(No Model.)

H. C. KRAUSE.

ORE SEPARATOR.

No. 349,504. Patented Sept. 21, 1886.

Fig. 1.

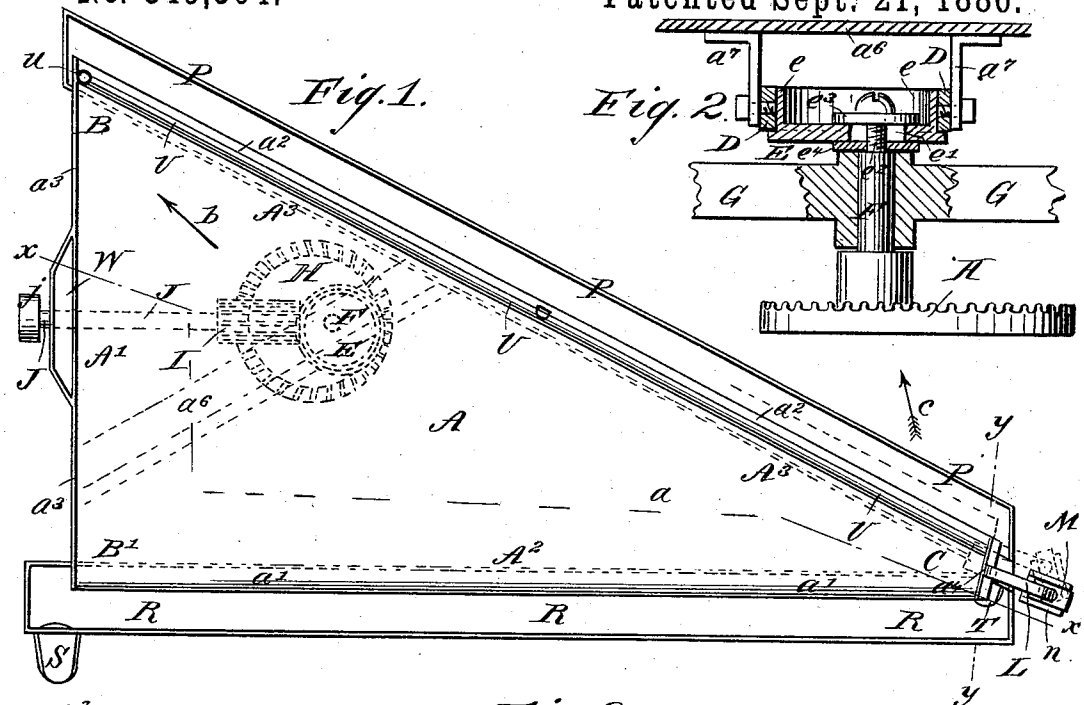


Fig. 2.

Fig. 3.

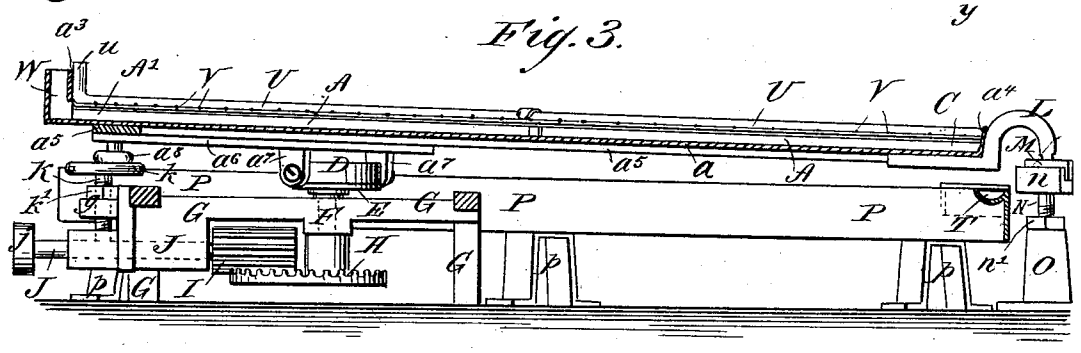


Fig. 4.

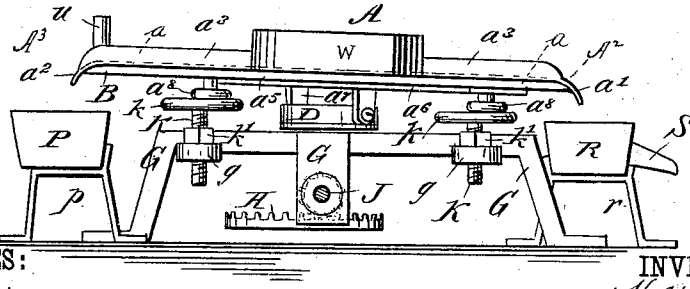
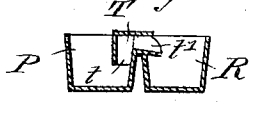


Fig. 5



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ORE-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 349,504, dated September 21, 1886.

