S. H. HALL.

CENTRIFUGAL SEPARATOR.

APPLICATION FILED JULY 15, 1921.

1,411,782.

Patented Apr. 4, 1922.

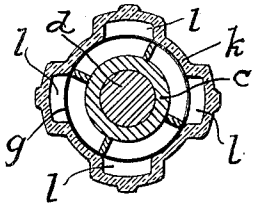


FIG. 3.

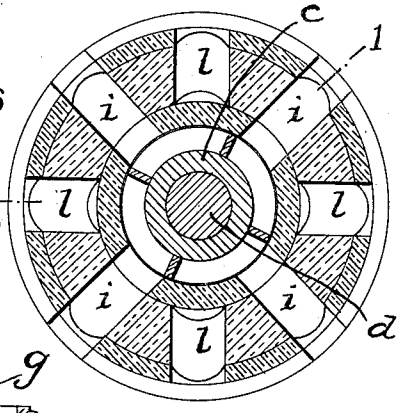


FIG. 2.

FIG. 1.

INVENTOR

Selden H. Hall

BY

Frank L. Busser

ATTORNEY.

WITNESS:

Robt. R. Kitchel.

UNITED STATES PATENT OFFICE.

SELDEN H. HALL, OF POUGHKEEPSIE, NEW YORK, ASSIGNOR TO THE DE LAVAL SEPARATOR COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

CENTRIFUGAL SEPARATOR.

1,411,782. Specification of Letters Patent. **Patented Apr. 4, 1922.**

Application filed July 15, 1921. Serial No. 484,886.

To all whom it may concern:

Be it known that I, SELDEN H. HALL, a citizen of the United States, residing at Poughkeepsie, county of Dutchess, and State of New York, have invented a new and useful Improvement in Centrifugal Separators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings which form a part of this specification.

My invention relates to centrifugal separators and particularly to centrifugal bowls for separating solids from liquids.

Solids are often present as impurities in liquids. It has been known for many years that solids may be, by centrifugation, effectively removed from a liquid of lower specific gravity by means of a liquid of higher specific gravity than the solids, which denser liquid may either be present, as an additional impurity, in the original mixture or may be added to the original mixture of liquid and solids. In such operations the constituents arrange themselves in concentric zones within the separator bowl, the denser liquid occupying the outer zone, the solids occupying an intermediate zone and the lighter liquid being displaced toward the center; the denser liquid acting to carry out of the bowl solids which would otherwise adhere to the bowl wall. Even if the denser liquid is of about the same specific gravity as the solids, or even of somewhat lower specific gravity, it will have more or less sludging effect upon the solids and carry out with it more or less of the solids.

In utilizing a denser liquid for the above purpose, where it is not already present in the mixture and where, therefore, its deliberate addition is necessary, it is most convenient, as well as quite obvious, to either mix it in a desired proportion with the mixture to be separated before entry into the bowl or to flow it, at a regulated rate, into the same inlet that receives the mixture to be separated. This procedure, however, is, in some processes, open to certain objections. In the first named case, the liquids that are mixed must be re-separated, and even in the second named case there is some mixture of liquids and consequent necessary re-separation. This is not only objectless except in cases where a preliminary emulsion of the liquids is desirable for special reasons, but it adds to the mechanical work required to be performed. Again, separation of liquids is never quantitative, and the lighter liquid outflowing from the bowl will carry with it as an impurity, a very small proportion of the denser liquid. Again, in certain processes, the only denser liquid that is available as an agent for carrying off the solids may be of such a character that its intimate contact with the lighter liquid will impart to the lighter liquid a disagreeable taste or odor or other undesirable quality.

The object of my invention is to introduce into the bowl the denser liquid separately from the lighter liquid and in such manner that there will be no substantial admixture or intimate contact of the two liquids before or during the centrifugal operation. I am aware that this, broadly, has heretofore been attained. For example, the denser liquid has been introduced into a passage at the periphery of the bowl neck and has thence been conveyed by tubes to the periphery of the bowl, the denser liquid thence flowing downward to an outlet at the bottom. Such a bowl is operative, but it involves a construction that as a whole is radically different from bowls that by long usage have come to be recognized as possessing superior efficiency. Thus it is distinctly advantageous to utilize a bowl of the type shown in the Snyder Patent No. 1,283,343, October 29, 1918, wherein, among other advantageous features, the liquids are fed into a central passage and wherein a top disc is provided that extends nearly to the bowl periphery and that affords, above the separating space of the bowl, a conduit for the outflow of the denser liquid and solids floated off thereby, the denser liquid flowing upward in the separating chamber and escaping around the the outer edge of the top disk into said outflow conduit.

The more especial object of the present invention is to so modify separator bowls of the most efficient type as to carry out the separating operation in the most efficient manner now known and at the same time prevent any intimate contact or substantial admixture of the two liquids.

A preferred embodiment of the invention is shown in the accompanying drawings, in which—

Fig. 1 is a vertical cross-section of my improved bowl on the line 1—1 of Fig. 2.

Fig. 2 is a partial cross-section on line 2—2 of Fig. 1.

Fig. 3 is a partial cross-section on line 3—3 of Fig. 1.

The bowl shell *a* has a bottom *b* with a socket *c* fitting the driving and supporting spindle *d*. The bowl top *e* has a discharge outlet *f* at the upper end. In the center of the bowl, there is a tube *g* enclosing a feeding passage *h* from which lead four channels *i* terminating at *j* near the periphery of the bowl. Outside of the tube *g* there is a second tube *k* enclosing an annular feeding passage from which lead four channels *l* terminating at *m* in line with distributing holes *x* through the frustro-conical members *y*, technically called discs. These discs, only a few of which are shown, make up what is known as the bowl liner. Above the liner is a top disc *n* providing a division wall between the separating chamber of the bowl and the passages *o* for outflow of heavier liquids to the discharge outlet *f*. The lighter liquids displaced toward the center flow upward inside of, and escape over the top of, a neck *p* on the top disc *n*.

