## Notes on Gold Milling.

By E. B. PRESTON, M.E., California State Mining Bureau.

## (Continued.)

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the apron. This latter point is reversed in some mills, and the sluice-plates are com-paratively steep. Between the aprons and the sluice-boxes a drop hox is placed, into which the

paratrixely steep. Between the aprons and the sluice-boxes a drop hox is placed, into which the pulp from the aprons discharges; there is one to each apron, or one for two adjoining ones. These boxes are t ft. wide and about 10 in. deep, with flat or partly sloping bottoms; these latter, generally where one box is usen for two aprons, the bottoms sloping from each end across the width of the apron, toward a central part where the bottom is level, and from whence it passes by overflow to the sluice-plates. These sluce-plates are in short lengths, and are either laid overlapping or screwed down to form a continuous sheet, and are prepared and treated in the same manner as the aprons. Of late years a useful addition is oeing made to the plates in the form of a shaking-plate, of the same width as the aprons, and immediately below them. It is either suspended or on a movable frame, and is given an end or side-shaking motion and light grade; for an end shake, the motion is imparted by a cam with  $\frac{1}{2}$  in stroke, and 200 strokes per minute. The correct strokes for these plates must be determined at each mill by experiment. Their efficiency was demonstrated in one mill, where the pulp passed over two consecutive apron-plates, and then to the shaking plate, which accumulated a greater amount of amalgam than the second apron. *Amalgam Traps*.—To retain any quicksilver or small particles of amalgam that escape inadvertently while dressing or cleaning the plates, traps are generally placed below the sluice-plates, and are made of various patterns. The general idea is for the pulp to drop to the bottom of a deep vessel and flow out at on near the apper edge; in some case, passing over a series of incliner shelves of copper plates during the descent. A simple and very efficient contrivance for an amalgam trap is to suspend a narrow low by one end and attach the opposite end to a rod connected by a pin to an eccentric, through which it receives a gentle shaking motion in the direction of its long side.

A simple and very encient contrivance for an amagem trap is to suspend a narrow how by one end and attach the opposite end to a rod connected by a pin to an eccentric, through which it receives a gentle shaking motion in the direction of its long side. The tailings are introduced into a stationary lox immediately above, from whence, diluted with fresh water, the pulp passes over the top of a partition in an even sheet to the signended hox below. The proper motion for this lower box must be found by experimenting, for which purpose the end of the rod is supplied with a series of holes, to shorten or lengthen the stroke. The motion should be just sufficient to keep the pulp suspended like quicksand, without splashing or caking on the bottom. Anneleumeting, ---Quicksilver is charged by hand into the mortars through the throat, at stated intervals, with a small wooden spoon. Automatic quicksilver feedeers have been invented that are worked from the cam-shaft in such a manner that, at stated intervals a little cup on a ratchet wheel, in revolving, dips quicksilver from a reservoir and drops it through a tube into the mortar. This insures alsolate regularity; but for some reason they do not find much application in California. Retorted or new quicksilver should be used for these purposes covered with a weak solation of cyanule of potassium.

cyanic of patassium. Quantity of Quicksilver. —To form some idea of the amount of mercury necessary to be introduced when handling an ore, the value of which is not known, a hora-spoon lest of a weighted quantity is made, and the quantity of gold decided. Gold alloyed with an appreciable amount of silver requires a larger addition of quicksilver than does a puter gold. One ounce of gold of average fineness can be amalgameted with 1 or. of picksilver, but for a safety margin, an allowance must be made, so that 2 oes. will answer better; and with extremely finely divided gold, 2% or 3 oes. If the stamps have a duty of two tons each, the amount of mercury requisite to amalgamete the gold

contained in one ton of ore should be divided into five parts and introduced at half-hour intervals. If the ore be of low grade, the necessary portion may be added every hour; as the value increases, the stated intervals for charging should be reduced. The larger proportion of California gold ores receive mercury every half hour. The skilled millinan judges from the condition of his plates as to whether he is charging correctly. He places his finger on the apron-plate, and if the accumulated anualgam gives to a gentle resistance, and has a putty-like feeling, the condition is about right; when hard to move, he must increase the charge; or if thin, reduce it. The harder the amalgam, the more it assumes a dead-white color. The matter of correct charging of the mercury requires a constant watching, as on this depends the success of battery amalgamation; hence the ore should be frequently tested with the horn-spoon.

success of battery amalgamation; hence the ore should be frequently tested with the horn-spoon. Amalgam retained on the inside battery-plates weighs heavier, for the bulk, than the apron amalgam. There is a diversity of opinion among millmen as to how often the amalgam accumulated on the aprons and sluices should be removed. Thus it is found in the California milling practices that aprons are scraped as often as twice a day in some mills, while in others it is allowed to accumulate from one clean-up day to the next, which sometimes means once a month. Personal experiments by the writer, conducted in various mills, invariably showed a yield of more amalgam from the more frequent removal of the accumulations, but as the clean-up of the apron would require the cessation of crushing, such frequent stoppages would materially lessen the output. To avoid this, as the upper 18 in. of the apron-plate retains about 75 per cent. of all the amalgam on it, this much of the apron-plate may be made separate from the rest, and held in place by wooden buttons on the side, so that it can be removed at any time the amalgam on it, this much of the apron-plate may be made separate from the rest, and held in place by wooden buttons on the side, so that it can be removed at any time while the battery is at work, and an extra plate, provided for the purpose, slipped in its place. Once or twice in the twenty-four hours it is advisable to hang up the stamps, one battery at a time, and dress-over the surface of the aptron-plate, sprinkling, if necessary, a little fresh mercury, and brushing it into the adhering amalgam, after which the amalgam should be evenly spread out again. This takes but very few minutes. Frequently, when dressing a plate, a very fine coating of a brownish or grayish color can be seen adhering to the surface, which, on the application of the brush, is easily detached and thoughtlessly washed off. If this be examined under the glass, it will be found to contain considerable gold, hence should be gathered carefully

