

(No Model.)

2 Sheets—Sheet 2.

F. R. BROWN.

ORE SEPARATOR.

No. 291,872.

Patented Jan. 15, 1884.

Fig. 3.

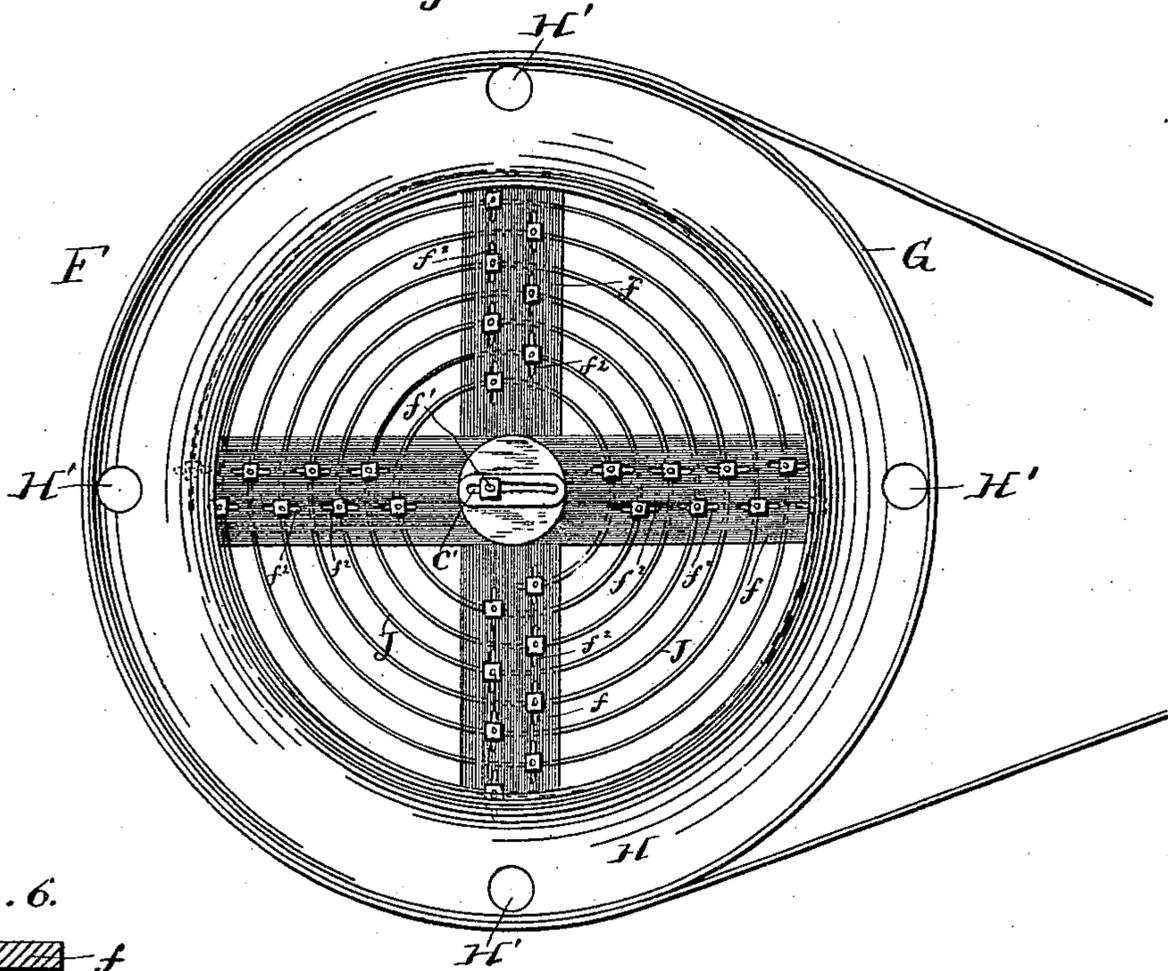


Fig. 6.

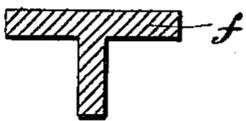


Fig. 7.

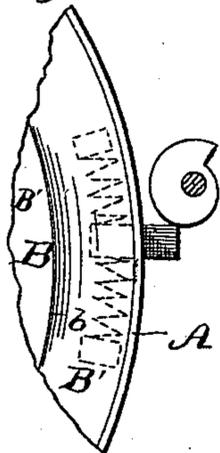


Fig. 4.

