. wide is placed over it. Small holes are punched through the rubber, and lap of screen and are both nailed to the frame. The screen is placed on the frame, with the rough side facing the mortar. On the outside of the frame are fastened, by means of two screws, three iron facings ½in. by 9in. and ¾in. thick, which protect the wood from the one horizontal and two vertical keys that serve to wedge the frame against the chuck-block and the planed flanges of the discharge.

“Some time ago experiments were made with screens of aluminium-bronze, which proved extremely satisfactory. The bronze contains, according to a letter from the Cowles Electric Smelting and Aluminium Company, 5 per cent. of aluminium, 95 per cent. of copper, and a trace of silicon, and is furnished in imperforated sheets at 1s. 10d. per pound. When new it has a golden colour, which it loses with use. The width and length of the slots are the same as in the ordinary screens, but there are nine slots instead of eight. The sheet is 0.035in. thick, and the screen lasts six months, and does not break, while the Russia-iron screens break in two weeks. The wear is uniform over the entire surface, the slots enlarging to No. 5½ needle, when the screens are then past use. The bronze, however, is not lost, but can be melted down and made into new screens. It is the intention of the Homestake management to introduce this screen throughout all its mills. This would have been already done had not the contract for Russia-iron screens been made before the bronze screen was tried.

“The Caledonia mill use No. 24 brass-wire screens, the thickness of the wire being No. 26, and the screening-surface 48in. by 5½in., the screen lasting one week. It is fastened to a simple wooden frame 53in. by 12½in., the horizontal sides being 3½in. wide, the vertical sides 2½in. Three wooden ribs 1in. wide divide the screen-surface into four panels, and thus prevent it from bulging out. The fastening of the screen to the frame and the wedging of this against the mortar are the same as at the Homestake, except that there the screen-frame is placed on the chuck-block and here it is keyed against the lower rim of the mortar-discharge. The Caledonia uses wire screens because, although its stamps drop 3in. farther than those of the Homestake mills, the splash is not so great, by reason of the greater width of the mortar and the space taken up by the amalgamated copper plate below the feeding-lip. The force of the splash in the narrow Homestake mortar is