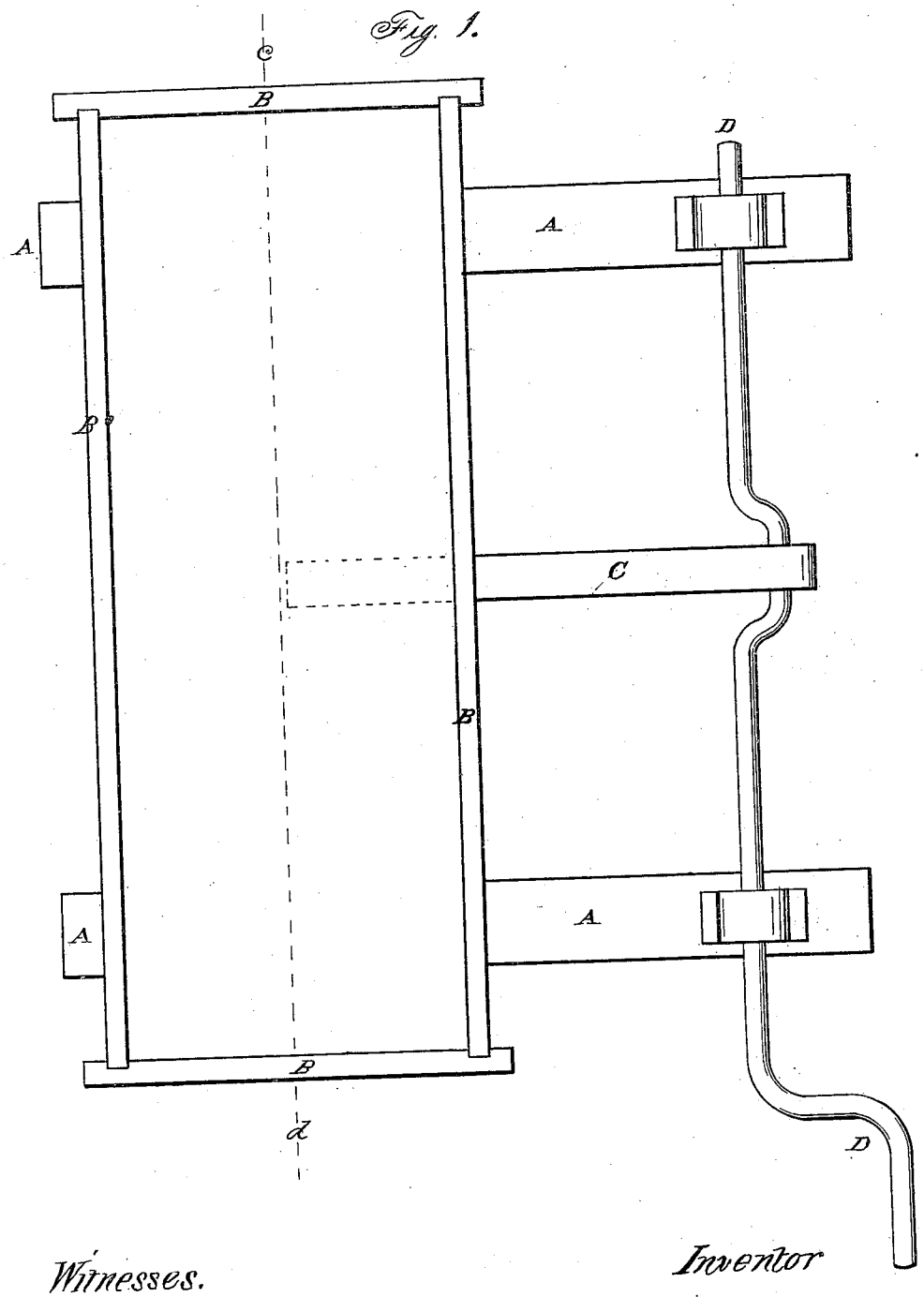
2 Sheets—Sheet 1.

S. W. BULLOCK
Ore-Separator.

No. 205,525. Patented July 2, 1878.

Fig. 1.



Witnesses.

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Inventor

Smith W. Bullock

by D. Bannon

Attorney

2 Sheets—Sheet 2.

S. W. BULLOCK
Ore-Separator.

No. 205,525. Patented July 2, 1878.

