R. W. DULL.

SEPARATOR.

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1,258,100.

Patented Mar. 5, 1918.

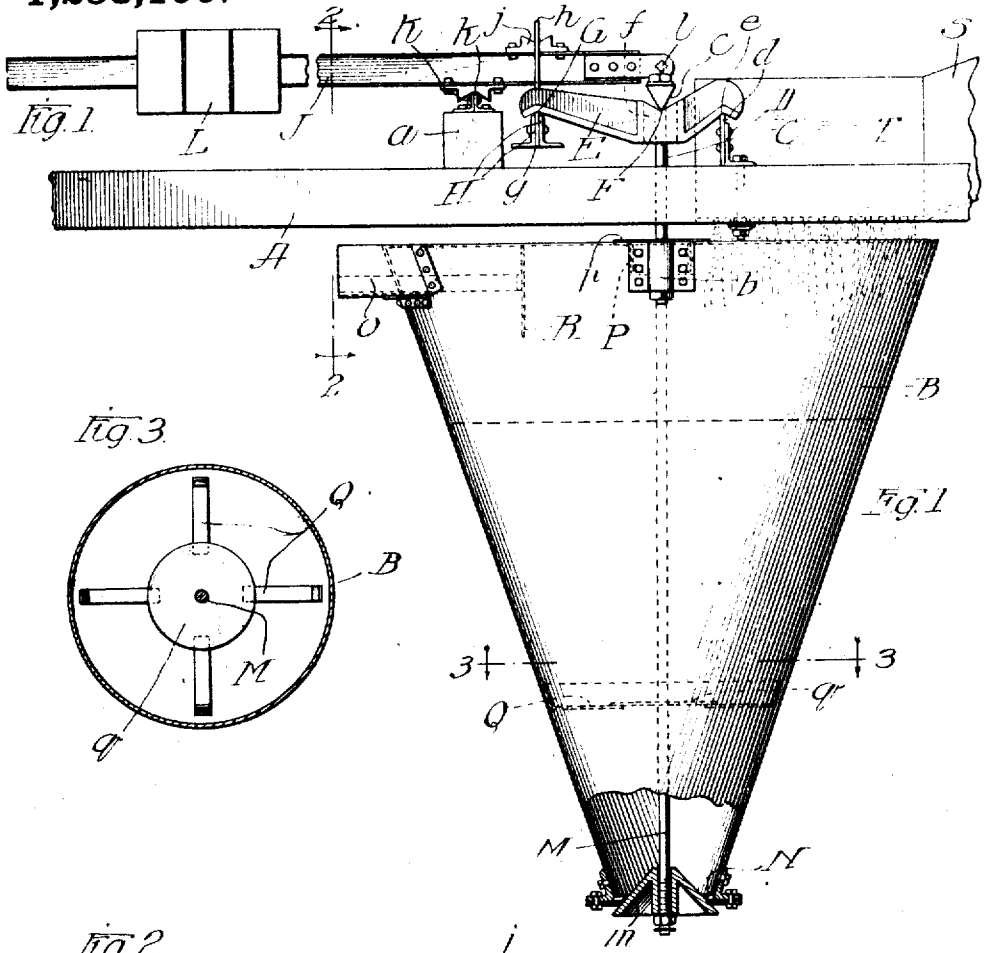


Fig. 1.

Fig. 3.

