Feb. 17, 1925.

1,527,072

O. B. PECK, JR

CENTRIFUGAL CONCENTRATOR

Original Filed Oct. 8, 1923 2 Sheets-Sheet 1

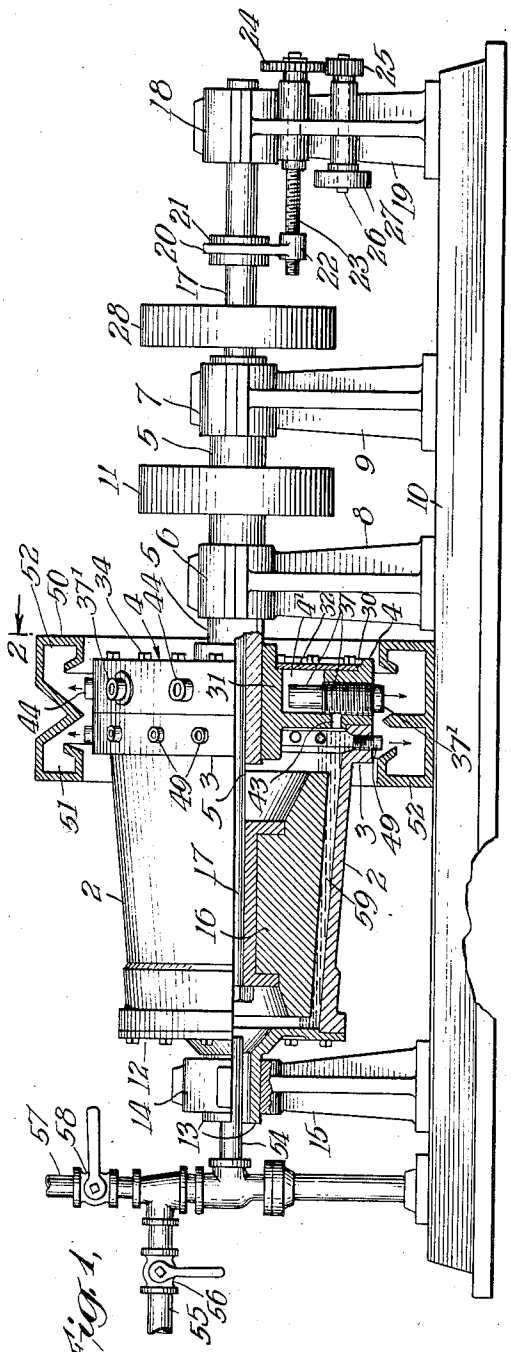


Fig. 1.

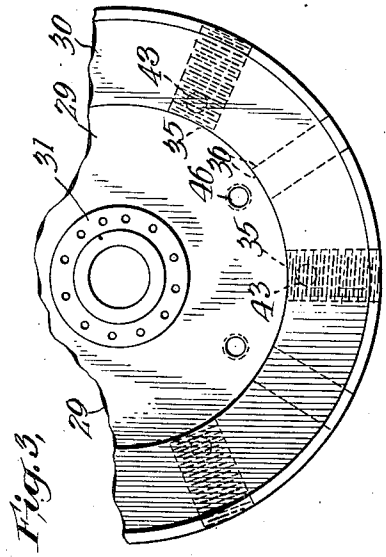


Fig. 3.

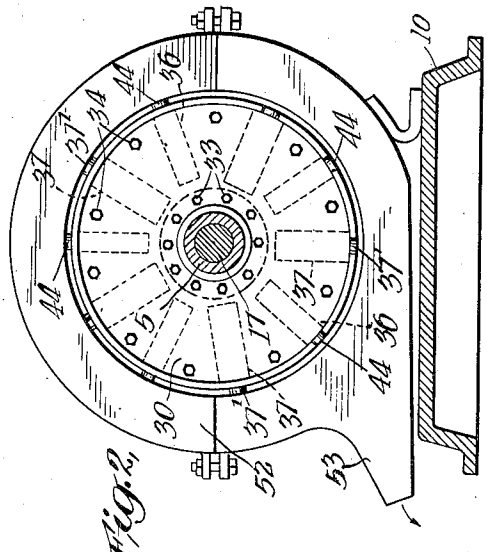


Fig. 2.

