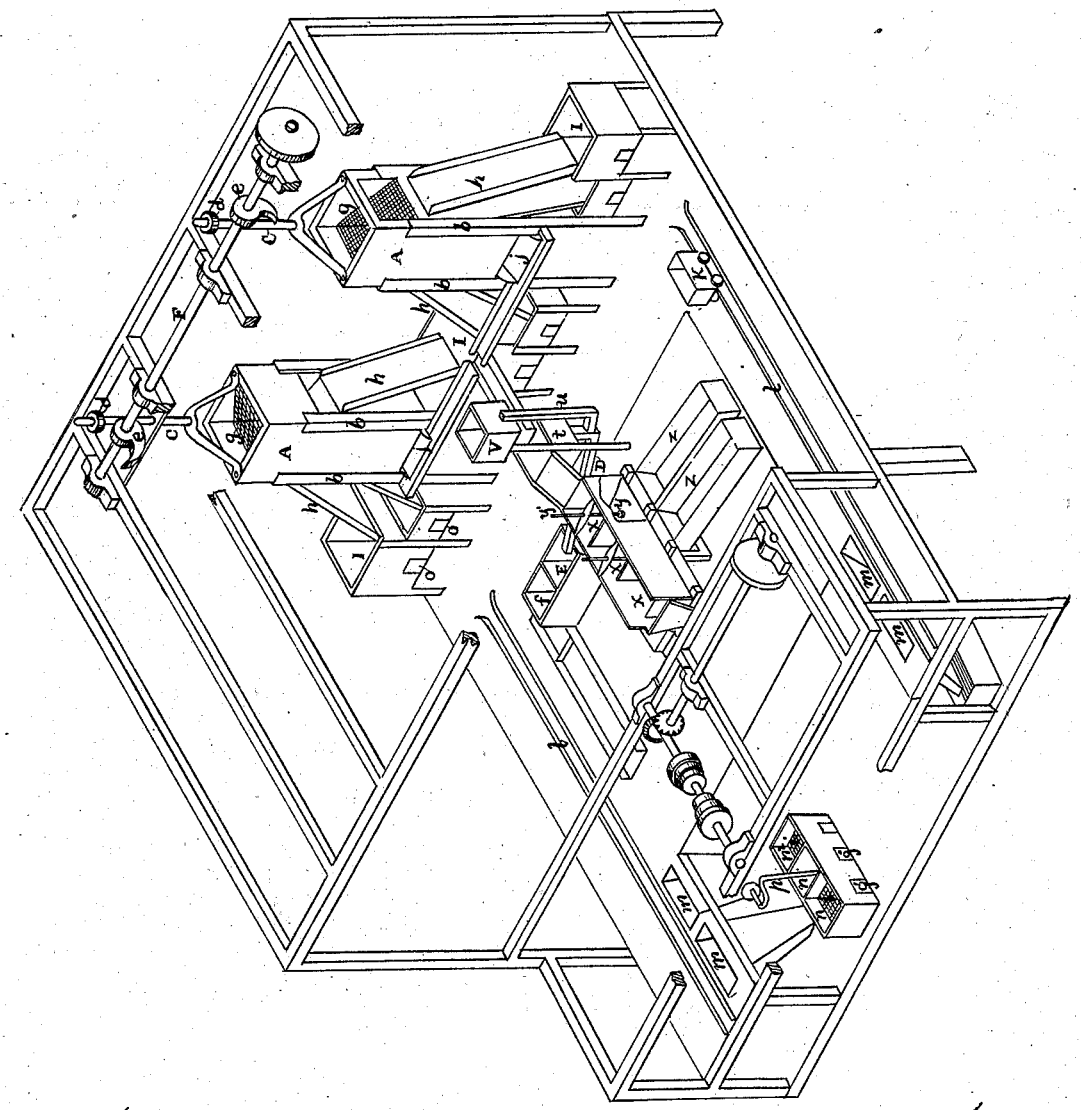
J. RICHARDS.

ORE-SEPARATOR.

No. 192,191. Patented June 19, 1877.



Witnesses.
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UNITED STATES PATENT OFFICE.

JOSEPH RICHARDS, OF BATTLE MOUNTAIN, NEVADA.

IMPROVEMENT IN ORE-SEPARATORS.

Specification forming part of Letters Patent No. **192,191**, dated June 19, 1877; application filed April 13, 1877.

To all whom it may concern:

Be it known that I, JOSEPH RICHARDS, of Battle Mountain, county of Lander, and State of Nevada, have invented an Improved Ore Sizing, Concentrating, and Washing Mill; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings.

My invention relates to a novel combination and arrangement of devices for sizing, separating, settling, and treating ore-pulp in order to concentrate and grade the particles of ore preparatory to subjecting them to the reducing process. My invention, therefore, resolves itself into a milling operation, the object of which is the mechanical separation of the different qualities and grades of ore, and the elimination before final treatment of the gangue or worthless portion of the ore.