Fig. 2

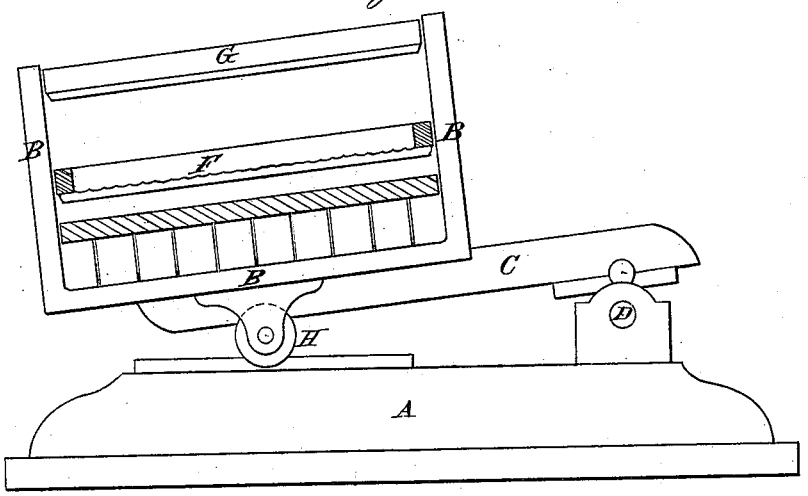


Fig. 4

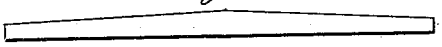
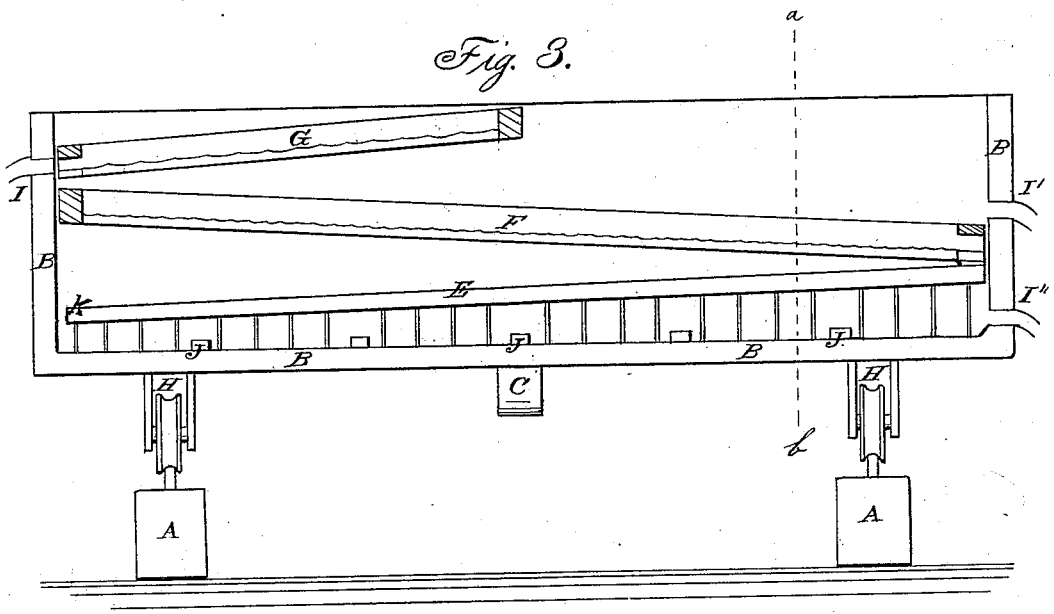


Fig. 3.



Witnesses.

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his Atty

UNITED STATES PATENT OFFICE.

SMITH W. BULLOCK, OF NEWARK, NEW JERSEY, ASSIGNOR TO DANIEL BARNUM, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN ORE-SEPARATORS.

Specification forming part of Letters Patent No. **205,525**, dated July 2, 1878; application filed April 29, 1873.