Fig. 1

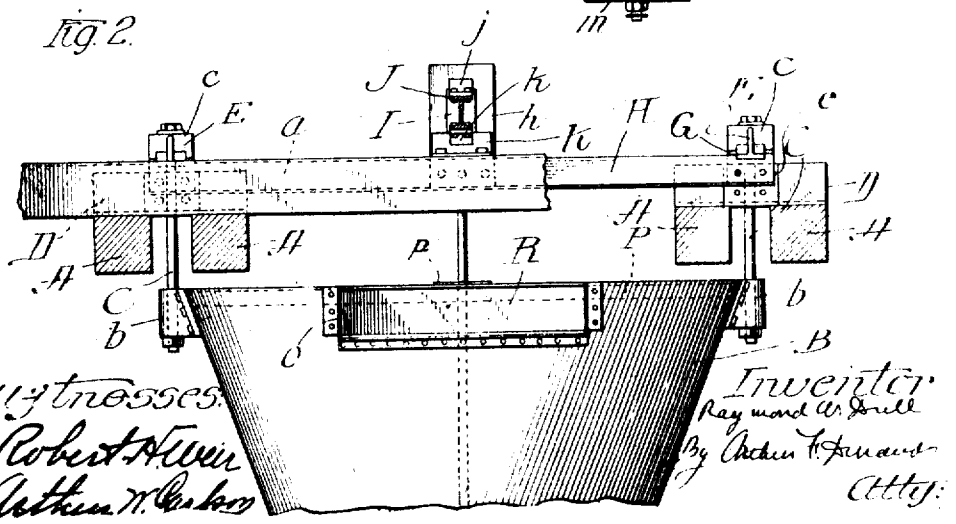


Fig. 2.

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UNITED STATES PATENT OFFICE.

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SEPARATOR.

1,258,100. Specification of Letters Patent. Patented Mar. 5, 1918.

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To all whom it may concern:

Be it known that I, RAYMOND W. DULL, a citizen of the United States of America, and resident of 133 South Sixth street, La Grange, Illinois, have invented a certain new and useful Improvement in Separators, of which the following is a specification.

This is an improvement on the construction disclosed in my prior Patent No. 1,155,473, patented Oct. 5, 1915.

My invention relates, therefore, to separators of that kind in which a receptacle is supported to move up and down, and in which the lower end of the receptacle is provided with a downwardly opening valve, whereby sand and water discharged into the receptacle will be separated by the overflow of the water at the top, and by the automatic discharge of the sand at the lower end of the receptacle, a full load in the receptacle serving automatically to open the valve at the lower end thereof.

The object of my invention is to provide novel and improved means for supporting the receptacle and its valve, and for thereby rendering the same more certain in operation, as well as more satisfactory in various ways.

Another object is to prevent the formation of an opening in the sand around the valve rod and to thereby prevent the water from discharging through the valve opening at the bottom of the receptacle.

Another object is to provide means for discharging the sand and water into the receptacle of the separator in such a manner that the contents will not boil or become agitated to the extent that the sand will escape from the top of the receptacle with the water; and whereby the sand will thus be caused to settle practically as soon as it enters the receptacle, allowing the water to discharge freely and alone from the spout provided for that purpose at the top of the receptacle.

To the foregoing and other useful ends my invention consists in matters hereinafter set forth and claimed.

In the accompanying drawings—

Figure 1 is a side elevation of an automatic sand and water separator embodying the principles of my invention, the lower end of the receptacle being shown in section to illustrate the construction and arrangement of the downwardly opening valve.

Fig. 2 is a vertical transverse section on line 2—2 in Fig. 1.

Fig. 3 is a horizontal cross section on line 3—3 in Fig. 1.

As thus illustrated, my invention comprises a body frame A composed of horizontal beams spaced apart and connected together by a cross beam *a* in a manner that will be readily understood. The receptacle B is shaped like an inverted cone, being tapered downwardly, and is provided at its sides with brackets *b* in which are removably held the lower end portions of the rods C which serve as supporting hangers for the receptacle. The upper end of each rod C is provided with a wedge-shaped block *c* removably held in place by a nut screwed on the upper end of said rod. An angle iron D is secured crosswise of the beams at one side of the receptacle, and a similar angle iron is secured crosswise of the beams at the other side of the receptacle, as shown more clearly in Fig. 2, and a fulcrum plate *d* is secured in a vertical plane to the face of each angle iron, these two plates being arranged in line with each other. Short levers E are provided with seats *e* at their ends, and on their under sides, these seats engaging the upper edges of the plates *d*, whereby the latter serve as fulcrums. These levers E are also provided with upper seats F for the lower edges of the wedges *c*, and have openings *f* through which the rods C extend vertically, these openings being large enough to afford each rod some lateral movement therein. At their other ends the levers E are provided with lower seats G which rest upon the upper edges of transverse plates *g* which are fixed between the angle irons H. A middle plate *h* is fixed between the angle irons H, and the hanger or link thus formed to support the distal ends of the levers E is adapted to rest on the parallel beams of the frame A when the receptacle moves downward. The plate *h* has an opening I therein for accommodating the long lever J, and the upper edge of this opening rests in the seat *j* mounted on top of said lever. The cross beam *a* has a fulcrum K which engages the seat *k* on the bottom of the lever J and the latter has an adjustable counterbalancing weight L of any suitable character mounted upon the free or distal end portion thereof. The other end of this lever J is pivoted at *l* to the upper end of the vertically disposed