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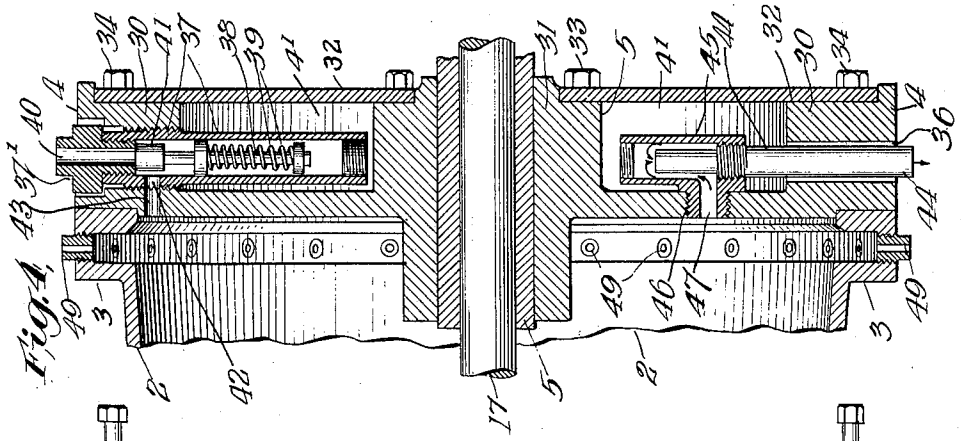


Fig. 4.

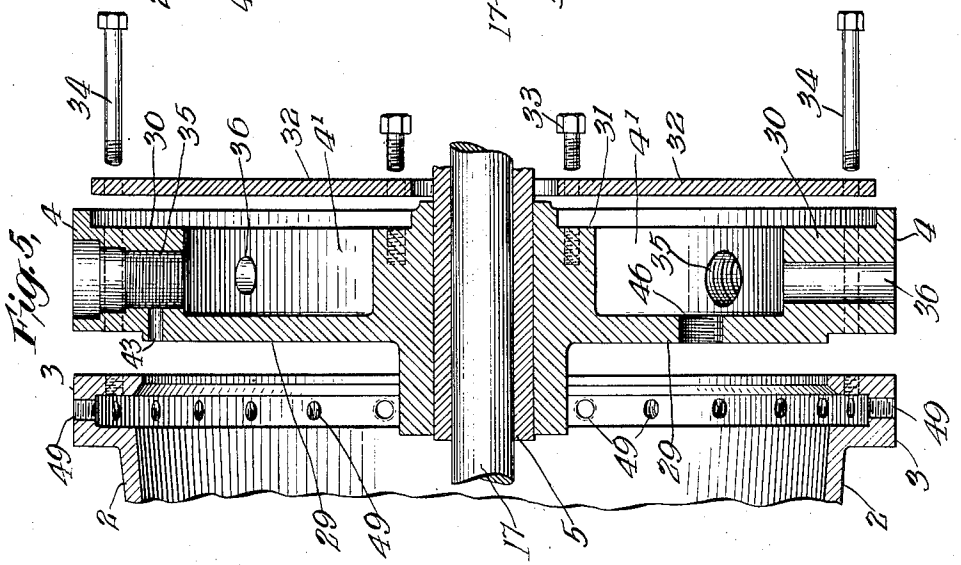


Fig. 5.

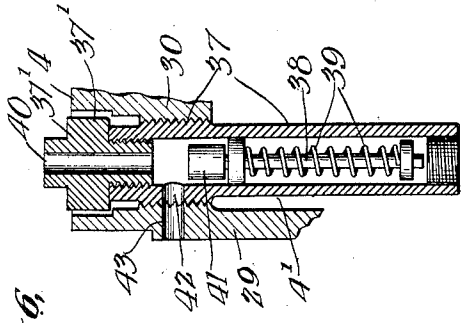


Fig. 6.

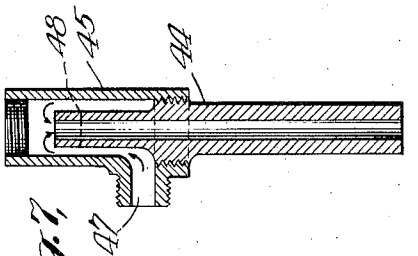


Fig. 7.

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UNITED STATES PATENT OFFICE.

ORRIN B. PECK, JR., OF LOS ANGELES, CALIFORNIA.

CENTRIFUGAL CONCENTRATOR.

