H. L. HAMILTON.

SAND SEPARATING APPARATUS.

APPLICATION FILED AUG. 29, 1918. RENEWED JUNE 7, 1920.

1,350,154. **Patented Aug. 17, 1920.**

2 SHEETS—SHEET 1.

Fig. 1.

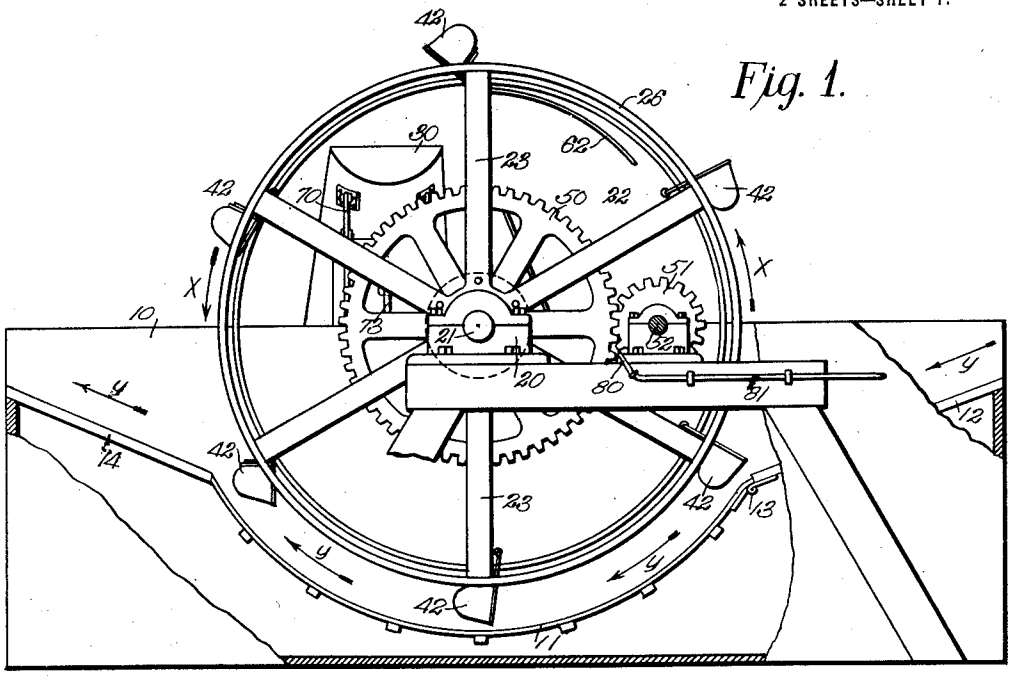
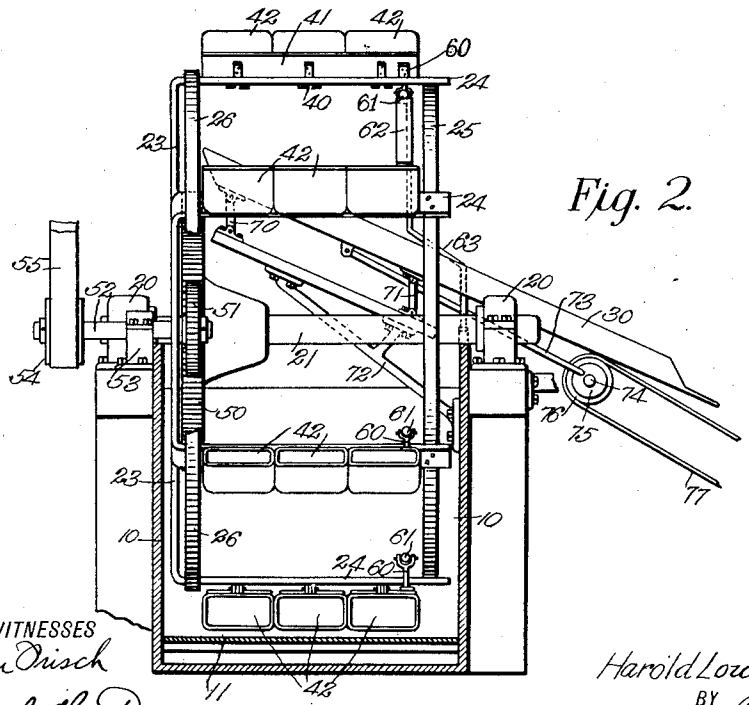


Fig. 2.