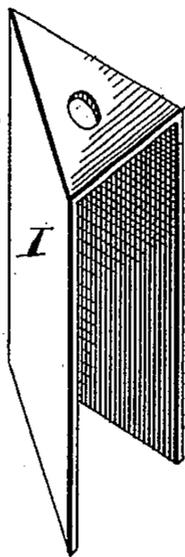
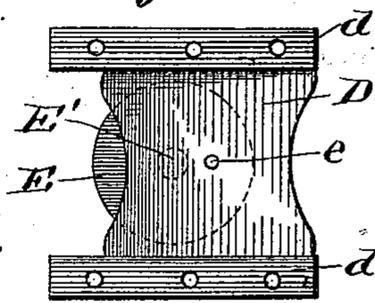


Fig. 5.



WITNESSES

Chas. R. Burr
George Tilghman

INVENTOR

Francis R. Brown
by W. H. Babcock
Attorney

UNITED STATES PATENT OFFICE.

FRANCIS R. BROWN, OF BOULDER, COLORADO.

ORE-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 291,872, dated January 15, 1884.

Application filed October 19, 1883. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS R. BROWN, a citizen of the United States, residing at Boulder city, in the county of Boulder and State of Colorado, have invented certain new and useful Improvements in Ore-Separators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to ore-separators, and especially to those which employ a pan shaken by machinery for such purposes, although most of the devices hereinafter described and claimed are applicable to separators not thus constructed.

Said invention consists, first, in a separator-pan provided with a convex bottom constructed in successive inclines, and having a central discharge-opening, substantially as hereinafter set forth; secondly, in a separator-pan provided with a convex bottom constructed in successive inclines, each incline being provided with one or more pockets adapted to arrest the heavier particles of ore as they are moved circularly or spirally over said bottom, substantially as hereinafter set forth; thirdly, in a separator-pan, in combination with a rotating diaphragm which has a coiled or spiral flange attached to its under side, and operating as hereinafter set forth; fourthly, in a separator-pan, in combination with a rotating diaphragm which has a coiled or spiral flange attached to its under side, the coils of said flange being of increasing height or width from the center outward, as hereinafter set forth; fifthly, in a separator-pan, in combination with a rotating diaphragm which has a coiled or spiral flange attached to its under side, and devices for adjusting the coils of said flange toward or from each other, substantially as hereinafter set forth; sixthly, in a separator-pan, in combination with a rotating diaphragm which is provided with devices whereby it may be secured in a concentric position with respect to said pan or adjusted to different degrees of eccentricity, substantially as herein-

after set forth; seventhly, in a separator-pan, in combination with an axial stud or post, a diaphragm arranged to rotate, and having its hub or center slotted so that it may be arranged concentrically or eccentrically with respect to said pan, and a bolt or bolts for securing the same; eighthly, in a pan for separating ores, in combination with a sliding block moving in guides attached to said pan, and certain devices whereby said block is operated to cause oscillation, substantially as hereinafter set forth.

In the accompanying drawings, Figure 1 represents a vertical section through a separator embodying my invention. Fig. 2 represents a plan view of the pan with the diaphragm and its attachments removed. Fig. 3 represents a detail plan view of the diaphragm and its attachments. Fig. 4 represents a detail view of one of the wings carried by said diaphragm. Fig. 5 represents a detail view of the slide whereby the pan is rocked, with its guideway and proximate devices. Fig. 6 represents a vertical section of one of the arms, and Fig. 7 represents a modification of the shaking devices.

In the said drawings, A represents the side wall of an ore-separating pan, and B the bottom thereof. The general shape of said bottom is convex; but it is divided by annular steps *b* into a series of annular ascending inclines, *B'*. Said bottom is provided with a central hub, *B²*, which fits upon an upwardly-extending stud, *c*, cast with a metallic base, C. This hub has play axially about said stud, though there is no complete rotary motion. It receives its horizontal oscillation from a block, D, which moves radially in and out in guideways *d*, formed in or on the under side of the bottom of said pan, or, as shown, rigidly attached thereto, this block being operated by an eccentrically-arranged pin, *e*, carried by a pulley or rotating disk, E, mounted on a vertical shaft, *E'*, and turning therewith. This shaft is driven from the driving-shaft of the machine, (not shown,) or from any suitable source or transmitter of power. As the block D moves back and forth it bears alternately against one or the other of its guideways *d*, so as to turn the separating-pan a short distance, first to one side horizontally

and then to the other. At the highest point of the bottom B, and at the side of the hub B², is the large outlet B³, for waste material, which, being lighter than the more valuable products, is raised to this point for discharge. In each incline B' there is formed one or more pockets, B⁴, each of which is provided with a faucet, B⁵, or other means of emptying it and controlling its emptying.

