Dec. 3, 1935. G. J. STREZYNSKI 2,022,814

CENTRIFUGAL BOWL FOR SEPARATING HEAVY SLUDGE AND SOLIDS FROM LIGHTER LIQUIDS

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FIG. 1.

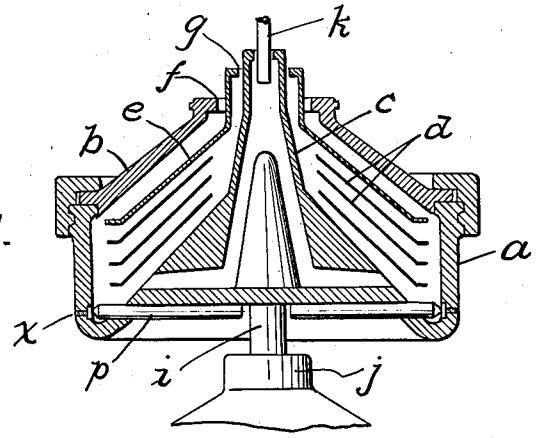


FIG. 2.

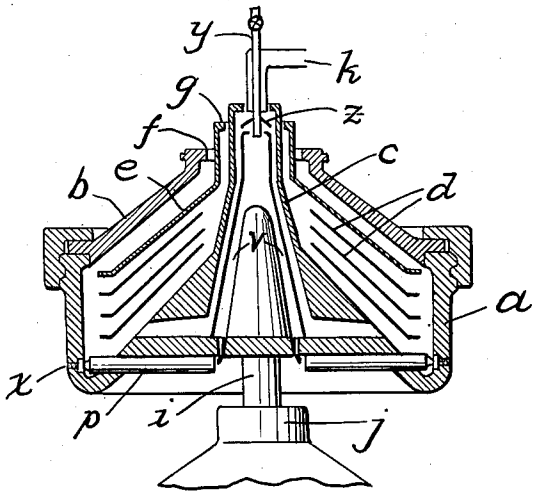
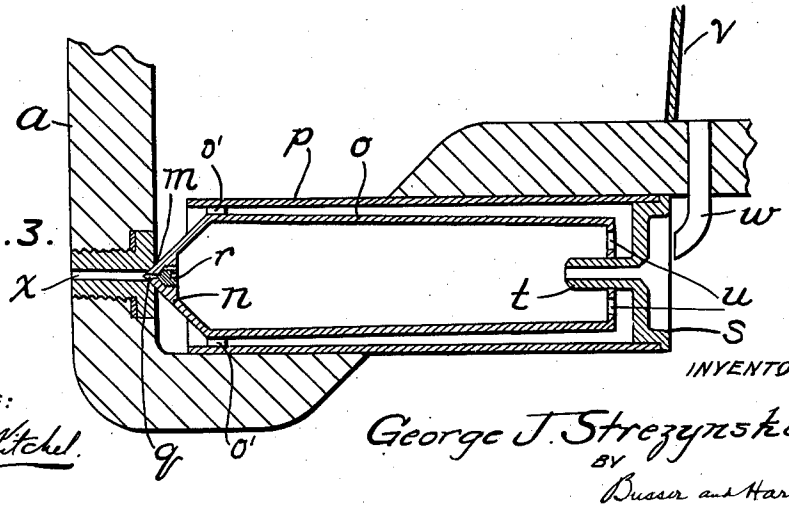


FIG. 3.



WITNESS:

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CENTRIFUGAL BOWL FOR SEPARATING HEAVY SLUDGE AND SOLIDS FROM LIGHTER LIQUIDS

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Application September 27, 1933, Serial No. 691,111

19 Claims. (Cl. 233—20)

My invention is an improvement in bowls for separating heavy sludges or solids from lighter liquids and discharging them through openings in the bowl wall.

The object of my invention is to provide, in a bowl with outlets at its maximum diameter for the escape of heavy sludge or slimy solids, simple and reliable means, which may be either automatic or under the control of the operator, for opening and for closing such outlets.

It is old to provide bowls with openings through the bowl wall. In some constructions these openings are constantly open. In others, mechanical, electrical or hydraulic means are provided to open and close such openings at the will of the operator or under the control of outside timing devices. It is also old to provide springs designed to hold the outlet closed against the pressure due to liquids but to permit the outlet to open under the greater pressure due to a considerable collection of heavier solids. Attempts have been made to provide automatic devices to open and close ports in the bowl walls. The object of the present invention is to provide outlet-control means that are less complicated and more reliable than known constructions.