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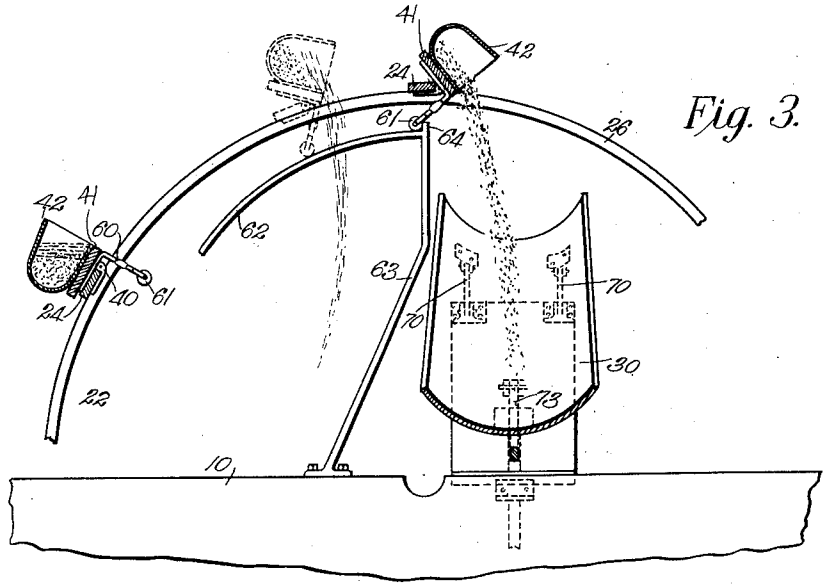


Fig. 3.

Fig. 4.

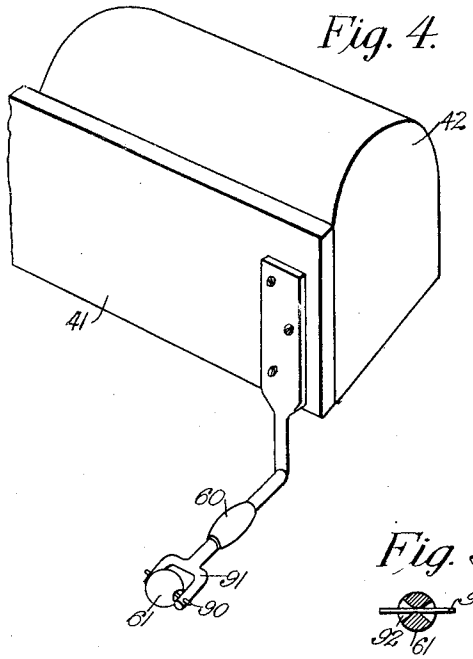
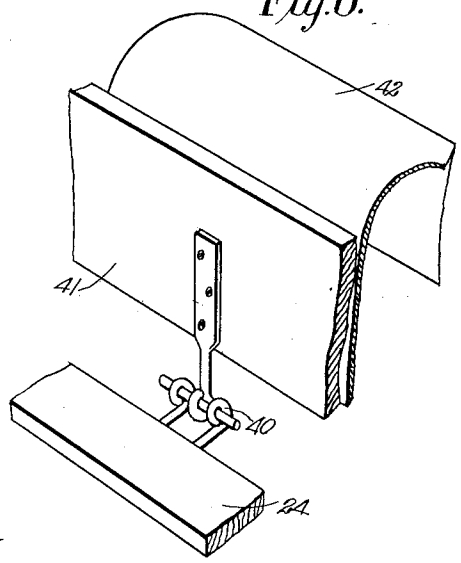


Fig. 5.

Fig. 6.



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SAND-SEPARATING APPARATUS.

