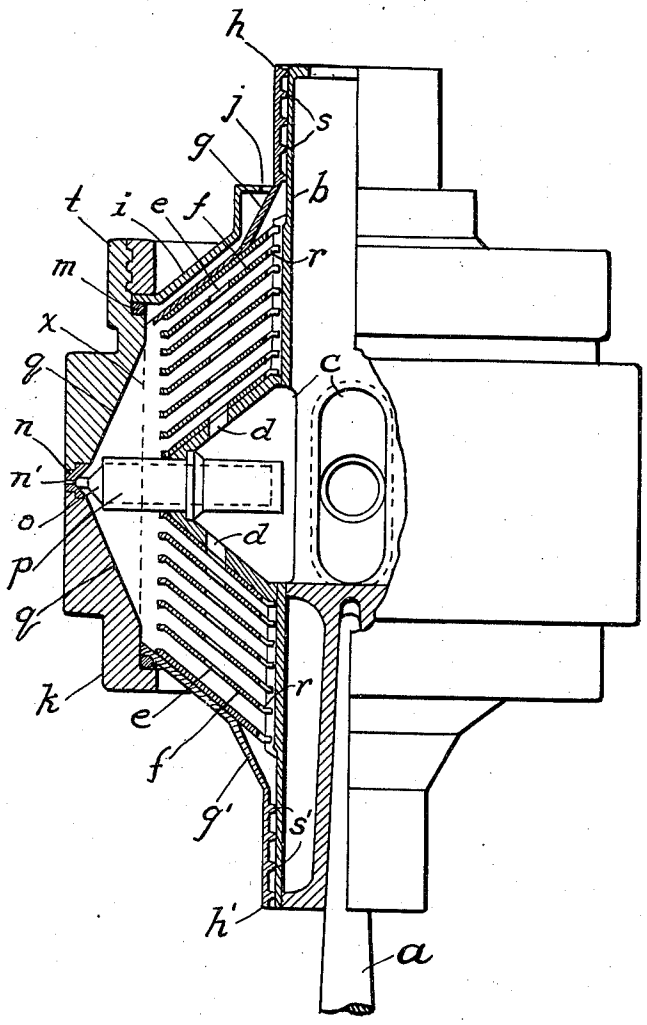
July 23, 1940. G. J. STREZYNSKI 2,209,043

CENTRIFUGAL SEPARATOR BOWL

Filed Dec. 2, 1937



INVENTOR

WITNESS:

George J. Strezynski

BY

Busser and Harding

ATTORNEYS.

Patented July 23, 1940 2,209,043

UNITED STATES PATENT OFFICE

2,209,043

CENTRIFUGAL SEPARATOR BOWL

George J. Strezynski, Poughkeepsie, N. Y., assignor to The De Laval Separator Company, New York, N. Y., a corporation of New Jersey

Application December 2, 1937, Serial No. 177,688

3 Claims. (Cl. 233—27)

My invention relates to that type of centrifugal separator or purifier which is provided with frusto-conical members, popularly called discs, for dividing the separating space of the separator bowl into a multiplicity of sub-chambers of small height to thereby divide the mixture undergoing separation into a multiplicity of thin lamini or strata.

In such a bowl, there are two ways of increasing its capacity. One way, which also applies to an open bowl unprovided with discs, is by increasing its diameter, but this soon leads to a condition in which the stresses in the bowl shell due to its own weight are so great that there is little safe strength for liquid pressure. The second way is by increasing the length and coincidentally the number of the discs. When this expedient is adopted the gain is far from proportional to the increase in the number of discs because the flow through the several interdisc spaces is far from uniform. The flow through the spaces nearer to the inlet, usually those near to the bottom of the bowl, is much greater than that through those in the upper part of the bowl.

I have discovered that if the discs are divided into two equal groups, turned with their concave sides toward each other and fed from a central receiving chamber between them, while each group is provided with its own outlet for the lighter constituent, the inequality of feed, being only that of one of the half height groups, will be so greatly reduced as to be relatively negligible.

I have also found that if such a bowl is arranged to collect dirt or other solids or semi-solids, which separate relatively easily at the periphery, such material will be deposited, with this construction, in a ring at or near the plane of the center of gravity and will therefore have a relatively small disturbing effect on the balance of the bowl.

There are numerous possible embodiments of the invention, which is applicable to centrifugal purifiers having a single outlet, to centrifugal separators having separate outlets for lighter and heavier constituents, whether the latter are liquids or solids or semi-solids, or whether the heavier constituent is discharged over a top disc through the bowl neck or through outlets in the peripheral wall of the bowl, and also to centrifugal separators having three outlets for lightest, heaviest and intermediate constituents. The invention is of special utility as applied to a three-outlet bowl wherein one of the constituents, usually a solid or semi-solid, is discharged through outlets in the peripheral wall of the bowl. In describing a preferred embodiment of the invention, I have illustrated a bowl of the last named type, adapted, for example, to separate a mixture of heavy liquid, light liquid and sludge, and embodying certain inventive features set forth in a patent granted to me December 3, 1935, No. 2,022,814.

The figure is an elevation view of such a separator partly in vertical section.

A spindle *a* supports and drives the bowl. The bowl has a central tube *b* receiving the mixture to be separated and having around its central portion a central receiving means composed, preferably, of a plurality of spaced apart pockets *c*, to which flows the mixture from the receiving tube and from which the mixture flows through holes *d* in the pockets and holes *e* (aligning with the holes in the pockets) in discs *f* to the spaces between the discs.

g is a top disc spaced from the bowl top *i* to provide a channel through which a heavy separated constituent flows from the peripheral part of the bowl chamber to an outlet *j*. *g'* is a bottom disc, at the other end of the bowl, which is a duplicate of the top disc except that its edge is preferably tight with the lower end of the bowl, it being preferred that all the heavier liquid shall be constrained to outflow through the outlet *j*.