In the accompanying drawing, which illustrates embodiments of my invention: Figure 1 is a vertical section, a little at one side of the center, of a complete bowl. Figure 2 is a similar section of a modification. Figure 3 is an enlarged cross section of the sludge outlet valve.

a is a bowl shell having a top *b* and containing a tubular feed shaft *c*, a nest of separating discs *d* and a top disc *e*. The outlet for heavy liquid is at *f*, for light liquid at *g*, and for sludge or slimy solids at *x*. The bowl is supported and driven by a spindle *i* turning in a bearing *j*. The inlet for liquid to be treated is through a tube *k*.

My automatic sludge outlet valve comprises a port *x* through the bowl wall, a valve seat *m* at the inner end of the port and an automatically operating floating valve therefor comprising a radially extending hollow body *o* having a pointed head *n*, the tip of which is adapted to engage the valve seat and through which tip is a small opening *q* throttled by a screw *r*. The hollow valve body *o* is slidable radially and may be guided in any suitable manner, as by a tube *p* extending from near the bowl wall toward the center of rotation. The end of tube *p* near the bowl center is closed by a plug *s* having a stem *t* that, by entering a hole in the back end wall of the valve body, guides the back end of the valve body. The front end of the valve body may be provided with lugs *o'* to keep it spaced from the enclosing tube. The back wall of the valve body is provided with orifices *u*. There may be any number of these outlets and valve bodies.

In Figure 2 there is shown, inside the tubular shaft *c*, a hollow member forming a chamber *v* from the bottom of which lead tubes *w* each adapted to discharge liquid, through the hollow stem *t* of the plug *s*, into the corresponding hollow valve body *o*. A tube *y* extending through the center of the feed tube *k* provides means to feed liquid inside the chamber *v*. A deflector *z* around the tube *y* near its lower end prevents liquid fed through the tube *k* entering the chamber *v*.

The radius from the center of the bowl to the inner end of the valve body *o* is less than that of the outlet *f* for heavy liquid and greater than that of the outlet *g* for light liquid.

While this bowl is adapted for removal of any heavy slimy viscous material from a lighter liquid, such as "foots" from the alkali treatment of vegetable oils, dirt from milk, waxes from oils, etc., I will describe its operation when removing from mineral oil the sludge formed by treating such oil with strong acid.

When oil is fed into the bowl it will flow to the outside and fill back to a circle having the same radius as the light liquid outlet *g*. As this is nearer than the inner end of the valve body *o* to the bowl axis, the oil will submerge the valve and, entering its hollow interior through the orifices *u*, will fill it with oil. Centrifugal force acting on the valve will press it against the seat *m* and close the outlet *x*. A small quantity of oil will leak past the screw *r* and through the opening *q* and outlet *x*, but this will be immediately replaced by oil entering between the valve and the guide tube *p*. As sludge is separated from the oil it will build up a layer against the bowl shell and soon cover the end of the tube *p* and prevent further entrance of oil. In a short time the leakage past the screw *r* will empty the valve, which, being lighter than the oil that it displaces, will float toward the center of the bowl, thus opening the outlet *x*. The sludge will then escape through the outlet *x* until the end of the tube *p* is exposed, when oil will again enter and fill the valve and cause it to sink and close the port again, and the cycle will be repeated.

In some centrifugal operations, after the wall of sludge has built back to the outer edge of tube *p*, the valve will recede from the port *x* after losing only a small proportion of its contained liquid and the discharge of only a very little

sludge through the outlet *x* will be required to again move the sludge wall out beyond the outer edge of tube *p*. But little time is therefore required to again fill the tube *o* with liquid and complete the cycle. While the discharge of sludge through the outlet *x* will thus be intermittent, the action may be so frequent as to be equivalent to a practically continuous discharge of sludge at a rate sufficient to maintain the inner wall of sludge about coincident with the outer edge of the tube *p*.

I do not herein claim specifically this modified construction, the same forming the subject-matter of another application filed by me December 29, 1933, Serial No. 704,482.