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Application filed August 29, 1918, Serial No. 251,946. Renewed June 7, 1920. Serial No. 387,156.

To all whom it may concern:

Be it known that I, HAROLD LOUIS HAMILTON, a citizen of the United States, and a resident of Fargo, in the county of Cass and State of North Dakota, have invented a new and Improved Sand-Separating Apparatus, of which the following is a full, clear, and exact description.

The invention relates to apparatus used in gravel and sand washing plants to separate the fine sand from the water for obtaining the sand in proper condition for building and other purposes.

The object of the invention is to provide a new and improved sand separating apparatus arranged to effectively separate the same from the water without loss of even the very finest sand. Another object is to provide an apparatus capable of a large output in a comparatively short time and without unduly increasing the operating expense. Another object is to reduce the grinding or wearing action of the fine sand on the various coacting parts such as gear wheels, bearings and hinges.

With these and other objects in view the invention consists of certain novel features of construction as hereinafter shown and described and then specifically pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a rear side elevation of the sand separating apparatus with parts shown in section;

Fig. 2 is an end view of the same with the tank in section and parts of the wheel broken out;

Fig. 3 is an enlarged sectional front elevation of a portion of the wheel frame and chute;

Fig. 4 is an enlarged perspective view of one of the trip arms for the bucket;

Fig. 5 is a cross section of the roller bearing for the trip arm; and

Fig. 6 is a perspective view of the hinge connection between the bucket and the wheel rim.

The sand bearing water is adapted to flow through a tank 10 having a segmental bottom 11, on one side of which is arranged a variable inlet 12, preferably connected by a hinge 13 with the bottom 11 to allow of swinging the inlet 12 up or down for increasing or decreasing the speed of the flow of the water and sand into the tank 10 or for agitating purposes to increase or decrease the settling tendency of the sand in the water according to the specific gravity of the particular sand or other material handled at the time. The bottom 11 is provided on the opposite side with an overflow 14 inclined upwardly and outwardly to allow the clear water to flow from the tank to a suitable place of discharge. The level of the water in the tank 11 is regulated by slash boards in the trough (not shown) coupled to the tank at the discharge or overflow 14. On the front and rear of the tank 10 are arranged bearings 20 in which is journaled the shaft 21 of a sand separating wheel 22 provided at the rear with spokes 23 terminating at their outer ends in crossbars 24 supporting the front and rear rims 25 and 26 thus providing the wheel with an open front for the passage of a transverse chute 30 to carry off the sand from the apparatus, as hereinafter more fully explained. The crossbars 24 of the wheel 22 are connected by hinges 40 with boards 41 on which are secured buckets 42 adapted to dip the sand out of the water flowing through the tank 10. The hinges 40 are self-cleaning (see Fig. 6) to prevent the accumulation of sand and thus insure free working of the hinges at all times. The wheel 20 is rotated in the direction of the arrow x indicated in Fig. 1, and for this purpose use is made of a gear wheel 50 secured to the shaft 21 at the rear of the wheel, and a pinion 51 is in mesh with the gear wheel 50 and is secured on a shaft 52 journaled in a bearing 53 mounted on the rear of the tank 10, as plainly indicated in Fig. 2. The shaft 52 is provided with a suitable pulley 54 connected by a belt 55 with other machinery for imparting a continuous rotary motion to the shaft 52 to cause the pinion 51 to rotate the gear wheel 50 and consequently the wheel 22 in the direction indicated by the arrows x. By reference to Fig. 1 it will be noticed that the buckets 42 pass through the tank in an opposite direction to that in which the sand bearing water flows through the tank to cause the buckets 42 to dip the sand out of the water during the passage of the buckets through the water. The buckets 42 on entering the water have their mouths disposed

approximately vertical, as plainly indicated to the left in Fig. 1, and as the buckets 42 come in contact with the sand bearing water at the outlet side of the tank it is evident that the buckets 42 encounter sufficient resistance to bring the sand gradually into the position shown at the bottom of the wheel 22 in Fig. 1, that is, with the mouth of the bucket in an approximately radial position. This position is maintained during the further travel of the bucket through the tank in an upward direction and until after the bucket has passed out of the tank.

