P. H. McGOWAN.

ORE SEPARATOR.

APPLICATION FILED SEPT. 9, 1908.

945,857.

Patented Jan. 11, 1910.

2 SHEETS—SHEET 1.

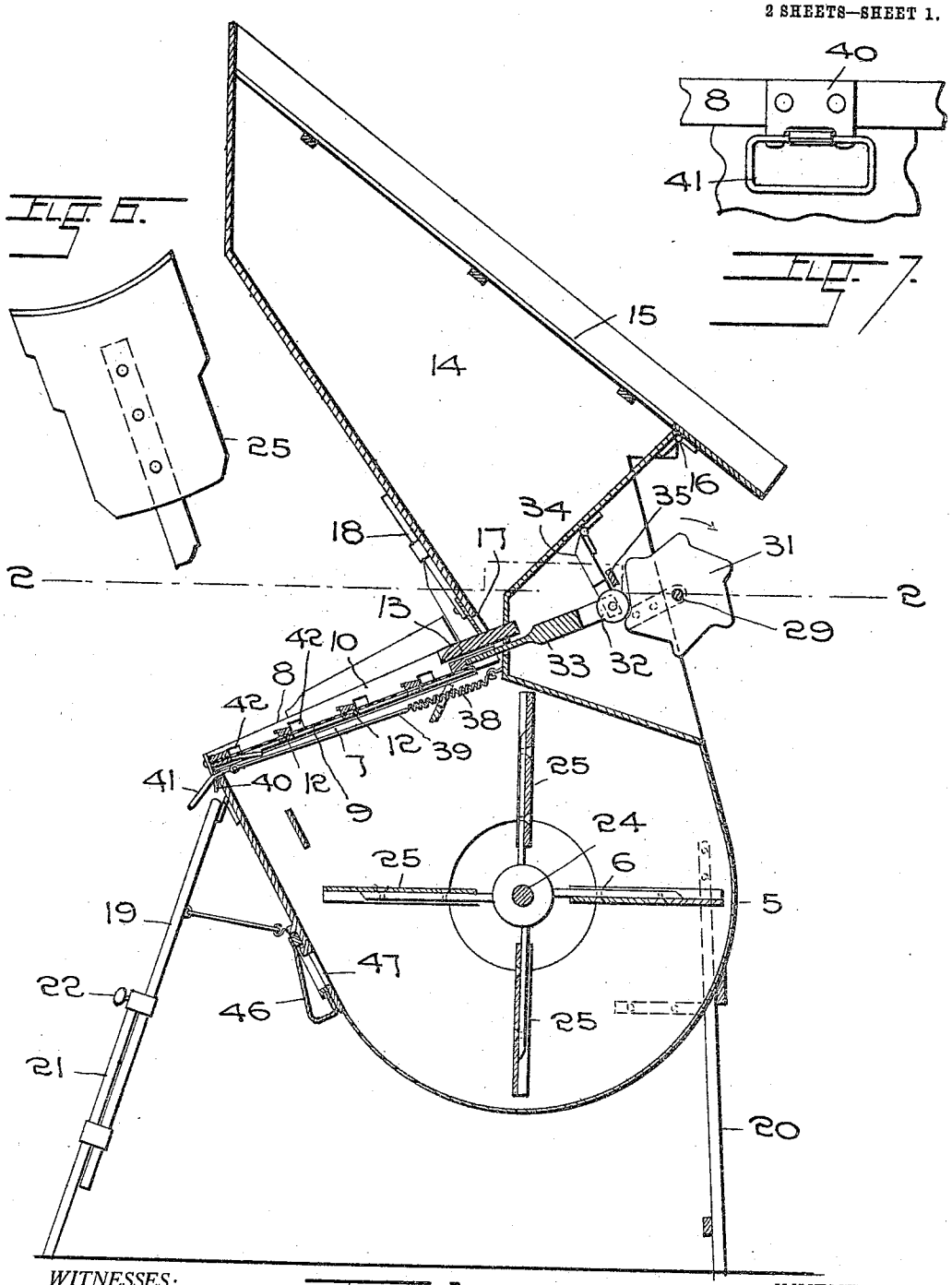

FIG. 6.

FIG. 7.

FIG. 1

WITNESSES:

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2 SHEETS—SHEET 2.

