H. BRADFORD & J. B. WILFORD.

Ore-Separator.

No. 221,661. **Patented Nov. 18, 1879.**

Fig. 2.

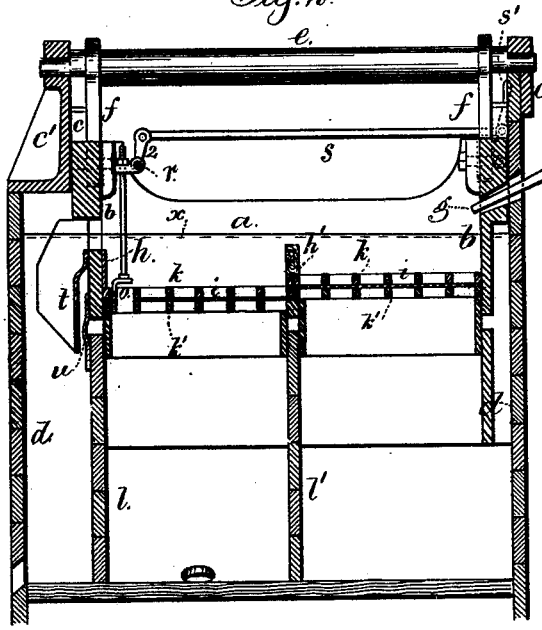


Fig. 3.

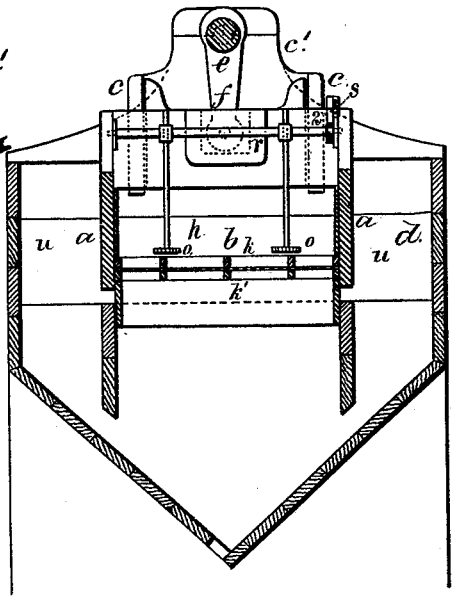
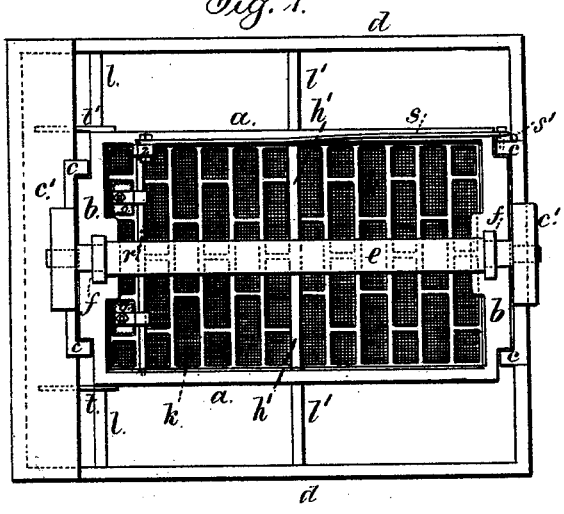


Fig. 1.



Witnesses

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UNITED STATES PATENT OFFICE.

HEZEKIAH BRADFORD AND JOHN B. WILFORD, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO SAID HEZEKIAH BRADFORD.

IMPROVEMENT IN ORE-SEPARATORS.

Specification forming part of Letters Patent No. **221,661**, dated November 18, 1879; application filed August 19, 1878.

To all whom it may concern:

Be it known that we, HEZEKIAH BRADFORD and JOHN B. WILFORD, of Philadelphia, in the State of Pennsylvania, have invented an Improvement in Separators for Ores and articles of different specific gravities, of which the following is a specification.

Ore-separators have been made with a jig that is reciprocated by a crank, and in which the material is fed at one side and passed off at the other side, thus moving across the jig at right angles to the axis of the crank-shaft. If the material banks up at either one side or the other, the strain is unequal, and the jig is liable to bind in its bearings or the parts wear unequally, and if one crank has any more motion than the other the material will be thrown from the side of the jig having the smallest movement and piled at the side having the largest movement. To avoid this difficulty, we feed the material at one end of the jig and deliver the lighter materials at the other end of the jig, so that the material travels in line with the actuating-shaft.

We make use of one or more sections in the reciprocating jig, so as to effect two or more separations, according to the different specific gravities of the material operated upon. The jig-bottom is composed of two sections. The second section is lower than the first, in order that the layer of lighter materials in the second section may be deeper than the layer of heavier materials in the first section, thereby rendering the weight of the columns equal and making the action of the water uniform; and the reciprocating jig is made with a bottom of wire-cloth or perforated material between two frames, that serve to support and confine the wire-cloth and allow for the introduction of new cloth or sieve-bottom whenever required. We also apply an apron of cloth between the jig and the stationary portion of the vat, which allows of the movement of the jig, but prevents the light material washing back among the particles of ore or heavier material, or such particles of ore passing with the water to the space allotted for the lighter material.

In the drawings, Figure 1 is a plan, Fig. 2 is a longitudinal section, and Fig. 3 is a cross-section, of our separating apparatus.