Each bucket supporting board 41 is provided with an angular arm 60 provided at its free end with a friction roller 61 adapted to engage a cam 62 attached to a bracket 63 fastened to the front of the tank 10. The cam 62 is eccentric relatively to the rims 25 and 26 and when a filled bucket moves into uppermost position its friction roller 61 engages the cam 62 thus gradually tilting the bucket 42 whereby the water that may be contained in the bucket on top of the settled tank of sand is gradually drained out of the bucket and thrown back into the tank without danger of reaching and passing into the chute 30. The upper end of the cam 62 is provided with an outwardly extending stop or lug 64 adapted to be engaged by the friction roller 61 to swing the bucket into dumping position to cause the sand to slide out of the bucket onto the chute 30 to be carried to one side of the machine. When the bucket 42 swings into dumping position it overbalances the arm 60 and the friction roller 61 moves out of engagement with the stop 64 and swings into contact with the corresponding crossbar 24 thus giving a slight knock to the bucket to loosen any sand that may adhere to the inside of the bucket. It will be noticed that by this arrangement all the sand contained in the bucket is discharged into the chute 30.

In order to prevent the sand from sticking to the chute 30 a jigging or vibratory motion is preferably given to the chute and for this purpose the upper portion of the chute is pivotally connected by two sets of links 70 and 71 with a bracket 72 attached to the front of the tank 10. A pitman 73 is pivotally connected with the chute 30 between the links 70 and 71. This pitman is connected with a crank disk 74 secured on a driven shaft 75 provided with a pulley 76 connected by belt 77 with other machinery to impart a rotary motion to the shaft 75 which by the crank disk 74 and the pitman 73 imparts a vibratory motion to the chute 30.

In order to prevent the sand from clogging the gear wheel 50 and the pinion 51 at their point of meshing, use is made of jets of water or air forced through a nozzle 80 arranged on one end of a pipe 81 connected with a pump or other means for forcing air or water through the pipe and nozzle to keep the gear wheel 50 and the pinion 51 free of sand.

In order to prevent the friction roller 61 from becoming clogged by sand use is made of an axle 90 held in a fork 91 forming part of the arm 60, and the roller 61 has its portion 92 formed of two diametrically opposite conical openings, the apexes of which are at the center of the roller, so that an annular knife edge contact is had by the roller 61 with the axle 90 to keep the roller and its axle free of sand.

The operation is as follows;

When the apparatus is in use, the wheel 22 rotates in the direction of the arrow x and the sand bearing water is caused to flow through the tank in the direction of the arrows y indicated in Fig. 1. It will be noticed that the buckets 42 successively pass through the sand bearing water with the outer edges of the buckets in close proximity to the inner surface of the segmental bottom 11 of the tank whereby the sand contained in the water is dipped out of the sand during the movement of the buckets through the water. The sand contained in a filled bucket after the latter leaves the water in the tank readily settles in the bottom of such bucket while the water stands on top of the sand. During the further outward travel of the filled bucket the friction roller 61 comes in contact with the cam 62 whereby a tilting motion is gradually given to the bucket to allow the water to run out of the same prior to the bucket moving into position over the chute 30. When the bucket reaches an uppermost position the friction roller 61 engages the stop 64, as previously explained, so that the bucket 42 is swung into dumping position and the sand contained in the bucket drops out of the bucket and onto the chute 30 to be carried by the latter to one side of the machine. As previously stated, the friction roller 61 on moving in contact with the crossbar 64 sufficiently jolts the bucket to dislodge any sand that may adhere to the inner surface of the bucket.

It is understood that the inlet is swung up or down to increase or decrease the velocity of the sand bearing water according to the specific gravity of the sand or other material to be separated from the water. The sand tends to settle on the segmental bottom 11 of the tank and the wheel 22 is rotated at a comparatively slow speed, say about five revolutions per minute, so that each advancing bucket with its mouth facing the flowing water readily dips up the sand and the latter accumulates in the bucket and gradually settles in the bottom thereof, partly on account of the movement

of each bucket in the opposite direction of the flow of the water and partly on each bucket gradually moving into upright position, that is, with the mouth of the bucket upward. It will be noticed that the accumulation of the sand in an advancing bucket gradually crowds out the water in the bucket and when the latter leaves the tank very little water is left in the bucket.