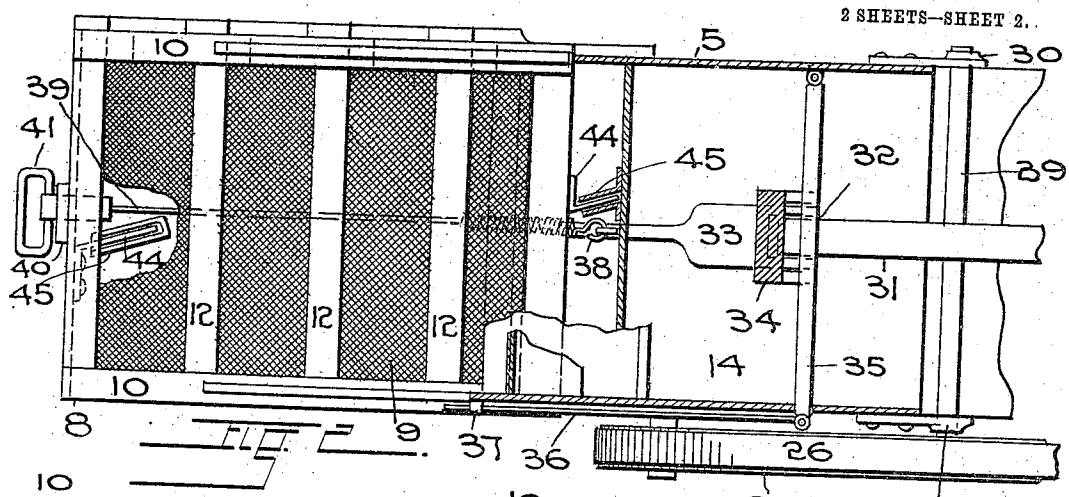

FIG. 2.

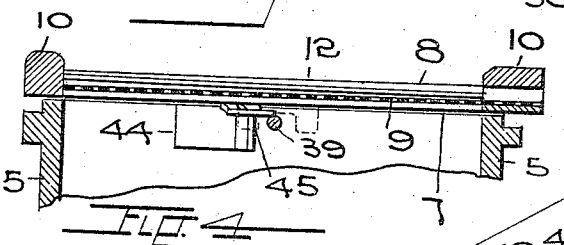

FIG. 4.

FIG. 3.

FIG. 5.

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UNITED STATES PATENT OFFICE.

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ORE-SEPARATOR.

945,857. Specification of Letters Patent. Patented Jan. 11, 1910.

Application filed September 9, 1908. Serial No. 452,237.

To all whom it may concern:

Be it known that I, PATRICK H. McGOWAN, a citizen of the United States of America, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Ore-Separators, of which the following is a specification.

My invention relates to improvements in apparatus for the separation of dry comminuted ore according to the gravity of its particles and the objects of my invention are to provide an apparatus of the class named in which simplicity of construction is combined with superior effectiveness and great practicability in use and in which the valuable mineral bearing particles contained in the ore are cleanly separated from the extraneous worthless matter with which they are associated and continuously discharged into the receptacle provided for the purpose. I attain these objects by the mechanism illustrated in the accompanying drawings in the various views of which like parts are similarly designated and in which—

Figure 1—represents a longitudinal, vertical, central section through the apparatus, Fig. 2—an enlarged section taken along the line 2—2, Fig. 1, certain parts being broken to expose subjacent mechanism, Fig. 3—a fragmentary, enlarged longitudinal section of the reciprocating screen and adjacent parts, Fig. 4—a transverse section taken along the line 4—4, Fig. 3, looking in the direction of the arrow, Fig. 5—a side elevation of the machine, Fig. 6—a perspective view of one of the fan-vanes and Fig. 7—a fragmentary end view of the screen, showing the means by which it is secured to the resilient member by which it is held in place.

Referring to the drawings by numerals, let the reference character 5 designate a partly cylindrical box or housing in which a fan 6 has a rotatory movement. The housing 5 has a rectangular opening 7 in its upper downwardly inclined surface and the greater part of this opening is, in practice, covered by a movable trough 8 which is composed of a foraminous bottom plate 9, longitudinally extending sides 10 and transverse riffles 12. A slanting apron 13 extends over the uppermost portion of the trough 8 as well as over the part of the opening 7 not covered by the latter and this apron forms the bottom of a feed trough 14 which forms part of the housing 5. A grizzly 15, which extends over the open top of the hopper, is hinged thereto at 16 so that its inclination may be varied in accordance to the size and character of the material under treatment. The comminuted ore contained in the hopper, passes over the slanting apron 13 and onto the moving trough 8, through an opening 17, the size of which may be regulated by means of a sliding gate 18.

