more costly. In some American mines as much as a fortnight's supply is always kept on hand.

FEEDERS.—The early mills were fed by hand, a practice entirely obsolete at present. The machine feeder is able to handle at least fifteen per cent. more per hour, according to a recent estimate, and this alone warrants its adoption. At present, feeders of the Challenge or Tulloch types are the most widely used. The principle upon which they are designed is this: when the layer of ore on the dies becomes thin, the stamp falls farther and strikes a bumper rod; the latter actuates a system of levers, and some ore is delivered from a hanging or revolving tray. The depth of the layer of ore in the mortar is thus automatically regulated by a simple attachment on the feeder. The Tulloch, which is the cheaper and commoner of the two, has a suspended tray; when damp ore is being fed, a hard cake usually forms on it, necessitating frequent inspection; in other respects it is a good feeder and is easily regulated. The Challenge employs a revolving plate provided with scrapers, so that it works equally well on all ores; it is slightly more complicated in construction, but is generally regarded as the better machine.

The feeders are mounted on light wooden frames, which run on rails, and are so placed that the ore shoots are directly over the hoppers. In some of the most recent machines, the hopper is done away with and the feeding mechanism attached to the shoot; a little room is gained by this arrangement.

BATTERY.—The early Californian mill had stamps weighing from 500 to 600 pounds, making 16 to 18 inch drops at the rate of 20 to 25 per minute. Contrast this with modern practice, which employs stamps weighing 850 to 1,000 pounds, making 6 to 8 inch drops at a rate of 80 to 105 per minute. This is perhaps the most radical of the many changes which have been made, but there is no doubt that it is a step forward. To day we crush from  $1\frac{1}{2}$  to  $4\frac{1}{2}$  tons per 24 hours, as compared with 1 ton twenty-five years ago, and the cost per ton is considerably reduced at the same time.

The modern mortar is of iron entirely; the shoes and dies of cast iron or cast steel, as may be most economical; the screens of Russia iron, tinned plate, brass wire, or phosphor-bronze; and the battery frame of wood, iron or steel. From this enumeration it can be easily seen that anything of the nature of a discussion on these parts would be much too lengthy. We may notice that the introduction of steel frames is of importance to South Africa and Western Australia, although wood is still largely used. The employment of phosphor-

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