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ORE SEPARATOR.

APPLICATION FILED SEPT. 18, 1911.

1,048,026. Patented Dec. 24, 1912

3 SHEETS—SHEET 1.

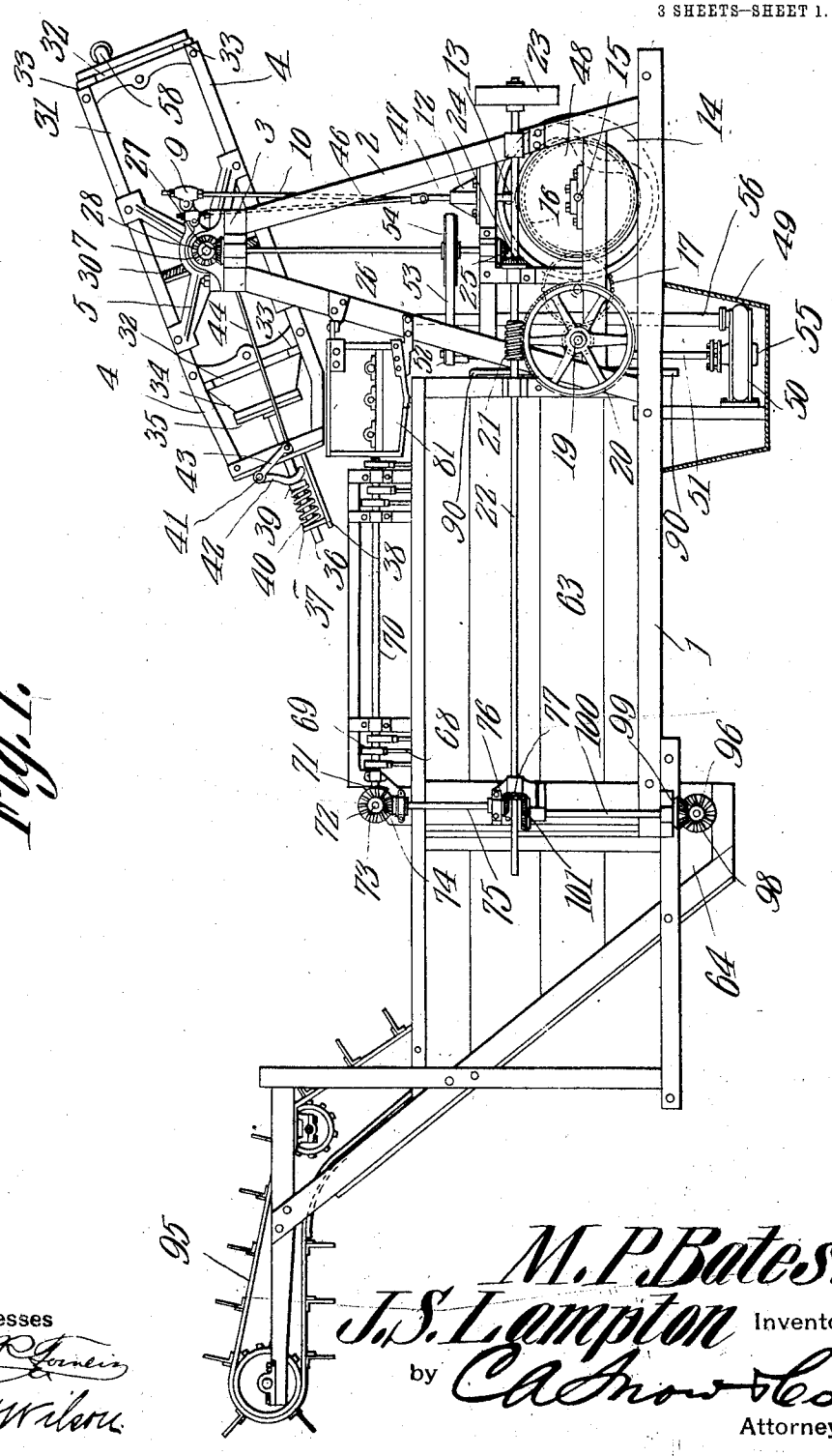

Fig. 1.

