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G. H. ANDERSSON ET AL

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CENTRIFUGE

Filed July 2, 1929

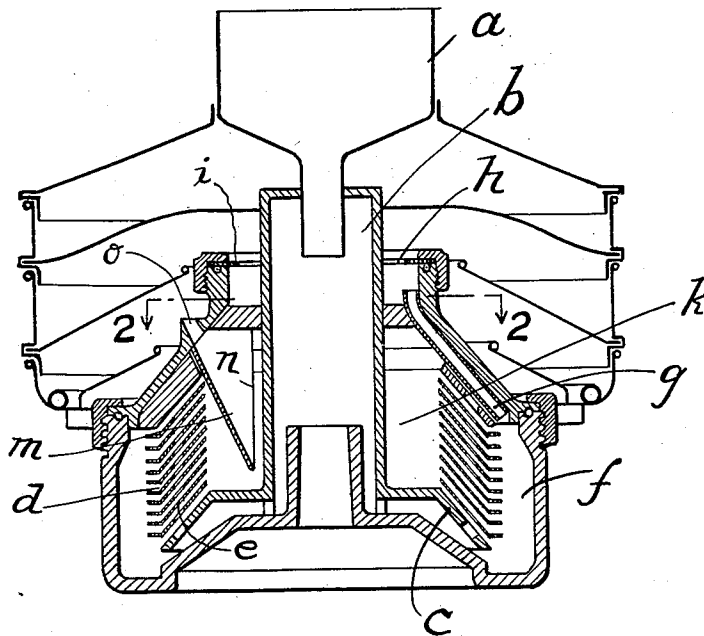


FIG. 1.

FIG. 2.

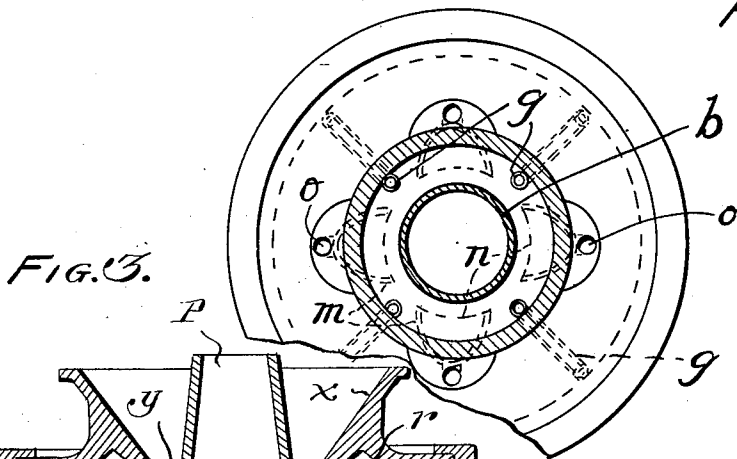
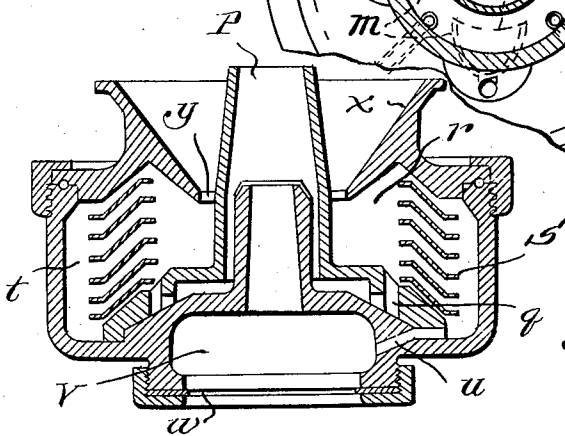


FIG. 3.



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CENTRIFUGE

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In separating liquids in which solid matters are contained, and particularly in the separation of solid matters from liquids, it is often desirable to discharge the solid matters as free from liquid as possible. In case the solid matters have a lower specific gravity than the liquid and the percentage of such solid matters is comparatively small, it is generally not very difficult to discharge them from the bowl, if they are allowed to stream out with not too small an amount of liquid. In case, however, it is desired to take out the solid matters almost entirely liberated from liquid, certain difficulties have been experienced in connection with the continuous discharge of the solid matters from the bowl. It will be easier to understand these difficulties if we first give a description of a centrifugal bowl of the type which is generally used.

The liquid to be separated is fed through a feed tube to an intermediate zone of the bowl, wherein it flows through vertically aligning holes in a set of superimposed "discs" to the spaces between the discs, wherein the separation takes place in such manner that the lighter particles move along the upper side of the discs towards a chamber at the inner zone of the bowl. This chamber communicates with outlets through which the relatively light solid matters are discharged. The relatively heavy liquid which has been liberated from solid matters is suitably discharged from the peripheral part of the bowl through channels communicating with outlets. In order that continuous discharge of the light and the heavy components shall be possible, the discharge radius must correspond to the specific gravity of the components. Experience has shown that if adjustments are such as to secure a high concentration of the solid light substances, these bake together in the inner chamber to a compact mass, which only with difficulty can be made to stream out through the solids discharge outlets.

The present invention makes it possible continuously to discharge from the bowl the separated lighter component practically completely liberated from liquid.