rod M which extends downward through the receptacle at the center thereof and which is provided at its lower end with a movable valve member *m*, the latter being cone shaped and adapted to engage the seat N provided around the edge of the opening formed at the lower end of the receptacle. In this way the valve closes by upward movement and opens by downward movement and the movable valve member is supported by the said rod directly on the counterbalancing lever. A spout O provides for the overflow of the water from the top of the receptacle.

The operation is as follows: Sand and water are discharged into the top of the receptacle and when the latter is fully loaded it raises the weight L and moves downward. The proportions are such, and the relative arrangement of the pivotal points and fulcrums is such, that the rod M moves downward a little faster than the receptacle. Consequently, and by the time the angle irons H engage the tops of the beams A, the valve member *m* is some distance below the valve seat on the lower end of the receptacle, and thus the sand is automatically discharged. As soon as the desired discharge has been accomplished, and before the water remaining in the receptacle can escape at the lower end of the latter, the counterbalancing weight L again raises the receptacle and thereby closes the valve. Thus the water is taken off through the spout O and the sand is periodically discharged through the bottom of the receptacle. As previously stated, the plate *h* and the fulcrum plates *g* and the angle irons H together form a link between the levers E and the lever J and suspend the weight of the receptacle on the said counterbalancing lever. Angle irons P can be provided at the top of the receptacle, and arranged to extend crosswise thereof, and a plate *p* may be secured to the tops of these angle irons and provided with an opening for the rod M, whereby the latter is guided in a proper manner and held approximately at the center of the receptacle during the up and down movements of the latter. With this arrangement the rod M reciprocates relative to the receptacle during the operation of opening and closing the valve.

The rod M extends downward through the load in the receptacle, and to prevent the sand from packing together and forming an opening around this rod, through which opening the water would escape downward, thus holding the receptacle in its lowered position, a spider Q is provided, the arms of this spider being suitably secured to the walls of the receptacle, and the central portion *q* surrounding the rod M and forming a guide therefor and compelling the sand to pass outward and downward between the arms of the spider. In this way, the proper operation of the apparatus is insured, whereas without this feature there would be some danger of an opening forming in the sand around the rod M and a continuous discharge of water through this opening.

A dam or baffle plate R extends in a vertical plane across the top of the receptacle, inside the upper portion thereof, thereby preventing the sand from washing through and being discharged from the spout O with the water. This baffle plate is supported in any suitable manner at its ends, and the water and sand are discharged into said receptacle and against said baffle plate. The sand sinks or precipitates to the bottom of the receptacle, and the water flows downward and below the lower edge of said baffle plate and then rises and discharges from the spout O, in a manner that will be readily understood.

As a matter of further and special improvement the water and sand are conveyed to the receptacle by a spout S into a box T, the latter having a bottom wall provided with perforations or apertures for the downward escape of the sand and water into the receptacle. This box with a perforated bottom serves to prevent the water and sand from discharging violently into the receptacle, and assists in causing the sand to settle to the bottom as soon as it enters the receptacle. In other words, and with a comparatively large stream of water and sand discharging directly into the receptacle, the contents of the latter would be kept boiling, so to speak, with the result that the sand would remain in suspension and would not precipitate, but to the contrary would be carried off through the spout O with the water. The box T can be of any suitable form and construction, but the perforations in the bottom thereof must be of sufficient size to prevent clogging and provide a free discharge of the sand and water downward in the form of a number of small streams which will not cause a boiling action or agitation of the contents of the receptacle.