To all whom it may concern:

Be it known that I, SMITH W. BULLOCK, of the city of Newark, county of Essex, and State of New Jersey, have invented certain Improvements in Mineral Ore-Separators and Gold and Diamond Washers, of which the following is a specification:

The nature of my invention consists in constructing, arranging, and combining the parts of an ore separator, concentrator, or amalgamator, either with or without sieves, substantially as hereinafter described, as well as in arranging and combining therewith rollers, or their equivalents, and an arm or arms, these being firmly attached to the box or separator for operating the same, as hereinafter set forth; and it consists, also, in combining these with a crank, which, in its revolutions, will cause the box to reciprocate on the rollers moving on a horizontal plane, and, while doing so, to assume the varying angles which are due to the relative varying positions assumed by both the crank and the rollers throughout the entire revolutions of the crank, the effect of these varying positions and angles being the production of a rectilinear reciprocating and undulating compound motion to the box during each backward and forward movement of the same by the motion of the crank, and by which means each side of the box is alternately elevated and lowered on the axis of the rollers, in conformity with the relative varying positions of both crank and rollers, whereby I secure the combined action of the gravity of the material and the momentum given to it at the point of highest elevation on each side alternately, to accelerate its motion from side to side through the stud-pins and between the cleats, and thus insuring a thorough agitation and separation of the lighter portions twice each revolution, the object being to have the mineral retained between the cleats, while the water, with the lighter material, flows over the cleats at each end toward and out of the discharge-apertures.

Figure 1 is a top view or plan of a machine embodying my invention. Fig. 2 is a sectional elevation of the same, as seen cut through from *a* to *b* in Fig. 3. Fig. 3 is a sectional side elevation, as seen in Fig. 1, from *c* to *d*. Fig. 4 is a cleat.

A A are two foundation or bed timbers. B B B show the different parts of a box. C is an arm attached to box B. D is a crank and shaft connected with arm C. E is a plate, made of iron or wood, and studded with pins or spikes on the under side, and forming a false bottom to B. F is a screen-frame of the length and width of the box. G is a screen but half of the length of the box. H H are two grooved rollers in stands or hangers, firmly attached to, and on which box B is poised, and by which, with the crank, the compound motion is produced. I I′ I″ are spouts or tubes. J J J are cleats attached to the inside on the bottom of the box.

I prepare two pieces of timber, A A, six inches square, and about six feet long, more or less, and secure them firmly to the ground or upon other timbers in position, as seen in Fig. 1, about four feet apart. Upon one end of each of these timbers I put a short rail or bar of iron, secured by bolts or spikes. Upon or near the other end of each of these timbers A A, I place a journal-box to receive the crank-shaft D, as seen in Fig. 1. I now prepare a crank-shaft of one and one-half inch iron, more or less, as seen in Fig. 1, and place it in the journal-boxes upon the timbers A A. I now prepare and join together the several pieces B B B of wood or other material, so as to form a water-tight box or tank about two feet wide and about six feet long, open at the top. On the inside bottom of the box I prepare the cleats J J J J, about one-half inch square at each end and crowning in the center, as seen at Fig. 4, and place them transversely across the box, and about one foot apart. I then prepare the plate E, of wood or other material, with spikes or stud-pins in the under side of it, as seen in Figs. 2 and 3. I also prepare the screen-frame F, the size of the inside of the box B, with wire-cloth of a small mesh upon it, and place it in the box, as seen in Fig. 3. I also prepare the frame and sieve or coarse screen G, the width of the box, and, for convenience, only about half the length, and place it in the box B, as seen in Fig. 3. I now prepare and attach the

grooved rollers H H to the under side and in the center of each end of the box, so as to poise the box B, as seen in Figs. 2 and 3. I then prepare an arm or shaft, of wood or other material, about six feet long, and secure one end thereof to the under side of the box B, by bolts or otherwise, across the center of the box; and at or near the other end of the arm I prepare a journal-box to fit the wrist pin or journal of the crank. I now place the rollers H H, with the box attached, upon the short rails upon the timbers A A, and connect the journal-box of the arm C to the wrist of the crank, and I have the machine ready for operation.

It will, of course, be understood that two arms and two cranks are to be used when necessary, and that this arm or arms and cranks give to box B a compound motion consisting of the principles of reciprocation, of oscillation, of undulation, and of vibration.

It should be understood, also, that reversing the motion of the cranks changes the action of the water and material, which is due to its gravity. Thus, the box being poised at its center on the rollers H H, and attached to one end of the arm connected with the crank, is oscillated and vibrated, as well as reciprocated, at each revolution; and consequently it becomes material that the crank rotate so as to elevate that side of the box which will by gravity incline the material to descend to the other side of the box in coincidence with the reciprocating motion of the crank and box, and in the same direction.