The jig is made of a box, with sides *a a* and ends *b*, and this jig-box is guided in the vertical slideways *c* upon the frames *c'* of the machine. These frames *c'* rest upon the ends of the vat or tank *d*.

The actuating-shaft *e* is in bearings upon the frame *c'*, and provided with eccentrics or cranks and connecting-rods *f* from these cranks to the jig, so as to communicate to the jig the required up-and-down movement. The length of the stroke is in proportion to the size of the particles operated upon.

The ore, coal, or other material is admitted by the chute or spout *g* at one end of the jig-box, and the lighter material passes off at the other end of the jig-box over the dams *h*, so that the material moves through the jig-box in a direction parallel, or nearly so, to the shaft *e*, for the purposes aforesaid.

There is an opening or openings at the receiving end of the jig, so that chute *g* is as wide as the jig, or nearly so, in order to supply the material with uniformity, and the dams *h* extend, by preference, all across the jig, so that the delivery is uniform.

The jig-bottom *i* is made of wire-cloth or perforated metal, with meshes of the size, or slightly larger, than the material to be separated, and this jig-bottom is held between the metal frames *k k'*, that are above and below the wire-cloth, and serve to clamp and support the same and the layer of ore or other materials to be separated, which lies upon the jig-bottom. One or both of these frames is removable, being bolted or screwed to place, so that the frames can be separated for the removal of the wire-cloth and the introduction of a piece of different sieve-bottom.

There is a dam, *h'*, across the jig at about the same level as the dam *h*. The object of this is to produce three or more separations in the one reciprocating jig, the first and heaviest material passing down from the first section into a receptacle in the vat, the material next in weight passing over the dam *h'* and

through the second section of the jig, and the third or lightest material passing over the dam *h*. The second section of the jig-bottom is lower down than the first section, in order that the column of material may be of equal weight in the two sections, in order that the water passing through the same by the jigging motion may meet with the same resistance and its action be uniform.

Upon the jig-bottom is a layer of valves that are larger than the meshes of the sieve-bottom. These valves are of about the same gravity as the materials that pass down through the screen or perforated jig-bottom, and the operation is that, if two ores, such as iron and lead ore, are present in the ground and assorted material fed into the jig, the lead ore will remain in the first section, and will gradually pass down through the jig and be received in the bottom of the vat. The iron ore and refuse will pass over the dam *h'* into the second section of the jig, and the iron ore will pass down through the sieve-bottom and the refuse will wash over the dam *h*. The vat is divided by the partitions *l l'*, so as to keep the respective materials separate from each other.

The valves upon the sieve-bottom sometimes accumulate, and it is necessary to allow portions to escape from time to time. To effect this there are openings in the bottom with movable valves *o*, connected by stems to the cranks of the rock-shaft *r*. These valves may be opened more or less, as required, from time to time, and act as set forth in Letters Patent No. 143,492. In order, however, to adjust these valves when the jig is in operation, a long horizontal link, *s*, is used between the crank 2 at the end of the rock-shaft and the lever *s'* that is upon the stationary frame. This construction and arrangement allow for the vertical motion of the jig without perceptible motion being imparted to the valves, and at the same time the valves can be opened more or less without stopping the machine. The face of the valves should be perforated, so as to have about the same openings as the sieve-bottom to allow equal passage for the water.

At the delivery-dam *h* there is a shield of metal, *t*, that serves to direct the gangue or other refuse material away from the apron *u*, which apron is of canvas or other flexible material, and is attached at its bottom edge to the partition *l*, and at its ends to the sides of the vat *d*, and at its top edge to the lower end of the jig.

It is to be understood that the vat is to be filled with water to about the height shown at *x*, Fig. 2, and that the separation is made by the difference of specific gravity of the particles as they are agitated by the movement of the jig in the water, and the water is caused to circulate up through the jig-bottom as the jig descends, and the water is raised by the pumping action of the jig and flows over the dam *h*, as aforesaid, and returns over the canvas apron *u*, and returns to the back part of the vat, below the jig, to supply water to the same. If this apron were not employed, the movement of the water would tend to wash the refuse or lighter material over the partition *l*, or cause the fine particles of ore to escape in the opposite direction with the refuse.

We claim as our invention—

1. In combination with a reciprocating jig and valves *o*, the rock-shaft *r*, crank 2, horizontal connecting-rod *s*, and lever for adjusting the valves while the jig is in motion, substantially as set forth.

2. The combination, in an ore-separating apparatus, of a jig with a perforated bottom, vertical guides for the same, a shaft with cranks or eccentrics for moving the jig, a chute for supplying the material to be separated, contiguous to the connection between one end of the jig and the shaft, and a delivery-dam at the other end of the jig, and contiguous to the other connection between the jig and shaft, so that the material to be separated will move along the jig in a direction parallel, or nearly so, to the actuating-shaft, substantially as set forth.

3. The combination, in a separator for ores, of a jig-box, a shaft and cranks or eccentrics for reciprocating the same, a perforated bottom to the jig-box in two or more sections, and two or more dams across the jig, the upper edges of which are at or near the same level, the first section of the perforated bottom of the jig-box being at a higher level than the second, substantially as and for the purposes set forth.

4. The apron *u*, of flexible material, connected at its lower edges and ends with the vat, in combination with the reciprocating jig that is connected with the said apron, substantially as set forth.

Signed by us this 26th day of March, A. D. 1878.

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JOHN B. WILFORD.

Witnesses:
GEO. T. PINCKNEY,
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