Application filed April 27, 1886. Serial No. 200,289. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. KRAUSE, of Lake Linden, in the county of Houghton and State of Michigan, have invented a new and Improved Ore-Separator, of which the following is a full, clear, and exact description.

My invention relates to machines for separating and grading ores, and has for its object to provide a simple, comparatively inexpensive, and effective machine whereby ores of various kinds may be washed and concentrated, and the valuable mineral and the tailings separately and closely graded, and with economy of time and labor.

The invention consists in certain novel features of construction and combinations of parts of the machine, all as hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of my improved ore-separator. Fig. 2 is an enlarged detail vertical sectional elevation showing the driving-gearing by which the pan is agitated bodily. Fig. 3 is a vertical sectional elevation taken on the irregular line *x x*, Fig. 1. Fig. 4 is an end view of the front end of the separator; and Fig. 5 is a detail vertical sectional elevation across the mineral and tailings boxes, and taken on the line *y y*, Fig. 1.

The separator-pan A is formed of a flat plate, *a*, having downturned aprons a' a^2, respectively, at the tail and head edges, and upturned flanges a^3 a^4 at the front and back ends, respectively. The front end, A′, of the pan lies about at a right angle with the tail A^2 of the pan, and the head A^3 runs obliquely from the corner B of the pan toward the back end, C, of the pan, and preferably at an angle of from twenty-five to thirty degrees to the tail A^2. (See Fig. 1.)

To the bottom of the pan-plate *a* is fixed a marginal stiffening-frame, a^5, to which is fastened a bearer-plate, a^6, having lugs a^7 a^7, to and between which is journaled a gimbal-ring, D, which fits loosely upon a flange, *e*, of a plate, E, which is held to the top of a shaft, F, journaled in a frame, G, fixed to the floor of the mill-house. The plate E is slotted at e' for the passage of a screw-bolt, e^2, which also passes through washers or clamp-disks e^3 e^4, above and below the plate, on its way to the shaft F. With this construction the flanged plate E may be adjusted eccentrically to the shaft more or less, to control the bodily horizontal throw of the pan, for purposes presently explained.

To the shaft F there is fixed a crown gear-wheel, H, the teeth of which are arranged eccentrically to the shaft, and this wheel H meshes into a long pinion, I, fast on a driving-shaft, J, journaled in the frame G, and having a pulley, *j*, to which a power-transmitting belt will pass from any convenient motor.

The flanged eccentric plate E and the eccentric crown gear-wheel H will be set to give an accelerated horizontal motion of the pan A toward its front head corner, B, in direction of the arrow *b*, and by adjusting the eccentric plate E any required extent of bodily throw may be given the pan in this direction, as the class of ores being separated may require.

The front end, A′, of the pan is provided, preferably, with fixed bearer-feet a^8 a^8, which rest loosely on the tops of the large heads *k k* of screws K K, which are threaded into lugs *g g* of the frame G, and are provided with stop or jam nuts *k′ k′*. By adjusting the screws K K the front end, A′, of the pan may be raised to give the desired inclination from said front end to the rear end, C, and also to give the desired inclination to the front end of the pan from its tail corner, B′, to its head corner, B. A preferred downward incline or pitch from B to B′ is about one-quarter of an inch to the foot; but the front end of the pan will be inclined this way more or less, as the ores being worked shall require. The gimbal-ring D will slip on the flange *e* of the eccentric plate E, to allow any necessary adjustment of the head of the pan, as above described, and also to accommodate vertical adjustment of the end C of the pan, as next explained.

To the pan A, at its end C, is fixed an arm, L, the outer part of which is bowed, and at the extremity of the arm there is swiveled a shoe or bearing-block, M, which is adapted to slide in the grooved head *n* of a screw, N, which is provided with a jam or lock nut, *n′*,

