end of the cam is 17in., and a cam lasts about three years. The cams of the Caledonia mill differ only slightly from those of the Homestake mills. The face is 2½in. wide and 2in. deep, the strengthening-rib at the hub 10½in. deep. The hub is 3½in. thick, and the distance from the centre of the hub to end of the cam is 19in. The cams, being made of car-wheel iron, last over four years.

"The cam-shafts are of tough wrought iron, turned down in a lathe, and they have one longitudinal key-seat. The keys with which the cams are fastened to the shaft are of steel, and are hand-fitted. Wrought-iron keys lose their shape too quickly, and machine-fitted keys get loose very quickly, a great disadvantage. It takes ten hours to replace a broken cam-shaft supposing that the keys have been already fitted. This ought always to be done, as the fitting of each key-seat takes about an hour. A well-appointed mill always has on hand several cam-shafts, with necessary cams and keys ready for use. The cam-shafts of the Homestake mills were formerly made 4½in. and 4¾in. in diameter, and lasted about five years. Now the tendency is to make them stronger. The largest in use at present is 5⅜in. in diameter, and this is said to be good for ten years. The distance between the cam-shaft and the stem is 5½in. The cam-shaft of the Caledonia is 4 13/16in. in diameter, and its centre is 6½in. distant from the centre of the stem.

"The cam-shaft pulleys at the ends of the cam-shafts vary slightly in the different mills. At the Homestake they are 6ft. and 7ft. 5in.; at the Caledonia 7ft. 4in. in diameter, the face being usually 15in. wide, and they are made of wood, as iron could not stand the continuous shocks caused by the dropping of the stamps, and they would also be too heavy. The pulley is built on a cast-iron hub with flanges, and keyed to the cam-shaft. When put in place the shaft is made to revolve, and the face of the pulley turned off to the desired form, so that it may be perfectly true. The cams are lubricated with axle-grease, and to prevent any of this from dropping on the apron-plates and hindering amalgamation, a curtain is stretched out beneath the cams to catch any particles of grease that these may throw off while in motion.

"*Crushing-capacity.*—The crushing-capacity of a battery depends on the efficiency of the stamp; that is, the number of foot-pounds developed, the character of rock under treatment, and the discharging capacity of the mortar—that is, the height and size of the discharge, the character of the screen, and the width of the mortar at the discharge. The Homestake stamps weigh 850lb., drops 9in., and makes eighty-five drops per minute; thus it develops 78,030,000 foot-pounds in twenty-four hours, crushing 4½ tons of rock, or 17,340,000 foot-pounds for every ton crushed. The Caledonia stamps weigh 850lb., drops 12in., making seventy-four drops per minute; thus developing 90,576,000 foot-pounds in twenty-four hours, crushing 3·3 tons, or 1 ton for every 27,447,272 foot-pounds developed. Thus, although the efficiency of the Caledonia stamp is greater than that of the Homestake, it crushes less ore. There are several reasons for this—first, the character of the rock, which is much harder than that of the Homestake; second, the width of the mortar at the discharge—16in., as against 13½in.—the 2in. recess for the 8in. amalgamated copper plate below the feed, which is absent in the Homestake mortar. From the lower discharge of the Caledonia mortar—6in., as against 10in.—a greater crushing-capacity would be naturally expected than from the Homestake mortar. The above reasons will explain why this fails. The smallness of the Caledonia screen—258 square inches, as against 376 square inches—may be assumed to be counterbalanced by its character—Caledonia No. 24 wire, against Homestake No. 7 slot, which corresponds to No. 30 wire. The Caledonia claims that more gold is recovered by its slow method than by the more rapid one of the Homestake. This point could only be definitely settled by exact tests.

"*Apron-plate, Mercury-traps, Sluice-boxes.*—In order to save the fine particles of gold that have not been caught on the inside copper plates, and to collect any amalgam and quicksilver that have passed through the screens and amalgamated copper plates, the apron-plate is placed in front of the mortar. The motion of the battery-water caused by the dropping of the stamps throws with the drop of each stamp some pulp against and through the screen. This, passing over the lip of the mortar, flows in small waves over the apron-plate. During the slight interval between these waves any heavy particles of pulp—quicksilver, amalgam, or fine gold—passing over the amalgamated plate have a chance to settle upon, adhere to, and combine with it. The plate consists of one sheet of copper, nearly as wide as the discharge of the mortar, fastened with iron screws to the inclined wooden table beneath it. In all the Homestake mills—excepting the Deadwood and Golden Terra, where it is 12ft. long—the copper plate 3/16in. thick is 10ft. long, falls 2in. to the foot, and discharges into a copper-lined trough leading to the mercury-trap. The apron-plates of the Caledonia are 8ft. long, 4ft. 6in. wide, and the copper is ⅛in. thick, the plates in all the mills having the same fall. The wooden table extends 4ft. beyond the end of the copper plate, at the same time narrowing to a width of 4ft. It has a 1in. rib down the centre, and is overlaid with two blankets 5ft. wide and 22in. long, the upper overlapping the lower. On these the heavy sands collect, and they are washed every half-hour into a tank. These blankets last about six months. Carpets were tried, but they frayed, and had to be thrown out after one month. The pulp from the blankets flows into the mercury-traps, one being placed in the middle of the discharge for every plate.

"The plates are Lake copper, furnished to the mills ready for use, and do not require any annealing to make them porous. They have, however, to be flattened with wooden mallets to make them lie smoothly on the wooden table, and to remove any inequalities produced during transportation. At the Homestake Mills they are first scoured with sand-paper, followed by emery-cloth, or with tailings and a wooden block 4in. square, or with a grindstone, until the face is perfectly bright. If necessary, the sand is moistened with a weak solution of potassium-cyanide, and spots are often removed with dilute nitric acid. The surface of the pure metallic copper receives a solid coat of potassium-cyanide, which is applied repeatedly as a strong solution by means of a soft paint-brush. After two days the mercury is sprinkled on this cyanide coat, and rubbed into the plate with a moist cloth and tailings. When the plate is thoroughly amalgamated it is put into place, and is ready for use. More than the usual amount of mercury is added to the mortar, that