Witnesses

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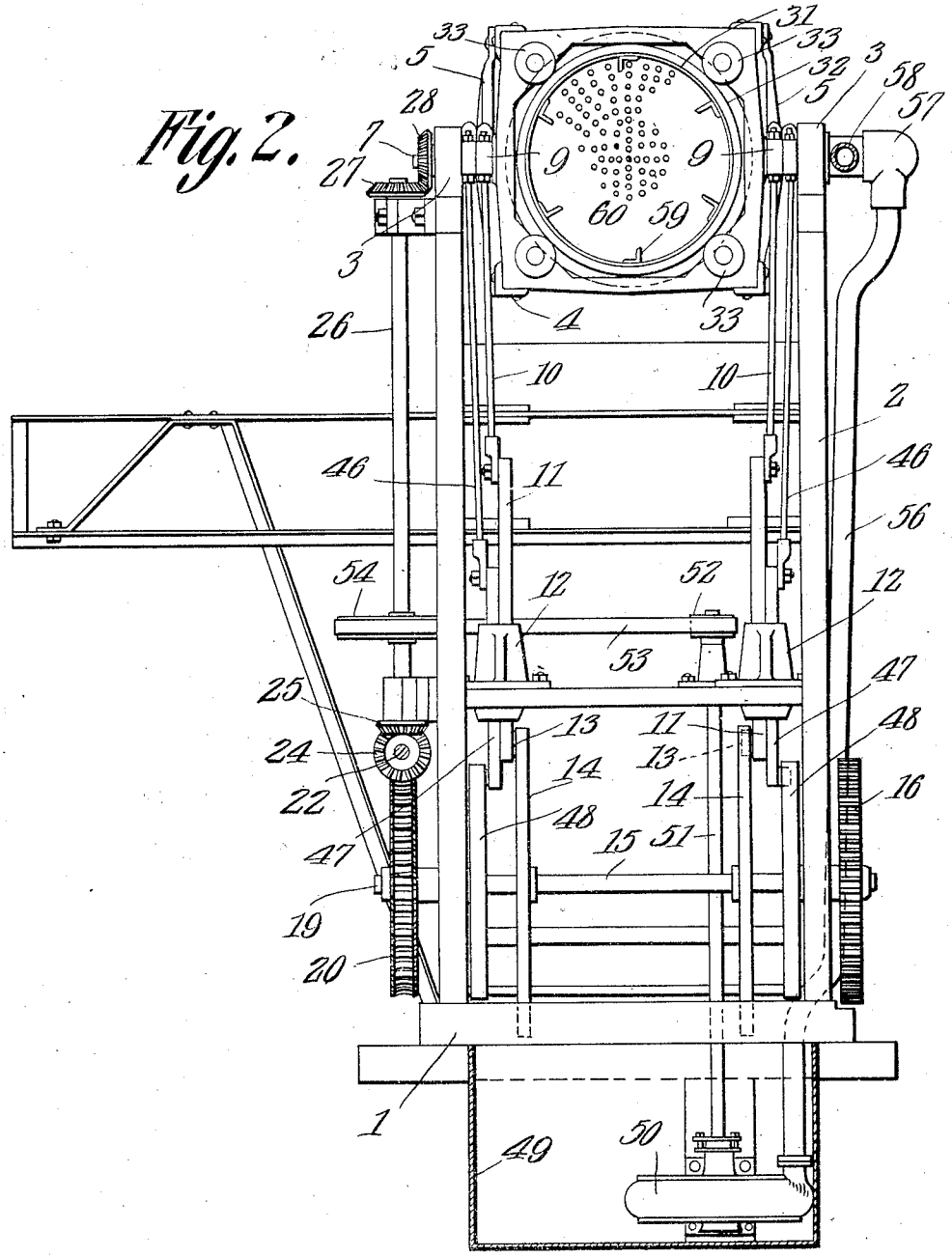
3 SHEETS—SHEET 2.

Fig. 2.

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3 SHEETS—SHEET 3.

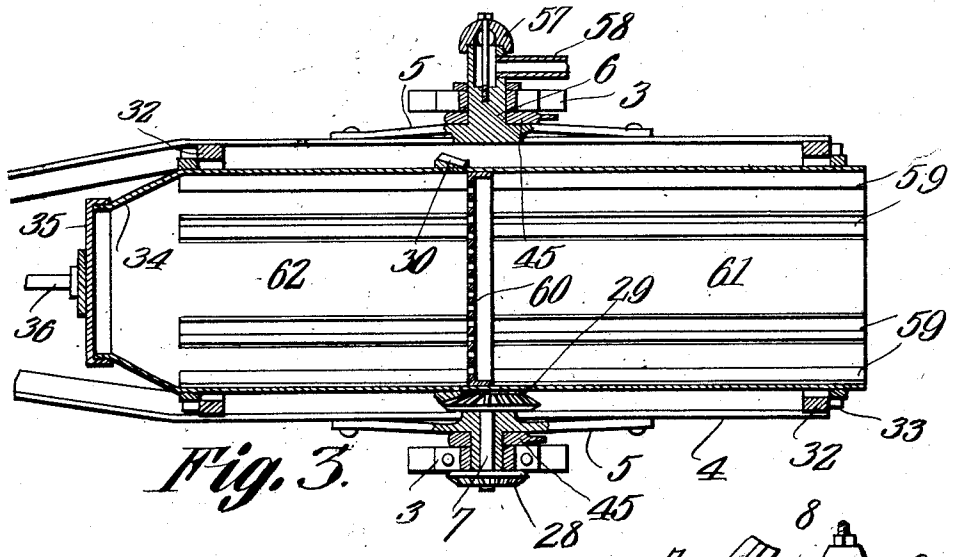


Fig. 3.