The apparatus is supported upon legs 19 and 20, the foremost one (19) of which is hingedly secured at its upper extremity, to the housing 5 and is composed of two members, the lower one 21, of which is longitudinally adjustable in relation to the other and is held in its adjusted position by means of a set screw 22. The adjustable leg 19 enables the operator to vary the inclination of the trough 8, in accordance with the fineness and character of the ore and the degree of inclination may be determined by means of a pendulum 23 which is pivotally secured at its upper end, to one of the sides of the casing 5 and whose lower extremity denotes upon a graduated scale 24^a, the degree of the angle of inclination of the inclined top of the housing and the thereupon supported trough 8.

The fan 6 is composed of a horizontal shaft 24 which is rotatably mounted in bearings on opposite sides of the casing, and radially extending vanes 25 which are curved, as is shown in Fig. 6 of the drawings, for the purpose of distributing the blast of air, produced by their revolving motion, evenly over the entire surface of the foraminated bottom plate 9 of the moving trough 8.

The fan 6 is operated through the instrumentality of a continuous belt 26 which passes around a pulley 27 at the end of the shaft 24 and a wheel 28 mounted upon an extremity of the driving shaft 29 which is supported in bearings 30 above the housing 5.

Mounted upon the shaft 29 is a cam wheel 31 whose peripheral surface engages an antifriction roller 32 at the extremity of a plunger 33 which is longitudinally movably mounted below the apron 13 and whose opposite end engages the upper end of the movable trough 8. The extremity of the plunger which carries the roller 32, is movably suspended from the under side of the hopper 14 by means of an oscillatory hanger

34. A bar 35 extending transversely of the hanger 34 is pivoted at one of its extremities, as is best shown in Fig. 2 of the drawings, while its opposite end is movably connected with a rod 36 which extends along one of the sides of the housing 5 and may be held in a selected position by means of a suitably arranged catch 37. By adjustment of the rod 36 and the therewith connected bar 35, the roller 32 may be held from contact with the cam 31, whenever it is desired to operate the fan 6 independent of the trough 8. The periphery or face of the cam wheel is shaped so that when the shaft 29 is rotated, alternate rapid forward and slow rearward motions are imparted to the plunger 33 which movements are transmitted to the trough 8.

To maintain the roller 32 in constant contact with the peripheral edge of the cam wheel 31 and, furthermore, to secure the trough 8 in operative position relative to the plunger 33, I employ a coiled spring 38 one end of which is secured to a stationary portion of the housing, while its opposite end is connected by means of a rod 39, with the foremost end of the trough 8. The latter is, to this end, provided with a notched plate 40, as is shown in Fig. 7, and the rod 39 terminates in a transversely extending handle 41, which when the rod is positioned in the notch, will, by frictional engagement with the outer surface of the plate 40, maintain the parts in their relative positions.

The trough 8, is as hereinbefore described, composed of a foraminous bottom plate 9, which is preferably composed of a fine screen or wire netting, upright sides 10 and transverse riffles 12. The latter, which preferably taper longitudinally, have a rearwardly inclined upper surface and are formed with lips 43 which project from their highest edges over the adjacent portions of the screen or bottom plate 9 and the side 10 of the trough which adjoins the smaller ends of the riffles, is provided with a number of openings 42 the lower sides of which are in register with the upper sides of the respective riffles and which are intended for the discharge of the valuable particles from the trough 8, into a subjacent receptacle. This discharge is accomplished by imparting to the trough a lateral reciprocating motion which when combined with the longitudinal reciprocating movement imparted by the plunger 33 in cooperation with the spring 38, will result in a diagonal or oblique movement of the trough. To effect the lateral movement above referred to, I transpose the longitudinal motion imparted by the plunger, into the diagonal movement through the instrumentality of obliquely disposed bars 44 which are secured on the underside of the trough to move between correspondingly positioned guides 45.