Wings *v* spanning the space between the bowl top *e* and top disc *n* and dividing the space above the top disc into separate passages *o*, and wings *w* secured to the bowl shell and extending inward to near the outer edge of the disc *y*, force the bowl contents to continue rotating at the same speed as the bowl.

Covers *q*, *q*, *q*, are supplied to provide chambers to catch the materials discharged from the bowl. Supported by these covers are two concentric supply tubes *r* and *s*, which extend down inside the upper ends of the tubes *g* and *k*.

When in operation, water, brine, carbon tetrachloride, or some other suitable liquid denser than the liquid which is to be purified, is supplied through the tube *r*, flows downward inside the tube *g* and outward through the channels *i* to the periphery of the bowl, where it collects. As the incoming liquid fills the outer part of the bowl, some of it escapes around the outer edge of the top disc *n* and fills the discharge passages *o*. The lighter liquid containing solid impurities is supplied through the tube *s*, flows downward inside the tube *k*, outward through the channels *l* and upward through the holes, which distribute it to the spaces in the liner.

Centrifugal force causes the solids to separate from the lighter liquid, pass outward and form a layer against the heavy liquid. As the layer of solids becomes thicker, it will be forced outward into the heavy liquid until the solids can escape around the outer edge of the top disc *n* into the passages *o*. The solids will then float through the heavy liquids in these passages and be discharged through the outlet *f*.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:—

1. In a centrifugal separator, the combination with a bowl providing a separating compartment, of means providing two independent feed passages extending down the central part of the bowl within said separating compartment, one feed passage discharging between the center and periphery of the bowl and the other discharging relatively close to the periphery of the bowl.

2. In a centrifugal separator for separating a liquid from solids, the combination with a bowl having an outlet for said liquid and a separate outlet at the top for another denser liquid, of means to admit the mixture to be separated into the separating chamber of the bowl between the center and the periphery, and means to separately admit the denser liquid to the lower part of the bowl relatively close to the periphery whereby the denser liquid will not substantially admix with the lighter liquid or require to be separated therefrom and will flow upward along the bowl wall and outward and carry with it the solids of the mixture that are separated by centrifugal force.

3. In a centrifugal separator for separating a liquid from solids, the combination with a bowl having upper outlets for the heavier and lighter ingredients respectively and a top disc whose outer edge is relatively close to the bowl wall, said disc dividing the bowl space into a separating chamber and a superposed conduit for the outflow of the heavier ingredients, of means to admit the mixture to be separated, and means to separately admit a relatively dense liquid to the lower part of the bowl relatively closer to the periphery.

4. In a centrifugal separator, the combination with a bowl and a liner therein, of a bottom disc below the liner and extending beyond the liner's outer edge, of independent feed passages extending down within the liner and outward, one passage discharging above the bottom disc into the space occupied by the liner and the other extending beneath the bottom disc and discharging between the liner and the bowl wall.

5. In a centrifugal separator for separating liquids from solids, the combination with the bowl having upper outlets for the heavier and lighter ingredients respectively, a liner in the bowl, and means to introduce the mixture to be separated to the separating chamber and directly to a zone thereof

between the outer and inner edges of the liner, of independent means to introduce another liquid in a substantially annular stream into the lower part of the separating chamber of the bowl outside the liner.

6. In a centrifugal separator, the combination with a separating compartment and a liner therein, of means providing two independent feed passages extending down within the central part of the bowl and surrounded by said compartment, and several extension channels leading from each passage, the extension channels from one passage terminating relatively close to the periphery of the bowl and those from the other passage terminating at a greater distance from the periphery of the bowl.

7. In a centrifugal separator, the combination with the bowl, of a feed tube surrounding the bowl's axis, an independent feed tube outside the first feed tube, a plurality of channels extending outward from the first tube, and a plurality of channels extending outward from the second tube and arranged alternately relatively to the first named channels, the two sets of channels communicating with the separating chamber of the bowl at different distances from the bowl's axis.

8. In a centrifugal separator for separating a liquid from solids, the combination with a bowl having upper outlets for the heavier and lighter ingredients respectively, a liner within the bowl comprising a number of discs superposed one upon another and provided with aligning orifices, and a top disc above the liner whose outer edge extends relatively close to the bowl wall and which provides above the liner an outflow conduit for the heavier ingredients, of independent feed passages for the mixture to be separated and for a liquid denser than the liquid of the mixture to be separated, said feed passages extending down within the liner and terminating respectively beneath the disc orifices and between the liner and the periphery of the bowl.

9. In a centrifugal separator, in combination, a bowl, a liner within the separating chamber thereof having orifices arranged in vertical alignment, a top disc above the liner forming above the separating chamber a discharge conduit for heavier ingredients, a neck on the top disc within which the separated lighter liquid flows upwardly, a bottom disc below the liner, both top and bottom disc extending outward beyond the liner, two feed tubes, one within the other, within the liner, and extension channels leading from each feed tube, one set of extension channels extending through the bottom disc into the orificed portion of the liner and the other set of extension channels terminating below the bottom disc between which and the bowl bottom the liquid discharged is conveyed to the peripheral portion of the bowl.

In testimony of which invention, I have hereunto set my hand, at Poughkeepsie, on this 12th day of July, 1921.

SELDEN H. HALL.