The wearing-parts of the mortar-boxes are protected by liners of cast-iron or wrought-steel plates (the latter being preferable) which can easily be renewed when necessary.

In the bottom of the mortar-box are placed the dies which form the working-face upon which the ore is crushed. There is one die to each stamper, the upper portion being cylindrical to correspond in diameter with the stamp-shoe, and the lower portion a square footplate with bevelled angles to facilitate the lifting from the box. The wear-and-tear of the shoes and dies not only depends on the ore and the degree of fineness to which it is crushed, but varies with the regularity of the feed, the rotation and drop of the stamper, and the varying depth of discharge. The material in use depends largely on local conditions; steel has the longest life but cast-iron gives a more even wear. The general opinion is that a steel-shoe with a cast-iron die renders the wear of each more uniform.

Screens.—We now come to what must be considered one of the most important questions in connection with the successful working of any mill—*viz.*, the proper size of the orifice of the screens. This can only be determined by a systematic sampling, grading, and assaying of the tailings, together with a careful study of the ore. The requisite degree of fineness to which the ore has to be crushed being partly decided upon, the question is—"What size of orifice in the screen will produce the maximum number of particles of the required size?" To arrive at this many things have to be considered, for only a small portion of the pulp (say about 10 per cent.) is actually crushed to the maximum size of the orifice, the rest being much finer, and a large proportion (in most cases about 40 per cent.) is reduced to slime. It is therefore evident that the size of the orifice does not determine the degree of fineness to which the ore is crushed and much depends on the width and shape of the box, the distance of the screen from the centre of the box, the rotation of the stampers, the height and speed of drop, and the depth of discharge. Suggestions have been made to use coarser screens than those required and thus crush 40 to 50 per cent. to its proper fineness, returning the 10 per cent. that is too coarse to the mortar; but surely when the causes of such irregular crushing are so self-evident the difficulty may be overcome to a large extent by using the stamp mill intelligently as a crusher, and giving every facility for the pulp to be discharged through the screens as soon as possible after it is crushed to the required size.

The screens in general use are of various kinds, some being plates suitably perforated (either plain or burred) and others are made of woven wire. Although the sheet-screens are more durable than those of woven wire, the latter present a far greater discharge-area giving sufficiently crushed particles an equal chance of being discharged or retained. The woven wire gives the necessary conditions for uniformity of pulverisation and a high crushing-power, their liability to choke being easily overcome by proper attention.

The screens are fastened to wooden frames and held in the frame-seat in front of the mortar-box by two long steel keys; they are usually set widening outwards at an angle of about 10° which renders them less liable to break without detracting from their efficiency.

The screen-area required would no doubt vary somewhat according to the material being crushed, but should only be increased when it cannot discharge as fast as the ore is crushed. Although it is quite possible that screening may be used to better advantage on a mortar-box, it does appear that in the modern mill with ordinary clean quartz the screen-area is quite large enough for the quantity crushed.

The Depth of Discharge is the distance from the level of the issue to the top of the die and varies in different mills from nothing to 12 in. or 15 in., according to the method of working. A deep discharge compels a slow crushing but a far more minute pulverisation of the ore than the screens indicate, as the material, instead of being forced up against the screen, has to rise up through the water before reaching it. The shallow discharge induces a more rapid but coarser crushing, as there is only a thin cushion of water between the ore on the die and the descending stamp which causes a more violent splash and forcible issue. The main use of a deep discharge in a modern mill is not for the purpose of fine crushing, but to permit of inside amalgamation being practised without the scour being too noticeable. It is, however, the varying depth of discharge (the great importance of which in many mills is underestimated; for, as the die wears, the depth increases) which creates such changing conditions and consequently renders it more difficult to regulate the thickness of the ore upon the die or crush to the requisite degree of fineness. This variation amounts to about 5 in., and in order to keep the discharge regular chock-blocks are inserted at decreasing depths according as the wear takes place; these when used in addition to false bottoms for insertion below the dies place the depth of discharge under complete and accurate control.

The Extraction of the Gold: Uses of Mercury.

Almost every system of gold-milling depends partly on the employment of mercury which has apparently been used from very early times. Being in a liquid state, at ordinary temperatures it differs from all other common metals, and has the property of uniting with gold, silver, copper, and other metals to form alloys or amalgams. On exposure to the air surface-oxidation takes place and it emits vapour to slight extent although its boiling-point is about 360° C. If mercury is agitated with pure water a certain amount is taken up mechanically in a state of minute subdivision, therefore, when subjected to the violent agitation and scouring action of sand and water in a stamp-battery, the extent to which flouring will take place is easily understood, apart from the injurious effects of deleterious matter contained in the ore.

By "flouring" is meant subdivision from mechanical causes, and once this occurs the action of foreign bodies (always present to a certain extent in stamp-milling) produces what is known as "sickening," where the particles so formed become coated with a film preventing a reunion. Grease, oils, and fatty substances readily cause sickening, and the base minerals always associated to a certain extent with gold and silver ores—*e.g.*, sulphur, arsenic, antimony, zinc, &c.—produce the same effect though probably to a lesser degree. This sickening produces a permanent flouring, and once the mercury is in