Application filed October 8, 1923, Serial No. 667,236. Renewed August 18, 1924.

To all whom it may concern:

Be it known that I, ORRIN B. PECK, Jr., a citizen of the United States, residing at No. 1433 West 48th Street, city of Los Angeles, State of California, have invented certain new and useful Improvements in Centrifugal Concentrators, of which the following is a specification.

My invention relates to that type of centrifugal concentrators having a rotatable concentrating vessel and an internal rotatable core member which operates in successive cycles, alternately accumulating a bed of concentrates and discharging the same from the vessel, and is more particularly directed to the discharge end or head of the vessel with its internal mechanism.

In the accompanying drawings,

Fig. 1, is partly an elevation and partly a central longitudinal section of my concentrator.

Fig. 2 is a transverse section taken on line 2—2 of Fig. 1 looking in the direction of the arrows.

Fig. 3 is an elevation of a part of the large end or head of the vessel, with the outer portion of such end removed, to assist in illustrating its construction.

Fig. 4 is a vertical transverse central section of the large end or head of the vessel, showing some of the parts contained therein, in section and also with a part of the vessel attached, in section.

Fig. 5 is in part similar to Fig. 4, but with the members located within the head of the vessel omitted, and the respective members somewhat moved apart to better indicate their relations.

Fig. 6 is an enlarged central section of one of the members illustrated attached in place in Fig. 1, with portions of the head adjacent thereto, and

Fig. 7 is a detached enlarged longitudinal central section of the overflow member illustrated in position in Fig. 4.

In making my improved concentrator I provide a rotatable, preferably conical-shaped concentrating vessel 2, which is illustrated in a horizontal position, and on the large end of the vessel is formed an annular enlargement 3, to which is attached a composite head or end 4, having a central hub rigidly engaging a hollow shaft 5, which is journalled in boxes 6 and 7, being located on the respective upper ends of the stands 8 and 9, which in turn are mounted on a bedplate 10, of the concentrator.

The shaft is provided with a pulley 11, by which rotation may be imparted to it and the vessel, from any suitable source of power.

The small end of the vessel is provided with a head or end 12, having a hollow trunnion 13, which is journalled in a box 14, carried on the upper end of the stand 15, which is mounted on the bedplate of the concentrator as shown.

Within the vessel is provided a core member 16, having a substantially smooth circumferential surface, preferably of shape to conform to the internal circumference of the vessel. This core is somewhat shorter than the internal length of the vessel and of diameter so when the same is at its position nearest the small end of the vessel, as illustrated in Fig. 1, there will be a suitable comparatively small annular space or channel, around between the exterior of the core and the wall of the vessel.

The core is rotatably supported by a shaft 17, extending through the hollow shaft 5 into the vessel, and out of the opposite end of said hollow shaft, in which it is rotatably journalled, a sufficient distance to afford space desired for certain other parts of construction of the concentrator.

The outer extended end of the shaft 17 is journalled in a box 18, mounted on the upper end of a stand 19, located on the base plate of the concentrator.

In suitable position on and securely attached to the shaft 17, is a collar 20, which rotatably engages a ring collar 21, having a depending part 22 internally threaded and adapted to receive a threaded rod 23, which is journalled in the stand 19, and at its outer end carries a gear wheel 24, which engages a gear wheel 25, mounted in suitable position on the end of a shaft 26. The shaft 26, on its opposite end is provided with a pulley 27, through which rotation may be imparted. The shaft 26, like the shaft 24, is journalled in the stand 19, as illustrated in Fig. 1.

There is a pulley 28 mounted on the shaft 17, by which this shaft, carrying the core member 16, may be rotated as desired, differentially to the vessel member of the concentrator.

The composite head or end 4 of the vessel is formed preferably by a major or disc part

29, as best shown in Figs. 3, 4 and 5, having an integral annular ring or flange portion 30, and a hub portion 31, adapted to receive a disc or plate 32, which is seated in contact with the flange and hub portions and securely held in such position by bolts 33 and 34, as most plainly shown in Fig. 4. These parts are shown somewhat removed from their relative position in Fig. 5, to better illustrate their association. It will be seen that the bolts 34, in addition to holding the outer diameter of the plate 32, in place on the other portion of the head, also serve to secure that end of the concentrating vessel, to the head.