F designates an annular diaphragm, which is provided with two diametrical arms or bars, *f*, that cross each other at right angles in the center of the pan, forming a hub, which rests upon the hub B² aforesaid. This hub is constructed with a slot, *c'*, across its center, and through this slot extends a bolt or bolts, *f'*, whereby it is so attached to hub B² as to rotate thereon. Fig. 3 shows only a single bolt used for this purpose, as, with the narrow slot there shown, two bolts would prevent rotation, unless the construction were modified in other respects. When the slot or opening in the hub is made broad enough, two bolts may be used, and the attachment with two bolts is generally preferred. By means of these bolts the diaphragm may be made either concentric with the pan, or eccentric thereto in a greater or less degree. This is accomplished by loosening said bolts, slipping said diaphragm laterally into the position desired, and then tightening said bolts again. By adjusting the diaphragm to a position eccentric to the pan, I provide for the dislodgment of the particles of ore which may adhere to the former, as the vibrations of the pan will cause the water to be dashed at intervals against said diaphragm on one side or the other, (according to said adjustment,) instead of passing through the annular space of uniform width which intervenes between the sides of the diaphragm and pan when they are concentric. This dashing not only washes the diaphragm, but jars or shakes it at all points, and thereby dislodges the adherent particles referred to. The side wall of the diaphragm is raised above the top of the pan, forming an annular band, G, which receives an endless belt, whereby the diaphragm is rotated from any convenient source of power. In or on the top of this diaphragm, at the periphery thereof, is formed a circular trough, H, from which spouts H' (preferably four or more in number) extend down through said diaphragm and discharge into the pan below. Through these spouts the stock to be operated on and also the water are introduced either together or separately. To the under side of said diaphragm, near the periphery thereof, are secured several downwardly-extending wings, I. These are V-shaped in cross-section, and their office is to keep the water and stock in rapid rotation. The arms *f* of said diaphragm are provided with longitudinal slots *f*², which are adapted to receive bolts whereby the coils of a helical or coiled flange, J, are secured to the under side of said arms. This flange or spiral J has its

outer coils of greater height than its inner ones, the decrease inward being regular from coil to coil and corresponding to the convexity of the bottom of the pan. The office of said coiled flange or spiral is to draw, as it rotates, the water and the lighter material of the stock upward to the outlet already described. This flange or spiral is preferably made in sections. The slots in the arms already described allow the coils to be separated more widely or drawn more closely together, thus regulating its action.

The operation of the separator is partly by gravity, the heavier particles of ore, which are generally the most valuable, naturally tending to settle upon the lower inclines, and those less heavy on successively higher inclines. They will also naturally settle, from the same cause, in the pockets aforesaid.

The flange or spiral before described may be coated with quicksilver, and quicksilver may be employed in any other part of the separator where it would be serviceable.

The shaking, rotating, and adjusting devices may obviously be modified in various ways without departing from the spirit of the invention. For example, the pan may be shaken by a cam on a shaft, which strikes against a tappet secured to said pan, a buffer of resilient material being preferably used to lessen the jarring effect of the stroke and the wear caused thereby. A spring or weight or any positively-acting device of suitable nature is employed to effect the return movement of the pan.

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

1. A separator-pan provided with a convex bottom constructed in successive inclines and having a central discharge-opening, substantially as set forth.

2. A separator-pan provided with a convex bottom constructed in successive inclines, each incline being provided with one or more pockets adapted to arrest the heavier particles of ore as they are moved circularly or spirally over said bottom, substantially as set forth.

3. In combination with a separator-pan, a rotating diaphragm which has a coiled or spiral flange attached to its under side, and operating as set forth.

4. In combination with a separator-pan, a rotating diaphragm which has a coiled or spiral flange attached to its under side, the coils of said flange being of increasing height or width from the center outward, as set forth.

5. In combination with a separator-pan, a rotating diaphragm which has a coiled or spiral flange attached to its under side, and devices for adjusting the coils of said flange toward or from each other, substantially as set forth.

6. In combination with a separator-pan, a rotating diaphragm which is provided with devices whereby it may be secured in a con-

centric position with respect to said pan, or adjusted to different degrees of eccentricity, substantially as set forth.

5 7. In combination with a separator-pan and an axial stud or post, a diaphragm arranged to rotate, and having its hub or center slotted, so that it may be arranged concentrically or eccentrically with respect to said pan, and bolts for securing the same.

10 8. In combination with a pan for separating

ores, a sliding block moving in guides attached to said pan, and certain devices whereby said block is operated to cause oscillation, substantially as set forth.

In testimony whereof I affix my signature 15 in presence of two witnesses.

FRANCIS R. BROWN.

Witnesses:

WM. H. BABCOCK,

GEORGE TILGHMAN.