The top and bottom discs *g* and *g'* have necks which surround and are spaced from the feed tube *b*. The discs of the two groups *f*, *f* have, near their inner ends, a series of holes *r* through which the lighter separated constituent can escape to the annular channels formed between the feed tube *b* and the necks of the discs *g* and *g'* and discharge through the outlets *h* and *h'*.

By screwing a ring *t* into the shell *k* the bowl top *i* is forced down against a ring *m* of rubber or similar material that makes tight the joint between the shell and the top.

A valve seat *n* in the bowl shell has an outlet *n'* and, in cooperation with a valve *o* surrounded by a tube *p*, as shown in my hereinbefore mentioned Patent No. 2,022,814, provides for intermittent escape of solids. The inner surface of the bowl shell slopes outward from both ends toward the valve seats as shown at *q*.

In the necks of the discs *g* and *g'* I have shown helical guides *s* and *s'* of the type shown in Patent No. 1,945,336 issued to me July 6, 1933.

In operation a mixture of liquids or of liquids and solids is fed by a regulating tube, not shown, to the center of the tube *b*, whence it flows

through the pockets *c* and the holes *d* and *e* to the spaces between the discs *f*. It may be readily seen that the division of material between the upper and lower groups of discs will be about equal and, because each group of discs is of small height, the distribution between the several interdisc spaces of each group will be fairly even. In the spaces between the discs the several constituents are separated. The lightest constituent moves toward the center, then through the holes *r* and the necks of the discs *g* and *g'* to the outlets *h* and *h'*. The heaviest constituent, which may be a granular solid or a viscous sludge, moves outward against the inside of the shell and along the sloping surfaces *q* to the valve seats *n* and escapes from the bowl through outlet *n'*. The constituent of intermediate specific gravity, which may be a liquid or a sludge of relatively low viscosity, moves to the outside of the discs and then upward into and through the spaces between the top disc *g* and the bowl top *i* and escapes at *j*.

When the collection of dirt in the bowl shell is so slight that the outer end of the tube *p* is exposed, liquid can flow in between it and the valve *o* and fill the valve, making it so heavy that it moves outward and closes the hole in the valve seat. When dirt collects until it covers the end of the tube *p* the flow of liquid to the valve ceases. At all times liquid within the valve escapes through a small hole, not shown in the drawing, in its tip and thence out the hole *n'* in the valve seat. The rate of outflow from the valve is, however, less than the rate of inflow thereinto; but when accumulation of dirt stops such inflow, the continuing outflow lightens the valve so that it floats toward the center, opens the hole *n'* in the valve seat and allows dirt to escape. As soon as sufficient dirt escapes to uncover the end of the tube, liquid flows in and fills the valve and the cycle is repeated.

It is unnecessary to describe the adaptation of the invention to a two-outlet separator of the more common type, wherein the heavier liquid discharges over a top disc, as *g*, and the shell of the bowl is imperforate. In such a separator the tube *p* and valve *o* would, of course, be omitted and the wall of the bowl shell would ordinarily be cylindrical, as indicated by the dotted line *x* in the drawing.

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

1. A centrifugal separator comprising a separator bowl enclosing central receiving means adapted to receive the mixture to be separated and two annular chambers spaced apart axially and converging toward one another toward the periphery of the bowl, two sets of frusto-conical orificed discs in the respective chambers, one set of discs being inverted relatively to the other, all the said discs of both groups being of uniform diameter with their inner and outer edges in alignment in the direction of the axis of the bowl, the orifices in said discs being in alignment along lines extending parallel to the axis of the bowl, and means, affording communication between the central receiving means and the two chambers, including feed inlet openings in the opposing more nearly adjacent walls of the two chambers and in alignment with said disc orifices, said chambers having separate axial discharges.

2. A centrifugal separator comprising a centrifugal bowl enclosing a central tube adapted to receive the mixture to be separated and two annular chambers which are spaced apart axially and which converge toward each other in the direction of the bowl's periphery, two sets of frusto-conical orificed discs in the respective chambers, one set of discs being inverted relatively to the other, all of the said discs of both groups being of uniform diameter with their inner and outer edges in alignment along lines parallel to the bowl's axis and the orifices therein being along lines parallel to the bowl's axis, the opposing more nearly adjacent converging walls of the two chambers having openings aligning with said orifices, and radially extending distributing pockets enclosed by said walls and opening at their inner ends to said central feed tube and affording communication from said feed tube to said openings and thereby to the two separating chambers, said chambers having separate axial discharges.

3. A centrifugal separator comprising a bowl enclosing central receiving means adapted to receive the mixture to be separated, two annular chambers spaced apart axially, the chambers of the bowl having a peripheral wall comprising two annular sections sloping outward, at a comparatively sharp angle to the bowl's axis, toward a circumferential line axially midway of said chambers, two sets of frusto-conical discs in the respective chambers, the two sets sloping outward toward one another at an angle to the bowl's axis substantially wider than the angle of slope of the said peripheral wall sections, the outer edges of the discs of both groups being in alignment in a direction parallel to the axis of the bowl, thereby forming an open annular peripheral space triangular in cross-section and common to both chambers for final separation of solids and concentration thereof adjacent a circumferential line axially midway of the two chambers, and means for conveyance of the mixture to be separated from the central receiving means simultaneously to the two chambers, said chambers having separate axial discharges for the lighter ingredient separated therein.

GEORGE J. STREZYNSKI.