Referring to the accompanying drawings, Figure 1 is a perspective view.

A A represent two sizing-boxes, which are mounted at one end of the mill structure, and into which the pulp or tailings is delivered by suitable spouts. These boxes are placed loosely inside of guides *b b*, and each one rests upon a suitable platform. A stem, C, is arranged to project upward from each box, and on this stem is a tappet, *d*. A cam, *e*, is secured upon a horizontal shaft, F, above each box, in the proper position to strike the tappets and lift and drop the boxes in the manner of operating stampers in a stamp-mill. Inside of each box I secure two or more inclined screens, *g g*, one above the other, each alternate screen being inclined in an opposite direction. The fineness of these screens is graded from the top down, the upper screen being the coarsest.

An opening is made in the sides of the boxes at the foot of each screen, and a chute, *h*, leads from each opening down to an elevated tank, I, which is mounted on legs on the floor below. By inclining each alternate screen in an opposite direction, one-half of the chutes and one-half of the tanks I will be on each side of the sizing-boxes. The pulp, therefore, which falls into the sizing-boxes will be screened by the upper screens so that only the coarsest portion will be delivered into the upper chute and pass into the outside tanks. The second screen will separate a second grade, and its chute will direct it into the tank on the opposite side, and so on down, separating the grains according to their size until the very fine portion, which is known as "slimes," passes off through a spout, *j*, at the foot of each sizing-box, which conducts them to a series of settling-tanks, to be hereinafter described.

The pulp which accumulates in the elevated tanks I is occasionally drawn off into a car, K, and conveyed by it along a track, *l*, to the opposite end of the mill, where it is dumped in equal proportions into two spouts, *m m*. These spouts deliver the pulp into my concentrator, which consists of these tanks, *n*, n^1, and n^2.

Inside of the middle tank n^1 is a plunger, *p*, which is connected by a pitman with a crank-shaft above, so that it is kept in continual motion. The two outside tanks $n\ n^2$ are connected with the middle tank by an opening at or near the bottoms, and a gate, *g'*, is arranged to regulate the size of these openings. The spouts *m m* deliver the pulp into the outside boxes $n\ n^2$, in each of which is placed a screen, *i*. A quantity of water is admitted into these tanks $n\ n^2$, so that the action of the plunger causes the pulp to be thoroughly washed and separated from any fine portion which might have found its way into the tanks. That portion of the pulp which remains above the screens *i i* is occasionally skimmed off and carried back to the spout *j*, where it is mixed with the slimes, and is subsequently treated with them, while the portion which settles through the screens is drawn off through the doors or gates *g g* in a clean condition ready for subsequent treatment. I employ two sets of these concentrators and washers, one set being located on each side of the mill, and each set serves to treat the pulp which is taken from one of the sizers. Usually I shall construct the boxes $n\ n^2$ with overflow-spouts, which will carry off the skimmings and thus render the operation continuous.

The slimes, which, as I above stated, passed off through the spouts *j* at the foot of each sizing-box, together with the settlings and washings from the concentrators $n\ n^2$, which have been added to them, are conveyed by a series of troughs to a tank, *t*, into the bot-

tom of which a stream of water is delivered through a pipe, *u*, which leads from an elevated reservoir, *v*.

This upward directed stream of water dilutes the pulp, and by its upward action carries the lighter portion of the slimes over the lower edge of the tank and through a spout, or into a series of settling-tanks, *x x x*. The first two settling-tanks have each a hole in its bottom, in which a conical or tapering plug, *y*, is secured. Each plug has a stem, *y'*, extending upward and passing through a cross-piece which extends across the top of the tank, so that the conical plug can be raised or lowered, as desired, in order to adjust the size of the opening, according to the quantity of pulp it is desired to draw of.

The stuff which passes through these holes is received in inclined tanks *z z* below, in which the particles will settle to the lowest part in properly cleansed and concentrated condition, leaving the lighter portion on top. The heavier portions of the slimes delivered into the tank *t* by the spouts *j* will settle down through a hole in the bottom of the tank and be conducted by a spout, D, into a tank, E, from which it overflows, into a tank, *f*, in a fit condition to be subjected to the reducing process.

This system of ore-washing, concentrating, and sizing apparatus is nearly automatic in its operation, so that the ore is put in proper condition for treatment at a slight expense.

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

1. The combination, with the sizing box or boxes A, with their graduating-screens *g g* and spout or spouts *j*, of the series of conducting-troughs and the settling-tanks *t x x x*, all constructed and arranged substantially as and for the purpose described.

2. The sizing and washing tank *t*, connected by the pipe *u* with the elevated water-reservoir V, in combination with the settling-tanks *x x x*, with their conical-plug openings, and the inclined receiving-tanks *z z*, all combined and arranged substantially as and for the purpose described.

In witness whereof I have hereunto set my hand.

JOSEPH RICHARDS.

Witnesses:
O. T. STACY,
FRANK A. BROOKS.