Through the outer ring or flange portion 30 of the head there is provided, radiating in direction from the axis, openings or holes 35 and 36, respectively, the former of which are provided with internal screw threads adapted to receive the threads on the housing or wall part 37, of valve mechanism as illustrated.

This valve is preferably closed at its end nearest the axis of the head, and is adapted to be screwed into place, extending in the chamber 4′ formed in the head of the vessel as shown, and is provided with a plunger or stem 38, suitably located and guided in the housing of the valve, where it is supplied with a coil spring 39, through which it is moved towards the axis of the head when the head is in a state of rest or is rotating at a sufficiently low speed during the unloading portion of the cycle of operation, this position being shown in Fig. 6 of the drawing.

The valve is provided with a discharge opening 40, through a part 37′ which is detachably screwed to the barrel or housing part 37, which opening extends in position to be closed by seating thereover of a closure head 41, located on that end of the plunger 38, when actuated by relatively highly developed centrifugal force, this latter condition being shown in Fig. 4. The valve is also provided with an opening 42, which registers when screwed into operating position, with an opening 43, in the wall of this head of the concentrator, here forming, when the valve head is in an open position as illustrated in Fig. 6, a free flow passage from the separating vessel. The purpose of this passage is to facilitate rapid discharge of the bedded concentrates from the vessel during the unloading part of the cycle of operation, the spring 39, then holding the valve in a normally open state.

It will be understood that the concentrates are discharged or unloaded from the vessel during slow speed of rotation, with resultant low degree of centrifugal force, which will enable the spring 39 to move the plunger 38, and raise the seating head 41, as illustrated in Fig. 6, opening the flow passage from the vessel, and that, during the concentrating portion of the cycle, the vessel being rotated at a high speed, the centrifugal force will compress the spring 38, carrying the plunger and its head 41, outward as illustrated in Fig. 4, in that way closing the flow passage 43.

In the openings 36 in the flange part 4 of the vessel head, may be inserted overflow tubes 44, engaging screw threads in an angle part 45, which in turn screws into openings 46 of the disc part 29 of the head, as illustrated. The parts or members 45, are provided with an opening 47, Figs. 2 and 7, communicating with the inside of the vessel, and during operation are adapted to serve as overflow channels for liquid in the vessel, if such liquid should accumulate therein to a position sufficiently near the axis to pass into this opening and up over the top end of the member 44, which course is indicated by arrows in Figs. 4 and 7.

If it should be desired, the member 44 may be removed or unscrewed from the part 45, and another of such members inserted in its place, having a shorter inner end to reach position as indicated in dotted lines 48, in Fig. 7, which would enable liquid to over-flow through the channel 47, and out of the vessel before accumulating to approach so near the axis of the vessel as would be the case with the longer end to the member 44, shown in this way, rendering the means for over-flow of excess liquid adjustable. Adjustment may further be effected by screwing the member 44 to a position farther in or out of the part 45.

It will be seen in this form of construction of the head of the vessel, that there is conserved strength and convenience as well as facility for positioning the concentrate discharge valve and the over-flow means within the head, away from outside interference and to effectuate better operation, as they will not be an obstruction or hazard menace.

As is especially shown in Fig. 1 the members 40 and 44, respectively, are in circumferential alignment in the head of the vessel, and there are also openings 49, positioned in a circumferential row on the enlargement of the vessel, which remain constantly open for discharge of material and liquid, operating most potently in this during the concentrating portion of the cycle. These latter openings also serve during the unloading portion of the cycle to assist the flow passages 43, in discharge of the concentrates.

Encircling the respective rows of discharge openings, in a suitable fixed position is a launder 50, having two annular chambers 51 and 52, respectively, with internal slots or channels in alignment with, and suitable to catch liquid and material from the respective discharge openings from the

vessel, and to convey the same out of the launder from its extended end or spout 53, which is shown in Fig. 2.

As means for feeding liquid and material into the concentrating vessel, I have provided a pipe 54, extending through the hollow trunnion 13, and terminating in the vessel, between that end and the adjacent end of the core 16. This pipe, through a branch pipe 55, may be connected with any suitable source of supply of material for concentration, and is provided with a valve 56, by which the flow of such material to the concentrating vessel may be regulated as well as stopped and started as desired. Such material should be mixed with sufficient liquid to flow freely, preferably about one fifth part solids by weight.

In order to supply comparatively clean water to the concentrating vessel during discharge of the bedded concentrates, there is provided a branch pipe 57, which may be connected to a desired source of supply of water, or other liquid, and in this pipe is a valve 58, by which the flow of such liquid may be controlled as desired.