and is threaded into a pedestal, O, on the mill-floor, as shown in Figs. 1 and 3 of the drawings. By loosening the nut n' the screw N may be raised or lowered in the pedestal O, and thereby vertically adjust the end C of the pan A, to give any necessary downward inclination to the pan from its front end toward its rear end. A preferred inclination of the pan in this way is about five-sixteenths of an inch to a foot; but the incline or slope may be varied by vertically adjusting the screw N and setting it by the lock-nut n', as the class of ores being worked may require. This means for supporting the end C of the pan not only allows vertical adjustment of the pan at that end to give it proper slope, but also provides for giving this end of the pan a greater or less extent of lateral throw toward and over the mineral-box P, which is supported by suitable leg-frames, p, or otherwise, beneath the head A^3 of the pan, to receive the washed and graded mineral from the pan. It is obvious that when the back end, C, of the pan is set vertically the screw N may be locked by the nut n', so as to hold the groove or slideway of the screw-head n at any desired angle to the stroke-line of the pan; hence when the head n is locked in the position shown in full lines in Fig. 1 the head of the pan at or toward its end C will receive very much less lateral movement in direction of the arrow c than it will receive when the head n of screw N is adjusted at a greater angle to the stroke-line of the pan, as shown in dotted lines. The lateral bodily movement of the back end of the pan in direction of arrow c is given as the pan is thrown or carried with accelerated movement in the direction of the arrow b by the eccentric gearing above described; hence this lateral motion of the back end of the pan will likewise be a comparatively quick one, and as the block M may be adjusted to a nicety to move at any angle to the general stroke-line of the pan, the finer ores passing toward the tail of the pan may be effectively separated and graded, as well as the coarser ores at and toward the head of the pan.

The tailings-box R is supported on suitable leg-frames, r, beneath the tail edge A^2 of the pan, and has a discharge-spout, S, and the back ends of the mineral-box P and the tailings or refuse box R will preferably be connected by a conduit, T, having an opening at t into the box P at about half the height of the box, and another opening at t' into the box R, whereby excess of water may pass off from the mineral-box to the tailings-box, and thence out at the spout S.

Water is supplied to the pan from a pipe, U, which ranges along and about parallel to the head A^3 of the pan, and just back of where the head-apron a^2 bends down from the main body of the pan. This pipe U will be connected to any source of water-supply at its end u by a flexible tube or pipe, allowing agitation of the pan, and the water will be delivered from pipe U into the pan in gradually-diminishing quantity or volume from the front end toward the back end of the pan, either by means of holes V of like size made in the pipe U at increasing distances apart toward the tail of the pan, or by holes V having gradually smaller sizes toward the back end, C, of the pan, and placed at like distances apart along the pipe, or by holes V made gradually smaller and also spaced farther apart toward the back end, C, of the pan, as may be preferred.

This graduated supply of water to the pan A allows the coarser and finer ore particles on the pan to be thoroughly washed with a minimum quantity of water, thereby not only avoiding waste of the water, but also preventing a washing and waste of the finer valuable ore particles back over the apron a' into the box R with the gangue or tailings.

The continuous operation of the machine is as follows: The crushed ore or gangue from the stamps will be fed onto the pan A through a box or chute, W, located at the front end of the pan, about over the driving-shaft J, it being understood that the plate E had been set to give the desired extent of bodily throw of the pan in direction of the arrow b, and that the pan had been set to incline properly from B to B', and from B B' to C, and that the slide-block bearing N n had been adjusted at proper angle to give the desired extent of lateral throw to the back end of the pan in direction of the arrow c. As the pulp or gangue flows toward the back end, C, of the pan, the quick or accelerated movement of the pan toward its highest point B, in direction of the arrow b, will carry or throw the heavier particles of ore toward that point, and the lighter ore particles will arrange themselves lower down the slope, according to their weight, and the current of water from the pipe U will wash all the worthless or comparatively worthless material over the apron a' of the pan into the tailings-box R, while the valuable mineral, by the forward impetus or momentum of the pan in direction of arrows b and c, will be carried over the head-apron a^2 of the pan into the mineral-box P in condition for smelting. The bearer-screws K K and N may be adjusted vertically at any time to alter the inclinations of the pan while the machine is running, to regulate the washing, concentration, and separation of the ores more closely as the work progresses.

It is obvious that the valuable mineral will not only be concentrated, but will be separated or graded into different sizes in the box P, with the larger particles at and toward the front of the pan, and the successively smaller particles ranging toward the back end, C, of the pan. The tailings or refuse will also be graded into different sizes in the box R, thus allowing the larger particles to be removed together and stamped or reduced for subsequent treatment, to recover what of value there may be in them.

Having thus fully described my invention,

I claim as new and desire to secure by Letters Patent—

1. In an ore-separator, the pan A, made with a front end, A′, and tail A^2, arranged about at right angles to each other, and with an oblique head, A^3, set at an angle of from twenty-five to thirty degrees to its tail, substantially as described, for the purposes set forth.

2. In an ore-separator, the pan A, made with a front end, A′, and tail A^2, arranged about at right angles to each other, and with an oblique head, A^3, set at an angle to the tail of from twenty-five to thirty degrees, an ore-feeding chute, W, at the front end of the pan, and head and tail aprons, a^2 a', and front and back flanges, a^3 a^4, substantially as described, for the purposes set forth.