The invention is capable of different spe-

cific embodiments, two of which are shown in the drawings, in which:

Fig. 1 is a vertical sectional view of a centrifuge embodying our invention.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a vertical sectional view of a centrifuge which embodies our invention in a different form.

Referring first to the structure of Figs. 1 and 2: From a vessel *a* the mixture of relatively heavy liquid and relatively light solid matters whose separation is to be effected is conveyed through the central feed tube *b* and under a skirt *c* and up through a hole in the latter to the separating space of the bowl. If the bowl is provided with a set of spaced-apart discs *d* provided with vertically aligning orifices *e*, the mixture flows up through these orifices and in the course of its flow distributes itself through the spaces between the discs, in which spaces the main separation occurs. The lighter solid matters move along the upper sides of the discs toward the inner chamber *k*, which preferably is of greater radial dimensions than the inner chamber of the ordinary separating bowl. The heavier liquid which has been liberated from solid matters moves along the under sides of the discs to the outer chamber *f* and flows upwardly and inwardly through a discharge tube *g* to the outlet *h*, which, by means of a regulating device *i*, may be adjusted to the desired discharge radius.

Within the inner chamber *k* are positioned a number of inclined elements *m* having inner edges *n*, located at a constant distance from the axis of rotation of the bowl; the elements *m* providing, along their inner faces, channels through or along which the solids, which stream around the edges *n*, are conveyed or slide, in a direction inclined outwardly from the axis of rotation of the bowl, toward the outlets *o*, which are located at a substantially greater radius than that which corresponds to the specific gravity of the lighter component.

The centrifuge shown in Figs. 3 embodies the same novel principle of construction that characterizes the centrifuge of Figs. 1 and 2. The mixture of relatively heavy liquid and

relatively light solid matters is admitted to the bowl through a central feed tube *p* and thence, through holes *q*, flows into an inner chamber *r* just inside the edges of the discs *s* and thence into the spaces between the discs, in which spaces the main separation occurs. The heavier separated liquid, liberated from its lighter solid components, streams out into an outer chamber *t* and flows thence through channels *u* to a chamber *v*, from which, leaving the bowl, it streams over the edge of a regulating disc *w*. Any one of a number of exchangeable regulating discs having holes of different diameters may be used, dependent on the desired quality or degree of concentration of the liquid.

Carried by, or formed in one piece with, the cover of the bowl is a conical element *x*, the lower narrower end of which is spaced from the feed tube *p* to provide an opening *y* to receive the separated solids as they are displaced upwardly from within the inner zone of the chamber *r*. The inner face of the inverted cone *x* forms a channel along which the separated solids are carried in a direction inclined away from the axis of rotation of the bowl and are discharged over the edge or base of the cone. There is thus provided, in place of the outlets *o* of Fig. 1, a single outlet whose axis is coincident with the axis of rotation of the bowl.

It is, in certain cases, advantageous to give the chamber *r* a comparatively great extension in a radial direction with a view to obtaining high concentration of the lighter substances and of avoiding clogging of the spaces between the discs *s*. In certain cases, the discs may be dispensed with. Any known type of regulating device may be used. Having now fully described our invention, what we claim and desire to protect by Letters Patent is:

1. A centrifugal bowl comprising a centrifugal separating chamber provided with an outlet for the discharge of the separated substance of greater specific gravity, and comprising also an element adapted to facilitate the travel of the lighter separated substance from the main locus of separation inwardly toward the axis of the bowl and adapted also to convey the thus inwardly conveyed lighter separated substance away from the region near the axis of the bowl in a direction inclined away from the bowl axis.
2. A centrifugal bowl comprising a centrifugal separating chamber provided with an outlet for the discharge of the separated substance of greater specific gravity, and comprising also an element adapted to facilitate the travel of the lighter separated substance from the main locus of separation inwardly toward the axis of the bowl and adapted also to convey the thus inwardly conveyed lighter separated substance away from the region near the axis of the bowl in

a direction inclined away from the bowl axis, and to discharge the same from the bowl at a distance from the axis of the bowl substantially corresponding to a distance from the axis of the bowl at which, in the separating chamber, the components are subjected to effective separating action.

3. A centrifugal bowl comprising a separating chamber, discs therein to facilitate the separation, said discs being spaced both from the periphery of the bowl and the inner wall of the bowl, an outlet for the heavier component communicating with the space outside said discs, and an element inclined both to the radius and to the axis of the bowl and extending into the space inside the discs and affording a channel along which the separated lighter component is carried away from the bowl axis and from which such lighter component is discharged.

4. A centrifugal bowl adapted especially for the separation of liquid of relatively high specific gravity and solids of relatively low specific gravity as free as possible from liquid, comprising a centrifugal separating chamber, means providing an outlet for the liquid, and an element providing a channel extending from the part of the separating chamber near the axis of the bowl toward the point of discharge for the solids, the latter named point of discharge being at a greater distance from than the first named outlet from the center of rotation, said element being inclined to the radius of the bowl and inclined away from the axis of the bowl and affording a smooth inner surface of substantial width along which the separated solids are adapted to slide toward their point of discharge.

In testimony of which invention, we have hereunto set our hands, at Stockholm, Sweden, on this 12th day of June, 1929.

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