In operation, the concentrating vessel is rotated at a desired rate of speed to meet the conditions of material being operated on, and the core member is also revolved at a desired speed, sufficiently differential to the speed of the vessel to engender a liquid scrubbing energy appropriate to effect separation, dislodgment and discharge of the relatively lighter parts of the material under treatment, while permitting the heavier parts, or concentrates to bed in the concentrating channel 59.

During this time, which is the concentrating portion of the cycle of operation, the core 16, being first positioned at the smaller end of the vessel, is gradually moved endways towards the large, or discharge end of the vessel, through appropriate rotation of the pulley 27, with its gear wheels and associate mechanism, which has been described, thereby enlarging the channel 59, to accommodate the accumulating bed of concentrates in the vessel, until the core has reached its extreme position toward the large or discharge end, when the endwise movement is stopped through cessation of rotation of the pulley 27, this being the end on the concentrating portion of the cycle, and the feed of material and liquid should be closed off by the valve 56; the speed of rotation of the vessel sufficiently lessened to much reduce centrifugal force being developed within the concentrating vessel, and water introduced through the pipe 57; rotation of the pulley 27 and the gear mechanism started in a reverse reversed to again carry the core member back to its initial position at the small end of the concentrating vessel, as illustrated in Fig. 1.

During the low speed of the vessel, which as above stated, is the unloading part of the cycle, the valve heads 41, will be moved by the springs 39, and the flow channels 43, render free for discharge of the bedded concentrates, which will, under the influence of the return movement of the core; the greatly lessened centrifugal force, and the liquid being supplied through the pipe 57, be quickly dislodged and discharged from the vessel, rendering the same clean and ready for the beginning of another cycle. At this time the speed of the vessel is accelerated properly; the flow of water closed off by the valve 58; the feed of material again started by opening of the valve 56, and the cycle repeated.

What I regard as new and desire to secure by Letters Patent is:

1. In a centrifugal concentrator, the combination of a rotatable concentrating vessel, a rotatable core within the vessel, an attached head to said vessel provided with normally open concentrate discharge means adapted to be actuated to closure by relatively highly developed centrifugal force, and means for rotating the vessel and head, substantially as described.

2. In a centrifugal concentrator, the combination of a rotatable concentrating vessel, a rotatable core within the vessel, an attached head to said vessel having an annular chamber therein, adapted to receive valve mechanism embodying means normally open for discharge of concentrates, adapted to be actuated to closure by relatively highly developed centrifugal force, and means for rotating said vessel and head substantially as described.

3. In a centrifugal concentrator, the combination of a rotatable concentrating vessel, a rotatable core within the vessel, a composite head attached to said vessel, having an annular chamber therein adapted to receive valve mechanism embodying means normally open for discharge of concentrates, adapted to be actuated to closure by relatively highly developed centrifugal force, means extending into said chamber for overflow of liquid from the concentrating vessel, and means for rotating said vessel and head, substantially as described.

4. In a centrifugal concentrator the combination of a rotatable concentrating vessel, a rotatable core within the vessel, said vessel provided with a composite head, having a major portion provided with an annular flange positioned near its circumference, and having openings through said flange, extending radially from the axis, adapted to receive valve mechanism normally open for discharge flow of concentrate from the vessel, and means for rotating the vessel, and head, substantially as described.

5. In a centrifugal concentrator the com-

bination of a rotatable concentrating vessel, a rotatable core within the vessel, said vessel provided with a composite head, having a major portion provided with an annular flange positioned near its circumference, and provided with openings through the flange, extending radially from the axis, valve mechanism, removably secured in said openings extending into an annular chamber within the head, adapted to discharge of concentrates from the vessel when normally open, and adapted to be actuated to closure by relatively highly developed centrifugal force, and means for rotating said vessel and head, substantially as described.

6. In a centrifugal concentrator the combination of a rotatable concentrating vessel, a rotatable core within the vessel, said vessel provided with a composite head, having a major portion provided with an annular flange positioned near its circumference, and provided with openings through the flange, extending radially from the axis, a plate removably secured to said major portion, forming therewith a chamber within the head, adapted to receive valve mechanism for discharge of concentrates, automatically closable through highly developed centrifugal force, and means for rotating the vessel and head, substantially as described.

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