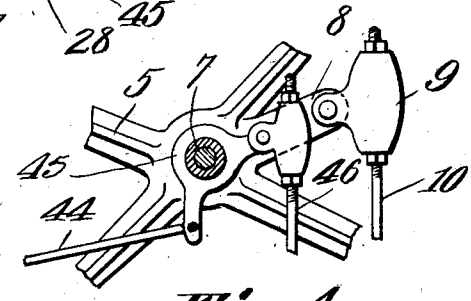


Fig. 4.

Witnesses

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# UNITED STATES PATENT OFFICE.

MALCOM P. BATES AND JOHN S. LAMPTON, OF OCEANPARK, CALIFORNIA.

## ORE-SEPARATOR.

1,048,026. Specification of Letters Patent. Patented Dec. 24, 1912.

Application filed September 18, 1911. Serial No. 649,830.

*To all whom it may concern:*

Be it known that we, MALCOM P. BATES and JOHN S. LAMPTON, citizens of the United States, residing at Oceanpark, in the county of Los Angeles, State of California, have invented a new and useful Ore-Separator, of which the following is a specification.

This invention relates to machines for separating ore, one of its objects being to provide means whereby the gravel can be supplied to the machine directly from the pit without first being screened or concentrated, there being means embodied within the machine for thoroughly separating the sand from the gravel after which the sand is discharged onto the riffles provided therefor and the gravel is dumped from the machine, the various operations taking place automatically and in proper succession.

Another object is to provide means whereby the same water can be used during successive operations, thus reducing to the minimum the waste of valves.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed can be made within the scope of what is claimed without departing from the spirit of the invention.

In the accompanying drawings, the preferred form of the invention has been shown.

In said drawings:—Figure 1 is a side elevation of the machine portions being shown in section. Fig. 2 is an enlarged end elevation. Fig. 3 is an enlarged longitudinal section through the drum. Fig. 4 is a transverse section through the bearing shaft at one side of the drum and showing a portion of the adjacent spider and the adjoining parts in elevation.

Referring to the figures by characters of reference 1 designates sills having an upstanding frame 2 mounted thereon adjacent one end and supporting caps 3. A frame 4 is interposed between the caps and has spiders 5 secured to the sides thereof, there being a trunnion 6 extending from one of these spiders and journaled in one of the caps 3 while a short shaft 7 is journaled within the other cap 3 and extends loosely into the other spider. It will thus be seen that the frame 4 is free to swing about the axis of shaft 7 and trunnion 6. Each spider 5 has an arm 8 extending rearwardly therefrom and having a sleeve 9 pivotally connected to it. These sleeves are adjustably engaged by the upper end portions of connecting rods 10 which, in turn, are pivotally attached to slides 11 mounted in guides 12. Anti-friction rollers 13 are carried by the lower ends of the slides 11 and are in constant engagement with cams 14 secured to a shaft 15. This shaft extends transversely of and is journaled upon the lower portion of frame 2 and has a gear 16 at one end meshing with and adapted to be driven by a smaller gear 17. This last mentioned gear receives motion from a smaller gear 18 in turn secured to a transverse shaft 19 journaled in the lower portion of frame 2 and having a worm wheel 20 secured to one end thereof. Said worm wheel receives motion through a worm 21 from a line shaft 22 which may, if desired, have a pulley 23 at one end whereby the same may be driven by any suitable motor.