glass, it will be found to contain considerable gold, hence should be gathered carefully in the gold-pan. To remove the amalgam from the plates, the stamps are hung up, the battery-water shut off, and the front of the screen and plates hosed off to remove any sand which would scratch the plate. The surface of the plate is softened by the addition of quicksilver until the amalgam moves readily. Then, commencing at the bottom and working upward, with a piece of rubber, or rubber belting, 4 in. long, with square edges, the amalgam is pushed ahead to the upper end of the apron, gathered in a heap, and transferred to a pan or bowl by means of a scoop. The amalgam is taken to the clean-up room for further cleansing. Where the amalgam has been retained on the plate for any length of time, as during an entire run, it requires a chisel or case-knile to rem we it thoroughly, care being taken not to scratch the plate. In scraping a plate it is not advisable to remove ("skin") all the amalgam ; enough should be left to form a thin coating, when ready to commence crushing again. All mills experience more or less loss of quicksilver, partly through careless hand-

All mills experience more or less loss of quicksilver, partly through careless hand-ling in dressing the plates, but also from the "flouring" of the mercury (breaking up into minute globules) after charging in the battery. This loss is extremely variable in the different mills, depending on the nature of the ore, high discharge, and low tem-perature of the battery-water. Ores carrying much tale, black oxide of manganese, galena, or arsenical pyrites, cause a good deal of flouring of the mercury. A further cause of loss is through incomplete retorting, a certain amount of mercury being re-tained in the bullion, which is volatilized in the subsequent melting. One half ounce to the ton of ore may be taken as near the average loss for California mills, although in a few cases these figures are doubled.

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in a few cases these figures are doubled. As the amalgam retained in the battery is less liable to loss than that portion ad-hering to the outside plates, the aim of the millman is to retain the largest proportion inside the screens. The coarseness of the gold has a good deal to do in this direction, as well as the splash and height of discharge. In some mills, as high as 80 per cent. of the total yield of amalgam will be found in the battery ; it is always greatest, with the same grade of gold, where the most copper-plate surface is found inside the hattery. The average proportion of amalgam retained in this country may be stated as two-thirds in the battery as against one-third on the (outside) plates, depending, of course, on the character of the gold in each district. As the proper condition of the mercury is a matter of importance to the millman, it is well to become familiar with its different phases. Pure mercury is bright, quick, and does not change its appearance on exposure to the air at ordinary temperature, but evaporates slightly. As the temperature decreases it becomes sliffer, and at low temperature assumes a more leaden appearance ; in raising the temperature it becomes more liquid. At 60° Fahr..it emits vapor sufficient to discolor a bright plece of gold when suspended over it in a closed vessel. Pare mercury, if dropped into a porcelain dish or on a table, will form into spherical globules, whereas the impure metal liveaks into pear-shaped drops, and if very impure, the particles drag a tail when moved. If containing lead, a skin of metal will remain on the fingernails when passing the hand through the surface. The introduction of grease or unctuous'substances, like clay and take, incline the metal to separate into extremely fine globules—flouring. Quicksilver is attacked by heated concentrated sulphuric acid, but is not affected by it when of mercury, a white compound. Quicksilver that has been used in gold-milling disolves and retains a certain amount of gold, which remains with it even af

held in solution. Satism Amzigam. —As sudium amalgam is frequently added to the quicksilver by millnen, the following method of preparing it is given: Dissolve small, dry chips of clean solution, freshly cut from a stick, in pure, dry mercury, gently heated in a flask or porcelain dish; addl it piece by piece until the mass has attained the consistency of soft putty, which should always be kept dry and well bottled, as it deteriorates rapidly in the air. This preparation is added to the mercury when dressing the plates; and to know when the proper amount has been added, dip a brightened nail into the quick-silver, which will adhere slightly to the edges of the nail if the amount be correct; whereas, if it becomes entirely coated, too much has been used, and more quicksilver must he added; on the other hand, if there he no signs of adhesion, more sodium amalgam must be added. Meaning and the the distry four hours, taking one part of acid to three of water. In returning foul quicksilver to purify it, the retort should only be half filled and the quicksilver covered with a layer of quicklime or charcoal powder. The heating should then be done very gradually, the retort not being brought to a full red heat. Cleaning U2.—Wuen ready to clean up a mortar, the feed of ore is shut off, and the speed of the stamps reduced until as mach of the sand, etc., as possible has been