During the operation of the device, a small portion of the finer material which passes through the trough 8, will drop, through the foraminations of the screen, into the interior of the housing 5 and to save and remove these particles I have provided a drawer 46 which covers an opening 47 in the front of the casing 6 above its lower part. The fine mineral particles which dropped through the foraminous bottom plate, being thrown against the inner surface of the housing by the motion of the fan, will pass through the opening 47 to be deposited in the drawer which may readily be removed and emptied.

Having thus described the mechanical construction of my improved ore separator, its operation will be readily understood. The comminuted ore is deposited upon the grizzly 15 where the coarse rocks are separated from the finer material which passes into the hopper 14, and through the gate-controlled opening 17, onto the screen 9. A rotary movement is imparted to the driving shaft 29 either by manual rotation of the wheel 28, which is, to this end, provided with a handle 48, or by connection with a mechanical or electrical source of energy and this movement is, by the means hereinbefore described, transposed simultaneously into a rotary movement of the fan 6 and an oblique reciprocating motion of the riffled plate 9. By reason of the peculiar construction of the cam face, the movement of the plate 9 is, as mentioned hereinbefore, rapid in the forward and retarded in the opposite direction so that, during the operation of the machine, the plate is subjected to a quick succession of forward jars or shocks. The ore which falls over the edge of the apron 13, upon the screen 9, travels downwardly impelled by gravity and aided by the current of air produced by the fan 6, which raises the particles in accordance with their specific gravity. The result is that the heavier mineral bearing parts are brought to the surface of the screen to be retained by the riffles 12 and the lighter material or gangue arranges itself to form the upper strata according to their specific gravity and move over the riffles to the lower edge of the screen over which it drops to be conveyed to the waste dump. During each rapid forward motion of the trough 8, the screen 9 is moved forwardly from under the ore which rests against the riffles 12, and, during the subsequent slow rearward movement, the heavier particles of this ore are again brought in contact with the riffles while the lighter matter is spread over the surface of the screen between the riffles to be acted upon by the blast of air from the fan 6. The result is that all the values contained in the comminuted ore which withstand the action of the blast, are deposited against the riffles free from ex-

traneous matter and are, by reason of the lateral reciprocating motion of the trough, continuously discharged through the openings 42 into a subjacent receiver. The slanting, upper surfaces of the riffles aid in returning, during the rearward movement of the trough, such values as were carried downwardly with the gangue to the surface of the screen, while the lips 43 serve to keep the subjacent portions of the screen clear so as to permit an unobstructed passage of the air current.

If so desired, the ore may be fed upon the screen at one of its upper corners in which case the tapering form of the riffles promotes the even downward movement of the mass over all parts of the foraminated surface.

Having thus described my invention what I claim is:—

1. In an ore-separator, a reciprocating foraminous plate having riffles transverse to its longitudinal axis, means for rendering the movement of said plate uniformly diagonal with respect to said axis and to the said riffles, and means for transmitting a current of air upwardly through said plate.

2. In an ore separator, a foraminous plate having riffles transverse to its longitudinal axis, means to impart alternate rapid forward and comparatively slow rearward movements thereto, and means to render said movements uniformly diagonal with respect to said axis and to the said riffles.

3. In an ore separator, a longitudinally inclined diagonally reciprocating trough having a foraminous bottom and transverse riffles, means to transmit a current of air upwardly through the said bottom, said trough having openings in one of its sides, adjacent the ends of the riffles.

4. In an ore separator, a casing having an opening in its upper inclined surface, a trough covering said opening and having a foraminous bottom, transverse riffles and openings in one of its sides, adjacent the latter's ends, means to impart a reciprocating movement to said trough, means for rendering said movement uniformly diagonal with respect to its longitudinal axis and means within said casing to transmit a current of air upwardly through the said bottom.

5. In an ore separator, a casing having an opening in its upper inclined surface, a correspondingly inclined trough covering said opening and having a foraminous bottom, and transverse riffles whose upper surfaces incline in a direction opposite to that of the trough and which are formed at their upper edges with longitudinal lips projecting over said bottom, said trough having in one of its sides openings adjacent the lower sides of said riffles and means within said casing to transmit a current of air upwardly through the said bottom.

In testimony whereof I have affixed my signature in presence of two witnesses.

PATRICK H. McGOWAN.

Witnesses:

G. J. ROLLANDET,

K. M. STUMP.