Shaft 22 has a gear 24 meshing with and adapted to rotate a gear 25 which is secured to the lower end portion of an upstanding shaft 26 journaled in frame 2. This shaft has a gear 27 at its upper end meshing with a gear 28 on the shaft 7. Another gear 29 is secured to the inner end of this shaft 7 and meshes with a toothed ring 30 secured to and extending around the middle portion of a drum 31. This drum is arranged within the frame 4 and has annular bearing rails 32 adjacent the ends thereof and which are contacted by anti-friction rollers 33 carried by the frame 4, these rollers serving to hold the drum centered at all times within the frame. From the foregoing it will be apparent that when shaft 26 is rotated motion will be transmitted therefrom through gears 27 and 28 to shaft 7 and gear 29 will therefore rotate the toothed ring 30 and the drum 31. Moreover the worm gearing 20, 21, and the gears 18, 17 and 16, will drive the shaft 15 and the cams 14 will therefore hold the rods 10 and the arms 8 elevated until after the drum 31 has been rotated a number of times by means of the mechanism hereinbefore described, after which the cams will shift the rods 10 longitudinally and cause the frame 4 and the drum therein to swing downwardly and then upwardly at one end

without, however, interfering with the rotation of the drum.

Drum 31 is open at one end while its other end has a frusto-conical outlet portion 34 normally closed by a head 35. This head has a stem 36 projecting perpendicularly from the center thereof and slidably mounted in a guide 37 supported by an arm 38 projecting from one end of the frame 4. A plate 39 is secured to the stem 36 and a spring 40 is mounted on the stem and bears at its ends against the guide 37 and the plate 39 respectively, thus operating to hold the head 35 normally in closed position. A rock shaft 41 is journaled upon one end of the frame 4 and has arms 42 extending therefrom and movably engaging the plate 39. Arms 43 extend from the ends of the shaft 41 and are connected, by rods 44 to bell crank levers 45. One of these levers is fulcrumed on the shaft 7 while the other is fulcrumed on the trunnion 6 and both of the levers are adjustably engaged by the upper ends of rods 46 extending downwardly and pivotally connected to slides 47. These slides are mounted in guides 12 and are constantly engaged by cams 48 secured to the shaft 15. The cams 14 and 48 are so shaped and timed that, after the drum 31 has been rotated for a predetermined length of time while inclined as shown in Fig. 1, the shaft 41 will be rocked by the bell crank levers 45 and their connections so as to cause the arms 42 to push against collar 39 and open the head 35 against the stress of spring 40. The head will be maintained open a sufficient length of time to permit the contents of the drum to gravitate through the open end of the drum after which the head will automatically close and rods 10 will then pull on the arms 8 and cause the frame 4 and drum 31 to tilt so as to elevate its outlet or reduced end and permit the contents of the drum to gravitate out of the large or open end thereof. The cams 14 will then return the drum 31 and its frame 4 to its normal position, as shown in Fig. 1, whereupon the foregoing operation will be repeated, it being understood that the drum 31 continues to rotate throughout the tilting operation and during the movement of the head to open and to closed position.

A tank or cistern 49 is located under the sills 1 and a centrifugal pump 50 is mounted therein, its shaft 51 being extended upwardly into the frame 2 and provided with a pulley 52 receiving motion, through a belt 53, from a pulley 54 on the shaft 26. The inlet to the pump 50 is located close to the bottom of the tank or cistern 49, as indicated at 55 and the outlet pipe 56 extends upwardly to a coupling 57 concentric with the pivot axis of the drum 31. Another pipe 58 is pivotally connected to this coupling and discharges into the open large end of the drum 31, said pipe 58 being connected to and adapted to swing with the drum.

Any desired number of ribs 59 are secured within the drum 31 and extend longitudinally thereof, each rib being preferably formed of a length of angle iron or the like. Moreover a diaphragm 60, preferably of perforated metal or of heavy metal fabric is secured within the drum at a point between the ends thereof, thus dividing the interior of the drum into two compartments, to wit, an upper or receiving compartment 61 and a lower or delivering compartment 62.

A riffle box 63 is arranged on the sills 1 and adjacent the frame 2, there being an elevator boot 64 opening into and extending below one end of this box. Both the riffle box and the boot are water-tight.

Riffle boards may be supported within the box 63 and are adapted to be actuated by rods 68 and eccentrics 69 mounted on a shaft 70. These riffle boards and their actuating mechanism, however, do not constitute any part of the present invention. Shaft 70 is driven by gears 71 and 72 receiving motion from a transverse shaft 73 journaled on the upper portion of the riffle box. One of the gears 72 also meshes with a gear 74 secured to an upwardly extending shaft 75 which, in turn, receives motion through gears 76 and 77 from the line shaft 22. Mounted on the riffle box 63 and under the outlet end of the drum 31 is a hopper 81 adapted to discharge into the riffle box 63.

An overflow pipe 90 extends from one wall of the riffle box and down to the tank or cistern 49 and serves to maintain the level of the water in the box 63 slightly above the lower end of the upper riffle board 65.

