(No Model.)

C. D. SMITH, W. A. SANDERS & G. E. WOODBURY.

ORE CONCENTRATOR.

No. 261,177. Patented July 18, 1882.

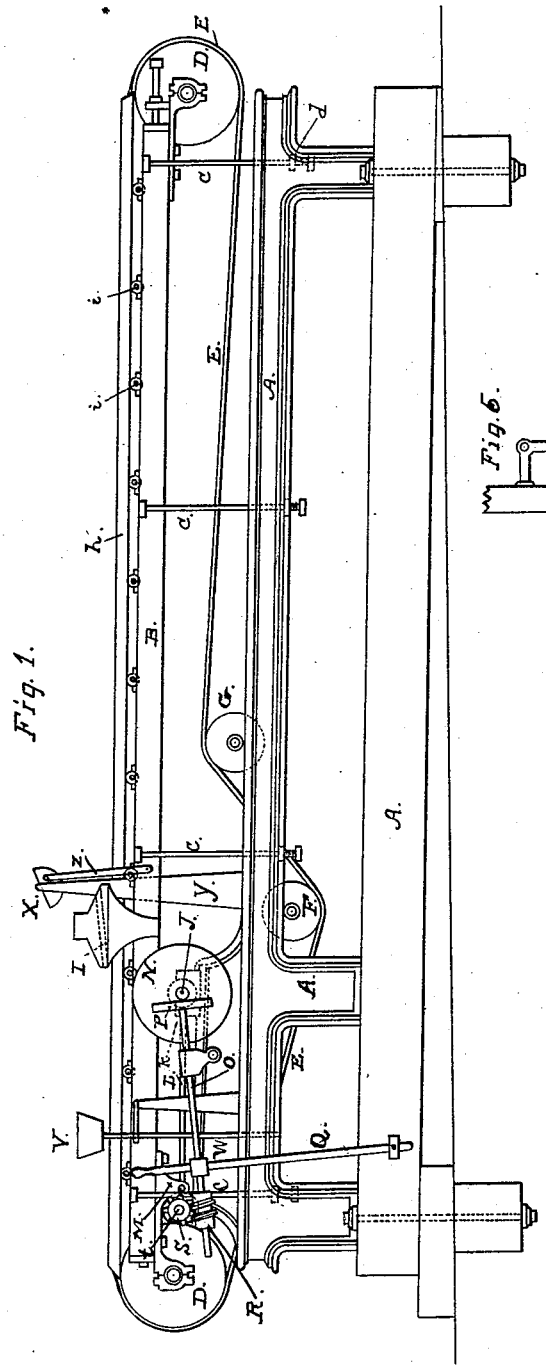

Fig. 1.

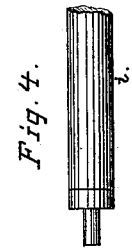

Fig. 4.

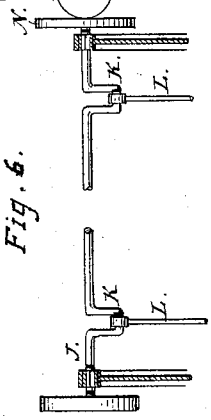

Fig. 5.

Fig. 6.

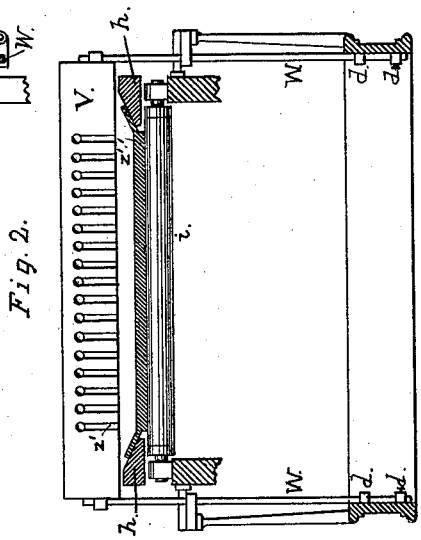

Fig. 2.

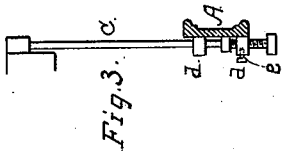

Fig. 3.

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ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 261,177, dated July 18, 1882.

Application filed October 18, 1881. (No model.)

To all whom it may concern:

Be it known that we, CHARLES D. SMITH and WILLIAM A. SANDERS, of Amador City, Amador county, California, and GEORGE E. WOODBURY, of San Francisco, State of California, have invented certain new and useful Improvements in Concentrators; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings.

