The tappet forms the projection under which the cam catches and lifts the stamp, and is fitted to the upper portion of the stem, being accurately bored so as to give a good sliding fit. This is necessary owing to the tappet requiring to be constantly adjusted according to the wear of the shoe so as to maintain a proper drop and prevent the striking of the cams. The old style of securing the tappet to the stem was with two vertical keys; in modern practice a gib fitting the curvature of the stem is placed within a recess in the tappet, and tightened by means of two or three side keys. To enable the tappets to be reversed when worn, both ends are faced and counterbored. The lifting mechanism is performed by cams with two arms fitted to the cam-shaft and curved in such a manner as to convert the uniform rotary motion of the cam-shaft into an upward motion of the stamp-stem, so that the rate of lifting shall be uniform, and by the intermittent action time is given so that the stamper may fall freely under the action of gravity.

The cam-action on the tappet tends to revolve the entire stamp on its own axis by friction, the extent of which depends on the velocity of the cam, weight of the stamp, and lubrication of the two surfaces. The speed of rotation should not be fast—about one complete revolution in twelve to twenty drops—it contributes greatly to the regular working of the whole machine, and causes the wearing-surfaces of the shoe and die to be more uniformly affected.

The old method of attaching the cams to the shaft with keys is now rapidly being superseded by the self-fastening cams of the Blanton type which grip the shaft by friction and are clamped more firmly with the lifting of the stamper. In this type the cam is bored to fit the shaft for about half its circumference the other side being fitted to receive a curved wedge, turned on the inside to the radius of the cam-shaft and of such a length as to allow the cam being moved about $\frac{3}{4}$ in. on the outside face. The wedges are suitably distributed along the shaft and held in position by two small dowels, the cams being simply slipped over and drawn smartly back on the wedges to fix them. A light blow on the under-side will release the cam and thus a whole set can be removed and replaced in a very short time.

A more recent modification of the Blanton grip is to machine the cam-shaft so as to have ten taper-faces running along its full length. This allows any cam to be placed in any required position on the shaft without the least fitting, and the order of drop can be easily altered if found necessary.

Height and Speed of Drop.—The height of drop must be in proportion to its rapidity. Sufficient time must be given for the stamper to fall by gravitation to a state of rest before being again lifted, otherwise the tappet will strike the cam. With a low drop a shorter-armed cam is used which lessens the leverage, decreases the strain, and allows of greater speed. With those who use the stamp mill for the purpose of crushing the high drop is a thing of the past. A 6 in. blow should be the maximum of drop with an increase in the weight of the stamper according to the hardness of the rock under treatment. Heavy fast-dropping stampers with the necessory low drop are undoubtedly the fastest crushers and will produce the most uniform tailings when worked under proper conditions.

The Order or Rotation of Drop requires careful attention before uniform working can be obtained, for it is absolutely necessary that an even layer of material should be kept over the dies, and an accumulation of crushed quartz at either end prevented. With inside amalgamation it is necessary to obtain a steady uniform wash backwards and forwards of the pulp in the mortar-box with as little splashing as possible; but there appears to be a great diversity of opinion as to which is the correct order of drop. It is probably affected to a certain extent by the height of the drop, shape of the mortar-box, position and area of screens, &c., but in most cases it is necessary to increase the drop of the stampers at either end of the box to ensure regularity. To vary the drop of individual stampers in a battery does not appear the correct way to overcome the difficulty, and should any difference be necessary it should be done by increase or decrease of weight. The common practice of dropping individually may possibly not be the best method, for there are cases where the stampers are dropped in pairs (*i.e.*, 1 and 5, 3, 2 and 4; or 2 and 4, 3, 1 and 5) in order that an even layer of material may be maintained without any difference in the drop, or weight of the stampers. Whatever the order of drop may be the weight should be evenly distributed over the cam-shaft to insure an even speed, and this is just as easily done by dropping in pairs as individually.

Mortar-boxes.

The capacity and efficiency of a mill must depend largely on the design and construction of the mortar, which varies considerably in weight, dimensions and shapes, according to the use for which it is intended. If required solely for crushing the design should be narrow, and of such a shape that the material cannot escape the crushing effect of the stamper, and must fall under the shoe thus increasing the force of the splash, diminishing the chances of pulverised ore resettling, and accelerating the exit of the pulp through the screen. But if, on the other hand, its crushing-capacity is to be reduced by attempting to make it an amalgamator, then let the mortar be more roomy so that inside plates may be used, give a weaker splash (increasing the chances of resettling) and thus allow portion of the ore to be unnecessarily slimed.

Mortars are generally cast in one piece and open the full width in the front to receive the screens through which the crushed ore is discharged. At the back, a feed-shoot is provided (sufficiently high to prevent splashing) with an opening extending from centre to centre of the two end stamps.

To get the best effect of the blow of a stamper the weight of the box must bear a certain definite proportion to it, no matter how good the foundations may be, or how firmly the mortar-blocks may be set. Although no doubt the proportion of weight has been well thought out, it still appears that a 4-ton box for 1,250 lb. stamps is on the light side, and from my own experience it seems highly probable that by increasing the weight of the mortar to 5 tons for 1000 lb. stamps, the crushing-capacity of the battery would be greatly increased. The heavier the stamper the faster it will crush, but the weight of the mortar or anvil on which the ore is crushed must increase proportionately before receiving the true effect of the blow. Although many assert that the mortars in use are quite heavy enough I feel sure that extra weight would prove to the contrary.