What I claim as my invention is:—

1. A separator comprising a receptacle having an open top and provided with an outlet at the lower end thereof, a pair of hangers for said receptacle, parallel levers for supporting said hangers, means to suspend said hangers on said levers, means to secure the depending ends of said hangers to said receptacle, whereby said receptacle is movable up and down bodily without tilting motion thereof, stationary fulcrums for said levers, a movable valve member for controlling said outlet, a counterbalance arm connected to both levers, and means to support said member on said arm.

2. A separator comprising a receptacle having an open top and provided with an

outlet at the lower end thereof, a pair of hangers for said receptacle, levers for supporting said hangers, means to suspend said hangers on said levers, means to secure the depending ends of said hangers to said receptacle, whereby said receptacle is movable up and down bodily without tilting motion thereof, stationary fulcrums for said levers, a movable valve member for controlling said outlet, a counterbalance arm connected to both levers, and means to support said member on said arm, said levers being spaced apart horizontally and arranged at opposite sides of said top, and said means being disposed centrally of the space between said levers.

3. A separator comprising a receptacle having an open top and provided with an outlet at the lower end thereof, a pair of hangers for said receptacle, levers for supporting said hangers, means to suspend said hangers on said levers, means to secure the depending ends of said hangers to said receptacle, whereby said receptacle is movable up and down bodily without tilting motion thereof, stationary fulcrums for said levers, a movable valve member for controlling said outlet, a counterbalance arm connected to both levers, a fulcrum for said arm, and means to support said member on said arm, said counterbalance arm having a horizontal bar supported transversely to support the distal ends of said levers.

4. A separator comprising a receptacle having an open top and provided with an outlet at the lower end thereof, a pair of hangers for said receptacle, levers disposed over opposite sides of said receptacle for supporting said hangers, so that said receptacle is movable up and down bodily without tilting motion thereof, stationary fulcrums for said levers, a movable valve member for controlling said outlet, a counterbalance arm connected to both levers, whereby said lever and said arm tilt in opposite directions, and means to support said member on said arm, said means including a rod having its upper end pivoted on the end of said arm, said member being carried on the lower end of said rod.

5. A separator comprising a receptacle having an open top and provided with an outlet at the lower end thereof, a pair of hangers for said receptacle, levers disposed over opposite sides of said receptacle for supporting said hangers, so that said receptacle is movable up and down bodily without tilting motion thereof, stationary fulcrums for said levers, a movable valve member for controlling said outlet, a counterbalance arm connected to both levers, whereby said lever and said arm tilt in opposite directions, and means to support said member on said arm, said levers being arranged parallel and disposed in a common plane above said receptacle, and said arm being located between said levers.

6. A separator comprising a receptacle having an open top and provided with an outlet at the lower end thereof, a pair of hangers for said receptacle, levers for supporting said hangers, means to suspend said hangers on said levers, means to secure the depending ends of said hangers to said receptacle, whereby said receptacle is movable up and down bodily without tilting motion thereof, stationary fulcrums for said levers, a movable valve member for controlling said outlet, a counterbalance arm connected to both levers, a fulcrum for said arms, and means to support said member on said arm, said member thereby supported independently of said levers and movable downward away from said outlet when said receptacle gravitates under a load.

7. A separator comprising a movable receptacle, a valve for the lower end of said receptacle, a rod extending downward through the receptacle to operate said valve, and means fixed to the receptacle to form a guide for said rod and to prevent the formation of an opening in the sand around said rod, said means being located a distance above said valve.