With the construction shown in Figure 2 it is possible to feed another liquid through the tube *y*, the chamber *v*, the tube *w* and hollow stem *t* into the valve to compensate for leakage past the screw *p* and keep the valve full so that it will hold the outlet *x* closed until the operator desires it to open. With this construction the inner end of the valve may be brought closer to the center than the outlet *g* for the lighter liquid, so that liquid from the bowl will never enter the valve body and the opening and closing of the valve is entirely under the control of the operator. Another advantage of this modification is that there is no loss of oil, although such loss is slight in the first described embodiment of the invention.

What I claim and desire to protect by Letters Patent is:

1. In a centrifugal bowl provided with an outlet extending outwardly from and communicating with the peripheral space of the bowl, a hollow member comprising a valve and positioned between said peripheral outlet and the axis of the bowl and having in the end thereof nearest said axis a fluid-admission opening, said member being movable outward to seat the valve and close communication between said outlet and the peripheral part of the bowl and movable inward to unseat the valve and open said communication, and means controlling the admission of liquid to and its discharge from said hollow member to thereby, by varying its weight, cause it to move into and out of position to close said outlet.

2. In a centrifugal bowl provided with an outlet extending outwardly from and communicating with the peripheral space of the bowl, a hollow member comprising a valve and positioned between said peripheral outlet and the axis of the bowl and freely floatable outward to seat the valve and close communication between said outlet and the peripheral part of the bowl and freely floatable inward to unseat the valve and open said communication, and means controlling the admission of liquid to said hollow member to cause it to move outward into position to close said outlet, there being a restricted passage in the outer end of said hollow member adapted to register with said orifice and permit leakage of liquid from said hollow member through said restricted passage and outlet when communication of said outlet with the peripheral part of the bowl is closed.

3. In a centrifugal bowl provided with an outlet extending outwardly from and communicating with the peripheral space of the bowl, a hollow member comprising a valve and positioned between said peripheral outlet and the axis of the bowl and freely floatable outward to seat the valve and close communication between said outlet and the peripheral part of the bowl and freely floatable inward to unseat the valve and open said communication, means providing a channel adapted, unless closed by the accumulation of a predetermined quantity of sludge, to convey liquid from the separating space of the bowl into said hollow member and move it outward to seat the valve, and means allowing escape of liquid from said hollow member when the valve is seated, thereby causing it to be sufficiently lightened to move inward, unseat the valve and allow excess sludge to escape through said outlet.

4. In a centrifugal bowl provided with an outlet extending outwardly from and communicating with the peripheral space of the bowl, a hollow member comprising a valve and positioned between said peripheral outlet and the axis of the bowl and freely floatable outward to seat the valve and close communication between said outlet and the peripheral part of the bowl and freely floatable inward to unseat the valve and open said communication, means providing a channel adapted, unless closed by the accumulation of a predetermined quantity of sludge, to convey liquid from the separating space of the bowl into said hollow member and move it outward to seat the valve, and means allowing escape of liquid from said hollow member when the valve is seated, thereby causing it to be sufficiently lightened to move inward, unseat the valve and allow excess sludge to escape through said outlet, said liquid escape means comprising a restricted passage in said valve adapted to register with said outlet when the valve is seated.

5. In a centrifugal bowl provided with an outlet extending outwardly from and communicating with the peripheral space of the bowl, a radially extending floating hollow member having an opening communicating with the separating space of the bowl and movable radially outward to close said outlet when weighted with a predetermined amount of liquid entering said opening from the separating space of the bowl, an element in the bowl whose outer edge is spaced from the bowl wall and over which said liquid is adapted to flow toward and into said opening in the hollow member and which shuts off such flow when the sludge accumulates to a depth sufficient to close the space between said element and the bowl wall, and means allowing escape of liquid from said hollow member while it is in its outlet-closing position, thereby lightening it sufficiently to cause it to float radially inward, allow excess sludge to escape through said outlet and re-open communication between its said opening and the separating space of the bowl.

6. In a centrifugal bowl provided with an outlet extending outwardly from and communicating with the peripheral space of the bowl, a hollow radially floating liquid-receiving member between said peripheral outlet and the axis of the bowl and having in the end nearest said axis a fluid-receiving opening, said member being adapted to move outward to close said outlet or inward to open it dependent on the weight of contained liquid, and means to cause flow of liquid into said hollow member when there is less than a predetermined quantity of peripherally accumulated sludge in the bowl and to shut off said flow when there is more than said predetermined quantity.