An elevator or conveyer 95 extends from the box 63 and is driven by a shaft 96 extending transversely of the boot 64. A gear 98 is secured to the shaft 96 and receives motion, through a gear 99 from a shaft 100. A gear 101 is secured to this shaft and meshes gear 77.

It is to be understood that the drum 31 is normally inclined, as shown in Fig. 1, its open end being uppermost. Riffle box 63 is normally filled with water up to the overflow 90, and the drum 31 normally contains as much water as it can hold. Under normal conditions the tank or cistern 49 is empty. When shaft 22 is set in motion the drum 31 is rotated in the manner hereinbefore described and the gravel to be acted on is transferred directly from the pit to the open end of the drum 31. As the drum rotates the ribs 59 will thoroughly agitate the contents of the drum, the sand and the values passing through the diaphragm 60 to the lower compartment 62 in the drum while the gravel is retained in the upper compartment by the diaphragm. After the drum

has slowly rotated for a predetermined period of time the cams 48 act upon the slides 47 to shift them longitudinally and thus open the head 35 in the manner hereinbefore set forth. The contents of the lower compartment 62, and the water contained within the drum, will thus quickly gravitate to the hopper 81 after which the head 35 will automatically move to closed position, as hereinbefore set forth and the drum 31 and its frame 4 will then be tilted so as to bring the open large end of the drum lowermost. The gravel contained within compartment 61 will thus fall out of the drum after which said drum will be returned to its normal position and the operation hereinbefore described will be repeated.

When the contents of the hopper 81 flow into the riffle box 63, a portion of the water contained within said box will overflow through pipe 90 into the tank or cistern 49 and carry therewith some of the flour gold floating thereon and the centrifugal pump 50 will elevate the water and the flour gold to the drum 31 when the operation hereinbefore set forth can be repeated.

What is claimed is:—

1. The combination with a revoluble drum having an inlet at one end and an outlet at its other end, of a slidable head constituting the closure of the outlet, spring pressed means for holding the head in closed position, and means for automatically opening said head momentarily when the outlet end of the drum is down, and means for swinging the drum about an axis extending transversely therethrough.

2. An ore concentrator including a drum having an open inlet end and outlet end, said outlet end being normally below the inlet end, a slidable head normally closing the outlet, means for automatically opening the outlet to release the contents of the drum, and means for automatically tilting the drum about a transverse axis to discharge the contents of the drum through the inlet of the drum.

3. A concentrator including a drum having an open inlet end and an outlet end, means for continuously rotating the drum, a spring pressed slidable head normally closing the outlet, means for automatically opening the outlet during the rotation of the drum, and means for automatically tilting the drum to discharge the contents of the drum through the inlet during the rotation of said drum.

4. A concentrator including a drum having an open inlet end and an outlet end, said drum being normally inclined downwardly toward said outlet end and having an inlet compartment and an outlet compartment, spring pressed slidable means for normally closing the outlet, means for automatically opening the outlet to release the contents of the outlet compartment, and means for automatically tilting the drum subsequent to the discharge of the contents of the outlet compartment, to deliver the contents of the inlet compartment.

5. A concentrator including a drum having an open inlet end and a normally closed outlet end, said drum being normally inclined downwardly toward said outlet end, a diaphragm within the drum and dividing it into an inlet compartment and an outlet compartment, means for automatically opening the outlet to release the contents of the outlet compartment, means for automatically closing said outlet, means for automatically tilting the drum subsequent to the discharge of the contents of the outlet compartment, to deliver the contents of the inlet compartment, and means for continuously rotating the drum.

6. A concentrator including a normally inclined frame, a drum mounted for rotation therein and having an open inlet end and a normally closed outlet end, said outlet end being normally below the inlet end, a head, yielding means for holding the head normally in position across the outlet to close the same, said head being revoluble with the drum, separating means between the inlet and outlet, means for continuously rotating the drum, means for directing a fluid into the drum, an oscillatory element, a cam, means operated thereby for actuating said element and means operated by said element for opening the head against the stress of the spring.

7. In a concentrator a normally inclined frame, a drum mounted for rotation therein and having an open inlet end and a normally closed outlet end, said outlet end being disposed normally below the inlet end, a closure for the outlet end and mounted to slide to open or closed position, means for automatically shifting the closure to open position, a spring for sliding the closure to closed position, means for rotating the drum and its closure within the frame, means for directing a fluid into the drum, and means for tilting the frame and the drum to lower the inlet end subsequent to the opening of the outlet.

In testimony that we claim the foregoing as our own, we have hereto affixed our signatures in the presence of two witnesses.

MALCOM P. BATES.
JOHN S. LAMPTON.

Witnesses:
VOURIE GROTON,
BOB REYNOLDS.