8. A separator comprising a receptacle, a valve for the lower end of said receptacle, a rod extending downward through the receptacle to operate said valve, and means to prevent the formation of an opening in the sand around said rod, said means being located a distance above said valve, and said means comprising a spider in which the rods move freely up and down and the arms of which are secured to the sides of said receptacle, and the center portion of said spider surrounding said rod and extending a distance from the sides thereof to support the sand around the rod.

9. A sand separator comprising a receptacle having a discharge opening, supporting mechanism for said receptacle, a frame to support said mechanism above said receptacle, whereby said receptacle is movable up and down bodily, counterbalancing means for normally holding the receptacle in raised position, adjusted to permit the receptacle to move downward under a load, and a valve for said opening, connected above with said mechanism to open when the receptacle moves downward, said mechanism including a lever having a fixed axis, a link connecting said lever with said means, a depending hanger having its lower ends secured to said receptacle, means engaging said lever at a point between said axis and link to support said hanger, said frame having beams spaced apart at the top of said receptacle, in a plane below said mechanism, and parallel fulcrums extending transversely of said beams to support said mechanism thereon.

10. A sand separator comprising a receptacle having a discharge opening, supporting mechanism upon which said receptacle is hung and whereby said receptacle is movable up and down, counterbalancing means for normally holding the receptacle in raised position, adjusted to permit the receptacle to move downward under a load, and a valve for said opening, connected with said mechanism to open downward when the receptacle moves downward, said mechanism and valve being connected together by a vertically disposed rod, said receptacle containing a guide for said rod, and said mechanism including a system of levers whereby said rod and valve move downward faster than the receptacle, beams spaced apart at the top of said receptacle, in a plane below said mechanism, and fulcrums extending transversely of said beams to support said mechanism thereon.

11. A sand separator comprising a receptacle having a discharge opening, supporting mechanism upon which said receptacle is hung and whereby said receptacle is movable up and down, counterbalancing means for normally holding the receptacle in raised position, adjusted to permit the receptacle to move downward under a load, and a valve for said opening, connected with said mechanism to open downward when the receptacle moves downward, said valve having a rod which extends upward through said receptacle, said mechanism having means to move said rod and valve downward faster than the receptacle to open said valve, beams spaced apart at the top of said receptacle, in a plane below said mechanism, and fulcrums extending transversely of said beams to support said mechanism thereon.

12. A sand separator comprising a receptacle having a discharge opening, supporting mechanism for said receptacle, arranged above the same, whereby said receptacle is movable up and down bodily, counterbalancing means for normally holding the receptacle in raised position, adjusted to permit the receptacle to move downward under a load, and a valve for said opening, connected above with said mechanism to open when the receptacle moves downward, said mechanism including a lever having a fixed axis, a link connecting said lever with said means, and a hanger secured to said receptacle, engaging said lever at a point between said axis and link, said mechanism including a rigid member extending transversely of said receptacle, and stopping means at opposite sides of said receptacle to engage the under side of said member and thereby limit the downward motion of the receptacle.

13. A sand separator comprising a receptacle having a discharge opening, supporting mechanism whereby said receptacle is movable up and down, counterbalancing means for normally holding the receptacle in raised position, adjusted to permit the receptacle to move downward under a load, and a valve for said opening, connected with said mechanism to open when the receptacle moves downward, said mechanism and valve being connected together by a vertically disposed rod, said receptacle containing a guide for said rod, and said mechanism including a system of levers whereby said rod moves downward faster than the receptacle, said mechanism including a rigid member extending transversely of said receptacle, and stopping means at opposite sides of said receptacle to engage the under side of said member and thereby limit the downward motion of the receptacle.

14. A sand separator comprising a receptacle having a discharge opening, supporting mechanism whereby said receptacle is movable up and down, counterbalancing means for normally holding the receptacle in raised position, adjusted to permit the receptacle to move downward under a load, and a valve for said opening, connected with said mechanism to open when the receptacle moves downward, said valve having a rod which extends upward through said receptacle, said mechanism having means to move said rod downward faster than the receptacle to open said valve, said mechanism including a rigid member extending transversely of said receptacle, and stopping means at opposite sides of said receptacle to engage the under side of said member and thereby limit the downward motion of the receptacle.