7. In a centrifugal bowl provided with an outlet extending outwardly from and communicating with the peripheral space of the bowl, a valve seat at the inner end of said outlet, a tube with

its axis extending from near the bowl wall toward the center of rotation and within the tube a hollow member comprising at its outer end a valve adapted to cooperate with said valve seat to close said outlet, there being a restricted port from inside the hollow member adapted to meet the outlet when the valve is seated, and means controlling the admission of liquid to said hollow member to vary the quantity of liquid therein and thereby cause it to advance and recede and alternately seat and unseat said valve.

8. In a centrifugal bowl provided with an outlet extending outwardly from and communicating with the peripheral space of the bowl, a valve seat at the inner end of said outlet, a tube with its axis extending from near the bowl wall toward the center of rotation and within the tube a hollow member comprising at its outer end a valve adapted to cooperate with said valve seat to close said outlet, there being a restricted port from inside the hollow member adapted to meet the outlet when the valve is seated, there being a passage between said tube and hollow member through which liquid is adapted to flow from the peripheral part of the bowl into the inner part of said hollow member, said passage adapted to be closed by accumulation within the bowl of a predetermined depth of sludge, thereby allowing outflow of liquid through said restricted port and outlet until the hollow member is sufficiently lightened by loss of liquid to cause it to float inward, unseat the valve and allow escape of sludge until said passage is re-opened.

9. In a centrifugal bowl provided with a light liquid outlet located relatively near its axis, a heavy liquid outlet located further from its axis and a sludge outlet extending outwardly from and communicating with the peripheral space of the bowl, a floating hollow member having an opening in its inner end nearer to the axis of the bowl than the heavy liquid outlet and further from the axis of the bowl than the light liquid outlet, said opening communicating with the separating space of the bowl when the same is free of accumulated sludge, means adapted to cut off said communication when the sludge deposits on the bowl wall to a predetermined depth, and means allowing outflow of liquid from the hollow member when said communication is cut off, whereby said floating member will be held in an outer position except when sludge accumulates to a depth sufficient to close said communication and will then, by reason of loss of liquid, move inward, and a valve carried at the outer end of said floating member and adapted to close said outlet when the hollow member is held in its outer position and to open said outlet when said hollow member moves inward.

10. In a centrifugal bowl provided with outlets for respectively heavier and lighter separated liquids and a peripheral outlet for the heaviest separated constituent, a floating hollow member communicating at its rear end with the separator space of the bowl, its length being such that its rear end is at a greater radial distance from the bowl axis than the lighter liquid outlet and at a less radial distance from the bowl axis than the heavier liquid outlet, said member adapted to receive lighter liquid from the separator space of the bowl through the rear end of said member communicating with said separator space and to move outward and close said peripheral outlet and adapted to move inward and open said peripheral outlet upon escape from said member of lighter liquid, and means allowing escape of such liquid while said member is in its outer position.

11. In a centrifugal bowl provided with an outlet extending outwardly from and communicating with the peripheral space of the bowl, a hollow member positioned between said peripheral outlet and the bowl axis and freely floatable toward and from the axis of the bowl and comprising at its outer end a valve having a leakage orifice communicating with the interior of the hollow member, and means controlling the admission of liquid into said hollow member to thereby increase its weight and cause it to float outward and thereby seat the valve and close said outlet, the leakage of liquid through said valve lightening the weight of said member and causing it, after cessation of admission of liquid thereinto, to float inward and thereby unseat the valve and open said outlet.

12. In a centrifugal bowl provided with an outlet extending outwardly from and communicating with the peripheral space of the bowl, a hollow member positioned between said peripheral outlet and the bowl axis and within a space communicating with the interior of the bowl and thereby adapted to float upon liquid admitted to said space, said member comprising at its outer end a valve having a leakage orifice communicating with the interior of the hollow member, and means controlling the admission of liquid into said hollow member to thereby increase its weight and cause it to float outward and thereby seat the valve and close said outlet, the leakage of liquid through the valve lightening the weight of said member and causing it, after cessation of admission of liquid thereinto, to float inward and thereby unseat the valve and open said outlet.