I do not confine myself to the rollers H H to support the box B; but sometimes I use a connecting-link as an equivalent by attaching one end to the center of the bottom of the box and the other end to the bed-timbers below, so as to allow the box to reciprocate while conforming to the varying angles which are due to the change in the positions of the crank in revolution.

Operation: When I wish to operate this machine I attach some motive power to the crank-shaft D, by hand or pulley and belt, or otherwise, as most convenient, so as to give a rotary motion to the shaft. This motion of the crank-shaft gives to box B, through the arm C, the combined or compound motion above described. I now introduce the material to be operated on upon the sieve G, with a stream of water. The result is, the particles small enough soon pass through the meshes or openings in the sieve, and fall upon the fine sieve F below it, while the coarser particles are soon discharged at the lowest end of the sieve into the spout I, and fall to the ground. The same operation is going on upon the sieve F when another portion of the material is taken off through the spout I′; but what passes the lower sieve falls upon the plate E, and, with the water, is soon delivered into the bottom of the box B at K, the end opposite the opening in the box and spout I″. The peculiar motion of the box B with the stud-pins in the plate E keep the lighter portions of the stuff in suspension in the water, while the heavier or mineral portions are concentrated upon the bottom of the box, and retained there by the cleats J J J J, which prevent them from being carried forward by the water. This process may be continued until the mineral portion has accumulated upon the bottom of the box, so as to make it necessary to remove it. Then the machine must be stopped for that purpose, and the mineral removed with a shovel or otherwise.

In working gold and silver ores, quicksilver may be placed in the bottom of the box, and the pins may be made of copper and coated with quicksilver, so as to take up the precious metals by amalgamation; or skins or woolen cloths, such as are often used, may be placed in the bottom of the box with better results than when placed in sluices with currents of water simply running over them, as heretofore used.

In working the base metals, openings may be arranged in the bottom of the box, so as to discharge the metallic portion at any time without stopping the machine.

The object sought for in the construction of this machine is to obtain a more perfect separation of mineral ores than is now done by the machines in general use, to wit, the common sluice or trough, which is necessarily elevated at the feed end, in order to obtain a current over the bottom of the sluice sufficient to carry all of the material except the very heaviest particles away with the water, notwithstanding the cleats or grooves across the bottom; and as a fine or thin atom of gold will float in water in motion, sometimes above a grain of sand not much larger than the gold, it is plain that much of the sand will remain in the sluice, or such portions of the gold will be washed away.

To avoid all this waste of the mineral portion of the ores or sands, as well as of the quicksilver, I make my box as herein described, to wit: I prefer the box to be set perfectly level, endwise, and either curved or flat on the bottom, which is cleated crosswise, these cleats being crowning, or higher in the center than at the ends, and, the feed being at one end, the water and the dirt flow slowly over the cleats to the discharge end I″.

It will be seen that the current of water and dirt, in passing through the box, is entirely above the cleats. This current, being subjected to the peculiar action of the above-described compound motion in conjunction with the stud-pins, necessarily agitates the stuff so as to keep the dirt in suspension as high as the top of the cleats, so the current above the cleats carries it off. The reciproco-undulating compound motion, in connection with the stud-pins, is well calculated to effect this object, the stud-pins always moving with the pan or bottom of the box containing the material to be operated upon; and, by combining the several movements together, as described, and equalizing the motion, I obtain a better result

as a concentrator, separator, and amalgamator than by any other known movement; and by constructing the box or pan or shaking table with the stud-pins and cleats and screens and sieves, as herein set forth, and, when used as an amalgamator, by coating the stud-pins with quicksilver and operating the pan by this compound motion, as described, I avoid all extremes, and save nearly all the gold and silver by amalgamation and other minerals by concentration.

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

1. The box B, supported centrally upon rollers, and provided with the rigid arm C, in combination with the crank-shaft D, the arm being secured to the crank-shaft, thereby producing the compound motion set forth.

2. The box B, provided at its bottom with cleats J, in combination with a false bottom, E, supported at an incline upon the pins, substantially as set forth.

SMITH W. BULLOCK.

Witnesses:
THEO. J. ALLEN,
E. B. BARNUM.