15. A sand separator comprising a receptacle hung pendulum-like and having a discharge opening, supporting mechanism for suspending said receptacle at the upper end thereof, arranged above the same, whereby said receptacle is movable up and down bodily, without tilting motion thereof, counterbalancing means for normally holding the receptacle in raised position, adjusted to permit the receptacle to move downward under a load, and a valve for said opening, connected above with said mechanism to open when the receptacle moves downward, said mechanism including a lever having a fixed axis, a link connecting said lever with said means, a swinging hanger secured at its lower end to said receptacle and means engaging said lever at a point between said axis and link to support said hanger, said means including an adjustable weight arranged to directly counterbalance said valve, and the connection between said means and valve having only a single pivotal point therein.

16. A sand separator comprising a receptacle hung pendulum-like and having a discharge opening, supporting mechanism whereby said receptacle is suspended at its

upper end and movable up and down bodily without tilting motion thereof, counterbalancing means for normally holding the receptacle in raised position, adjusted to permit the receptacle to move downward under a load, and a valve for said opening, connected with said mechanism to open when the receptacle moves downward, said mechanism and valve being connected together by a vertically disposed rod, said receptacle containing a guide for said rod, and said mechanism including a system of levers whereby said rod moves faster than the receptacle, said means including an adjustable weight arranged to directly counterbalance said valve, and the connection between said means and valve having only a single pivotal point therein.

17. A sand separator comprising a receptacle hung pendulum-like and having a discharge opening, supporting mechanism whereby said receptacle is suspended at its upper end and movable up and down bodily without tilting motion thereof, counterbalancing means for normally holding the receptacle in raised position, adjusted to permit the receptacle to move downward under a load, and a valve for said opening, connected with said mechanism to open when the receptacle moves downward, said valve having a rod which extends upward through said receptacle, said mechanism having means to move said rod downward faster than the receptacle to open said valve, said means including an adjustable weight arranged to directly counterbalance said valve, and the connection between said means and valve having only a single pivotal point therein.

18. A sand separator comprising a receptacle having a discharge opening, supporting mechanism whereby said receptacle is movable up and down, counterbalancing means for normally holding the receptacle in raised position, adjusted to permit the receptacle to move downward under a load, and a valve for said opening, connected with said mechanism to open when the receptacle moves downward, said valve having a rod which extends upward through said receptacle, said mechanism having means to move said rod downward faster than the receptacle to open said valve, and stationary means to engage said mechanism and thereby limit the downward movement of said receptacle.

19. A sand separator comprising a receptacle having a discharge opening, supporting mechanism for suspending the receptacle at the upper end thereof and whereby said receptacle is movable up and down bodily and maintained in vertical position, counterbalancing means coöperating with said mechanism for normally holding the receptacle in raised position, adjusted to permit the receptacle to move downward under a load, and a valve for said opening, connected with said mechanism to automatically open when the receptacle moves downward, said valve having a rod which extends upward through said receptacle, said mechanism having means to move said rod downward faster than the receptacle to open said valve, said rod having its upper end provided with a pivot, said mechanism including a tilting arm for said counterbalancing means, a fulcrum for said arm, and said pivot being supported on one end of said arm.

20. A sand separator comprising a receptacle having a discharge opening, supporting mechanism whereby said receptacle is movable up and down, counterbalancing means coöperating with said mechanism for normally holding the receptacle in raised position, adjusted to permit the receptacle to move downward under a load, and a valve for said opening, connected with said mechanism to open when the receptacle moves downward, said valve having a rod which extends upward through said receptacle, said mechanism having means to maintain the receptacle in vertical position and means to move said rod downward faster than the receptacle to open said valve, and said receptacle having a single horizontal axis of suspension on said mechanism.

Signed by me at Chicago, Illinois, this 11th day of August 1015.

RAYMOND W. DULL.