13. In a centrifugal bowl for separating sludge from liquid, provided with an outlet extending outwardly from and communicating with the peripheral space of the bowl, a hollow member positioned between said peripheral outlet and the bowl axis and floatable within a space communicating with the interior of the bowl near the latter's peripheral wall, said member having an opening affording communication with said space, said member comprising at its outer end a valve having a leakage orifice, the flow of liquid from the interior of the bowl through said space into the hollow member increasing the weight of said member and causing it to float outward and thereby seat the valve and close said outlet, the leakage of liquid through the valve lightening the weight of said member and causing it to float inward and thereby unseat the valve and open said outlet after sludge, accumulating adjacent the peripheral bowl wall, closes communication between the interior of the bowl and said space.

14. In a centrifugal bowl for separating sludge and liquid, provided with an outlet through its peripheral wall, means providing a valve enclosure adapted to communicate with and receive liquid from the interior of the bowl, a hollow valve member floatable within said valve enclosure and movable outward to close said outlet and inward to open it dependent on the weight of liquid therein, and means to cause flow of liquid into said hollow member when there is less than a predetermined quantity of peripherally accumulated sludge in the bowl and to shut off said flow when there is more than said predetermined quantity.

15. In a centrifugal bowl for separating sludge

from liquid, provided with an outlet through its peripheral wall, means providing a valve enclosure adapted to communicate with and receive liquid from the interior of the bowl, a hollow valve member floatable within said valve enclosure and movable outward to close said outlet and inward to open it dependent on the weight of liquid therein, means to admit liquid into said hollow member to thereby increase its weight and cause it to float outward and close said outlet, and means allowing escape of liquid from said hollow member to thereby decrease its weight and cause it to float inward and open said outlet.

16. In a centrifugal bowl provided with an outlet extending outwardly from and communicating with the peripheral space of the bowl, a valve seat at the inner end of said outlet, a hollow member comprising at its outer end a valve adapted to cooperate with said valve seat to close said outlet, and an element in the bowl whose outer edge is spaced from the bowl wall and over which liquid is adapted to flow toward and into said hollow member and which shuts off said flow when sludge accumulates to a depth sufficient to close the space between said element and the bowl wall, there being a restricted port from inside said hollow member adapted to allow escape of liquid therefrom whereby said valve is caused to move inward and open said outlet when flow past said element is stopped and to move outward and close said outlet when flow is resumed.

17. In a centrifugal bowl provided with an outlet extending outwardly from and communicating with the peripheral space of the bowl, a valve seat at the inner end of said outlet, a hollow member comprising at its outer end a valve adapted to cooperate with said valve seat to close said outlet when the hollow member fills with liquid and open said outlet when the hollow member empties, and an element in the bowl whose outer edge is spaced from the bowl wall and over which liquid is adapted to flow toward and into said hollow member and which shuts off said flow when sludge accumulates to a depth sufficient to close said space between the element and the bowl wall, there being a restricted port from inside said hollow member adapted to allow escape of liquid therefrom.

18. In a centrifugal bowl provided with an outlet extending outwardly from and communicating with the peripheral space of the bowl and having a valve seat at its inner end, a hollow member positioned between said peripheral outlet and the axis of the bowl and having in the end thereof nearest said axis a fluid admission opening and at the end thereof farthest from said axis a valve adapted on outward movement to cooperate with said seat and close communication between said outlet and the peripheral part of the bowl and on inward movement to open said communication, and means controlling the admission of liquid to and its discharge from said hollow member to thereby cause outward and inward movement of the valve.

19. In a centrifugal bowl provided with outlets for respectively heavier and lighter separated liquids and a peripheral outlet for the heaviest separated constituent, a floating hollow member having an opening which communicates with the separating space of the bowl and which is positioned at a greater radial distance from the bowl axis than the lighter liquid outlet and at a less radial distance from the bowl axis than the heavier liquid outlet, said member being thus adapted to receive only lighter liquid from the separator space of the bowl and to move outward and close said peripheral outlet upon being filled with a predetermined weight of said lighter liquid and to move inward and open said peripheral outlet upon escape from said member of lighter liquid, and means allowing escape of such liquid while said member is in its outer position.

GEORGE J. STREZYNSKI.

CERTIFICATE OF CORRECTION.

Patent No. 2,022,814. December 3, 1935.

GEORGE J. STREZYNSKI.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 12, beginning with the words "I do not" strike out all to and including the number and period "704,482." in line 15, and insert the same after line 31, same page and column; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 14th day of January, A. D. 1936.

(Seal)

Leslie Frazer
Acting Commissioner of Patents.