It will further be noticed that in case a bucket should contain little or no sand and be filled with water the latter is drained out prior to the bucket reaching the dumping position and hence such water is not liable to be dumped into the chute 30.

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

1. A sand separating apparatus, comprising a tank having an inlet for the sand bearing water and an overflow for the water, a revoluble sand separating wheel extending into the said tank and provided with hinged buckets adapted to pass through the sand bearing water to dip the sand out of the water, means for gradually dumping the buckets to discharge the water contained in the buckets and to then discharge the sand out of the buckets, and means for receiving the discharged sand and carrying it away from the machine.

2. A sand separating apparatus, comprising a tank having a segmental bottom and provided with a swinging inlet at one side and at the other side with an overflow, and a revoluble sand separating wheel mounted to turn in the tank.

3. A sand separating apparatus, comprising a tank having a segmental bottom, an inlet at one side for the inflow of the sand bearing water and an overflow at the other side for the outflow of the water, a revoluble sand separating wheel open at the front and extending with its lower portion into the said tank, the said wheel being provided with hinged buckets adapted to dip the sand out of the water, means for rotating the said wheel in the opposite direction in which the water flows through the tank, means for gradually dumping the buckets on the latter moving into uppermost position to drain the water out of the buckets and to then discharge the sand, and a chute extending into the open front of the wheel to receive the sand as the latter is dumped out of the buckets.

4. A sand separating apparatus, comprising a tank having a segmental bottom, an inlet at one side for the inflow of the sand bearing water and an overflow at the other side for the outflow of the water, a revoluble sand separating wheel open at the front and extending with its lower portion into the said tank, the said wheel being provided with hinged buckets adapted to dip the sand out of the water, means for rotating the said wheel in the opposite direction in which the water flows through the tank, dumping arms on the said buckets, a stationary cam engaged by the said bucket arms on the buckets moving into uppermost position to gradually tilt the buckets to first discharge the water therefrom and then the sand, and a chute extending into the open front of the wheel to receive the sand discharged from the buckets.

5. A sand separating apparatus, comprising a tank having a segmental bottom, an inlet at one side for the inflow of the sand bearing water and an overflow at the other side for the outflow of the water, a revoluble sand separating wheel open at the front and extending with its lower portion into the said tank, the said wheel being provided with hinged buckets adapted to dip the sand out of the water, means for rotating the said wheel in the opposite direction in which the water flows through the tank, dumping arms on the said buckets and provided with rollers, a fixed cam having a stop at its upper end and adapted to be engaged by the rollers on the buckets moving into uppermost positions, the coaction of the cam and rollers causing the buckets to tilt gradually to discharge the water, and the coaction of the rollers with the said stop causing the bucket to tilt into discharging position for the sand, and a chute extending into the open front of the said wheel adjacent the said stop to receive the discharged sand.

6. A sand separating apparatus, comprising a tank for the said sand bearing water, a bucket wheel extending with its lower portion into the said tank to scoop up the sand, gearing for driving the said wheel, and means discharging a spray onto the gearing to keep the same free of sand.

7. In a sand separating apparatus, a tank, a carrier mounted to turn in the tank, a plurality of hinged buckets on the carrier, means for gradually tilting the buckets to allow the water to run out, and means for swinging the bucket into dumping position and simultaneously jarring the same.

8. In a sand separating apparatus, a tank, a skeleton wheel formed of front and rear rims and cross bars, a plurality of buckets hinged to its wheel adjacent the cross bars thereof and provided with arms, a cam provided with a stop and with which the arm engages, whereby the buckets will be gradually tilted by the cam to allow the water to run out and then swung into dumping position by the stop and simultaneously jarred by the engagement of the arms with the cross bars of the wheel.

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