3. In an ore-separator, the pan A, made with a front end, A,′ and tail A^2, arranged about at right angles to each other, and with an oblique head, A^3, set at an angle to the tail A^2 of from twenty-five to thirty degrees, in combination with mechanism for adjusting the pan-surface to give it backward slope from its front head corner, B, toward its front tail corner, B′, and toward its back end, C, substantially as described, for the purposes set forth.

4. In an ore-separator, the pan A, made with a front end, A′, and tail A^2, arranged about at right angles to each other, and with an oblique head, A^3, set at an angle to the tail A^2 of from twenty-five to thirty degrees, combined with mechanism for adjusting the pan vertically to give it a slope from its front head corner, B, toward its front tail corner, B′, and toward its back end, C, and mechanism for imparting an accelerated horizontal movement to the pan toward its front head corner, B, substantially as described, for the purposes set forth.

5. In an ore-separator, the pan A, made with a front end, A′, and tail A^2, arranged about at right angles to each other, and with an oblique head, A^3, set at an angle to the tail A^2 of from twenty-five to thirty degrees, in combination with mechanism for adjusting the pan to give it a downward inclination from front to back ends and from head to tail, mechanism for imparting an accelerated horizontal movement to the pan toward its high front head corner, B, and a water-distributing pipe arranged over and along the oblique head A^3 of the pan, and having orifices giving a downward discharge of water upon the pan toward its tail in gradually-diminishing volume from the front of the pan toward its back end, substantially as described, for the purposes set forth.

6. In an ore-separator, the pan A, made with a front end, A′, and tail A^2, arranged about at right angles to each other, and with an oblique head, A^3, set at an angle to the tail A^2 of from twenty-five to thirty degrees, in combination with mechanism for adjusting the head and tail of the pan to give it an inclination from the front head part, B, toward the front tail corner, B′, and toward the back end, C, mechanism for imparting a forward horizontal movement to the pan toward the front head corner, B, and a laterally-adjustable bearing at the back end, C, of the pan, with which said end is in sliding connection, substantially as described, for the purposes set forth.

7. The combination, in an ore-separator, of a pan having an oblique head, mechanism for giving the pan a downward slope from its front head corner, B, to its tail and back end, mechanism for imparting a horizontal forward movement to the pan toward its front head corner, B, and a laterally-adjustable bearing at the back end, C, of the pan, with which said end is in sliding connection, substantially as set forth.

8. The combination, in an ore-separator, of a horizontally-movable pan, an eccentrically-arranged flanged plate beneath and connected to the pan, a vertical driving-shaft, to which the eccentric plate is adjustably connected, and an eccentric driving gear-wheel on said shaft, substantially as described, for the purposes set forth.

9. The combination, in an ore-separator, of a horizontally-movable pan having an oblique head and a high front head corner, as at B, an adjustable eccentric flanged plate beneath and connected to the pan, and eccentric gearing imparting an accelerated horizontal bodily movement to the pan toward the front head corner, B, substantially as described, for the purposes set forth.

10. The combination, in an ore-separator, of a horizontally-movable pan, a gimbal-ring bearing, D, a vertical driving-shaft, an adjustable eccentric flanged plate working in said ring-bearing and connected to the driving-shaft, an eccentric gear-wheel, H, on said shaft, and a pinion, I, gearing with said wheel H, substantially as herein set forth.

11. The combination, in an ore-separator, of a horizontally-movable pan, an eccentrically-arranged flanged plate beneath the head of the pan, a shaft to which said flanged plate is connected, an eccentric gear-wheel on said shaft, and a swiveled sliding bearing supporting the back end of the pan, substantially as described, for the purposes set forth.

12. The combination, in an ore-separator, of a pan having an oblique head and a high front head corner, B, headed screws K K, arranged beneath the front end of the pan, an arm, L, connected to the back end of the pan, a slide-block, M, swiveled to said arm, and a screw, N, threaded into a support, O, and having a head, *n*, forming a guide for the block M, which thereby may be set at different angles to the stroke-line of the pan, and mechanism for imparting a horizontal movement to the pan toward its high front head corner, B, substantially as described, for the purposes set forth.

13. The combination, in an ore-separator, and with a horizontally-movable pan having

an oblique head and a front end and a tail arranged about at right angles to each other, and the surface of said pan sloping toward its tail and back end, of mechanism for imparting a forward movement to the pan toward its high front end corner, B, and mineral and tailings boxes P R, placed below the head and tail of the pan, respectively, substantially as described, for the purposes set forth.

14. The combination, in an ore-separator, and with the horizontally-movable pan A, constructed and operated substantially as specified, of mineral and tailings boxes P R, arranged below the head and tail of the pan, respectively, said boxes being connected by a conduit, T, next the tail of the pan, substantially as herein set forth.

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Witnesses:
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