Our invention has reference to that class of concentrators for separating sulphurets from ore pulp in which the pulp is distributed on an endless moving belt and subjected to agitation, whereby the sulphurets and heavy particles are settled to the bottom, while a stream of clear water washes off and carries away the sand and lighter portion, leaving the sulphurets to be carried along upon the belt to a place of discharge or deposit.

Our improvement in this class of machines consists in mounting the endless belt so that its upper surface will move up an incline, and then imparting to it a longitudinal motion or travel, while the frame around which it moves is caused to vibrate in line with the travel of the belt. In combination with the endless belt thus mounted and agitated we employ a laterally-vibrating water-distributer, from which clear water is discharged upon the pulp and belt for washing away and separating the lighter particles or portion of the pulp. We also employ a preliminary separating device, in which the pulp is received and subjected to a settling operation before it is distributed upon the belt, by which the free quicksilver and amalgam contained in the pulp are separated and collected, all as hereinafter more fully described.

Referring to the accompanying drawings, Figure 1 is a general elevation of our improved machine. Fig. 2 is a vertical cross-section taken in front of the water-box. Fig. 3 is a detail view of the adjusting device for the spring-legs. Fig. 4 is a detail showing the construction of the hollow rollers. Fig. 5 is a detail view of the movement for giving a lateral shaking motion to the water-box. Fig. 6 is a detail showing the cranks near the ends of the driving-shaft.

Let A represent a stationary base or frame-work. Above this stationary base we mount a frame or table, B, and support it on spring-legs C from the stationary base A.

In mounting the upper table we take care to have it higher at one end than at the other, so that its upper surface will be slightly inclined from end to end. This can be done either by graduating the length of the spring-legs or by making the lower frame or bed inclined. To render the height of these spring-rods adjustable we form lugs *d d* on the sides of the stationary frame directly under the spring-leg, and in each pair of lugs we arrange a screw, *e*, upon which the lower end of the spring-rod will rest, as shown at Fig. 3. By freeing the lower end of the rod and turning these screws the level of the table can be adjusted as desired. The lower ends of the rods are then secured again, thus holding them firm and allowing them to act as springs. This arrangement is highly important, as it enables us to preserve the desired level and incline of the shaking-table.

At each end of the frame B we mount a large roller, D, which extends entirely across the width of the table, and around the table we place an endless india-rubber belt, E, which is as wide as the table and rollers. This belt we depress after it passes around the higher end of the table A by carrying it down under a roller, F, which is mounted under the base-frame, and then we carry it up around another roller, G, which is mounted across the top of the base-frame A, so that it then passes along in line with the opposite roller D. This depressed portion of the belt passes through a water-tank, (not shown,) as will be hereinafter described. In manufacturing this belt we will make its edges thin for a short distance along each edge, as shown at Fig. 2. We then arrange stationary guides *h h* along each side of the table B, so that they will project above the surface of the table. We also arrange a series of transverse rollers, *i i i*, at intervals apart across the upper surface of the table B for the belt to rest upon. These rollers we construct of sheet-zinc rolled to a cylindrical form, and in each end we solder a head or block, to which the journal is secured, as shown

at Fig. 4. Such construction makes a roller that is light, yet strong enough to support the concentrating-surface when loaded and working, that is not affected by moisture and the constant exposure to moisture incident to its position. Wooden rollers for such purpose we have found to be unreliable, and cast-metal rollers would add to the weight of the vibratory frame to such a degree that the required short and delicate vibrating movement could not be obtained, as the momentum from such a weight would interfere and prevent the desired result—namely, a short, even vibrating movement. The thin edges of the belt will be pressed upward by the guides *h h* as they pass along the upper surface of the table, and they will thereby form the sides of the sluice, which prevent the pulp from escaping; but as the belt reaches the upper roller, D, there being no more guides to keep the edges raised, they will flatten out and pass around the rollers, like an ordinary belt. By this construction no special sluice is required, and no particles will lodge or be lost, as the entire sluice moves and the sides are integral with the bottom. We then impart to the belt a continuous traveling motion, and to the upper frame, B, which carries it, we impart a longitudinal back-and-forth vibration, so that the travel of the belt and the vibrations of the table are in the same line. The mechanism which we have adopted to accomplish this is as follows:

Under the table B and near its higher end we mount the driving-shaft J, which passes across under the table and has its ends supported in boxes on standards which form a part of the stationary base. The driving-pulley is on one end of this shaft, and at or near each end of it also is a crank or eccentric, K. These are connected by pitmen L with lugs or hangers M on the under side of the table B, so that the rotation of the shaft causes the table to swing back and forth longitudinally on its spring legs or supports. On the opposite end of the shaft is a disk-wheel, N. A horizontal shaft, O, is mounted in boxes on the stationary base A, and carries a small wheel, P, at its end in such position that its periphery bears against the side of the disk-wheel N with sufficient force to cause the wheel P and shaft O to be driven by the frictional contact. The shaft O is adjustable endwise by means of a hand-lever, Q, so that the wheel P can be adjusted to bear at any desired distance from the center of the disk-wheel N, and thus transmit a slow or fast motion, as desired.

The hand-lever Q is pivoted to the base of the machine, and secured to the shaft O, so that any amount of variation can be obtained instantly by moving it in one direction or the other. This quick movement sometimes becomes necessary when the feed becomes irregular and greater quantities of pulp are thrown upon the belt than should be.

On the opposite end of the shaft O is a worm, R, which engages with and drives a gear-wheel, S, which is mounted above it on a shaft, *t*. A friction-roller, (not shown,) which lies just back of the gear-wheel S on this shaft, drives the roller D, around which the endless belt passes, thus imparting to the belt a continuous travel at any desired speed.

V is the clear-water-distributing box. This box extends across the endless traveling belt near its upper end, and is mounted on spring-legs W. Its side is perforated with numerous holes to permit escape of the water in small streams. At each outlet is a groove or gutter, Z′, which leads down the side of the box and serves to confine and direct the water in the form of a stream upon the table beneath.

X is a semicircular trough, which is suspended above the moving belt at some point between the middle of the upper table and the water-distributer V. This trough extends across the moving belt, and is suspended on a pivot at each end at the upper ends of standards Y, which extend upward from the stationary base A. A pitman, Z, connects this trough on one side of its pivotal hanger with the moving table B, so that the movement of the table imparts to it a rocking motion. The pulp as it comes from the battery is run into the trough X, in which it is subjected to the panning or rocking motion, by which the particles of free quicksilver and amalgam that have escaped the plates in the battery are settled to the bottom, from which the accumulations can be removed, as occasion requires. The surface or lighter portion is constantly slopped over the lower edge of the trough by the rocking motion and falls upon an inclined distributing-plate, I. This plate moves with the table B, and distributes the pulp uniformly upon the passing endless belt or sluice. The forward movement of the belt carries the pulp up the incline, while the longitudinal vibration of the table and belt causes the sulphurets to seek the bottom. It then meets the laterally-vibrating shower of clear water, which separates the light portion and washes it down the inclined sluice, leaving the sulphurets clinging to the surface of the belt. As the belt passes around the upper roller, D, a portion of the sulphurets fall off into the tank below, while the passage of the belt through the water in the tank washes off the remaining particles.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In an ore-concentrator, the combination of an endless belt and supporting-frame, devices for reciprocating the same, a driving-shaft, friction-gear, belt-carrying rollers, and connecting devices between said friction-gear and the rollers, and controlling mechanism, as described, whereby the relative position of the friction-wheels may be varied, and the rate of movement of the belt with respect to the longitudinal reciprocations may be changed, substantially as set forth.

2. In an ore-concentrating machine, the com-

bination, with the belt-carrying rollers for moving the belt forward, and with the driving-shaft J, of the regulator described, consisting of a disk, N, mounted upon the shaft J, and disk or roller P, movable shaft O, and hand-lever Q, pivoted at the base of the machine and secured to the shaft O above, and connections R S, substantially as set forth.

3. A concentrator having a shaft, J, provided with crank or eccentric, which is connected with the vibrating frame by pitman L, the friction-wheel N, shaft O, and mechanism for moving and setting the same in a longitudinal direction, the friction-wheel P on the said shaft, working in contact with wheel N, and the worm R, by which the motion of the said shaft is communicated to the roller-driving shaft.

4. In an endless-belt concentrator, the india-rubber belt E, having its main body made thick and its edges thin, in combination with the guides *h* on the sides of the table, substantially as herein described.

5. In combination with an endless-belt concentrating-machine, the suspended rocking settler X, placed above the traveling belt to receive the pulp to be fed to the machine, and having a rocking motion imparted to it by mechanism in such manner that by virtue of the rocking motion the pulp is discharged, while the amalgam and quicksilver contained in the pulp is retained in such settler, substantially as herein described.

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