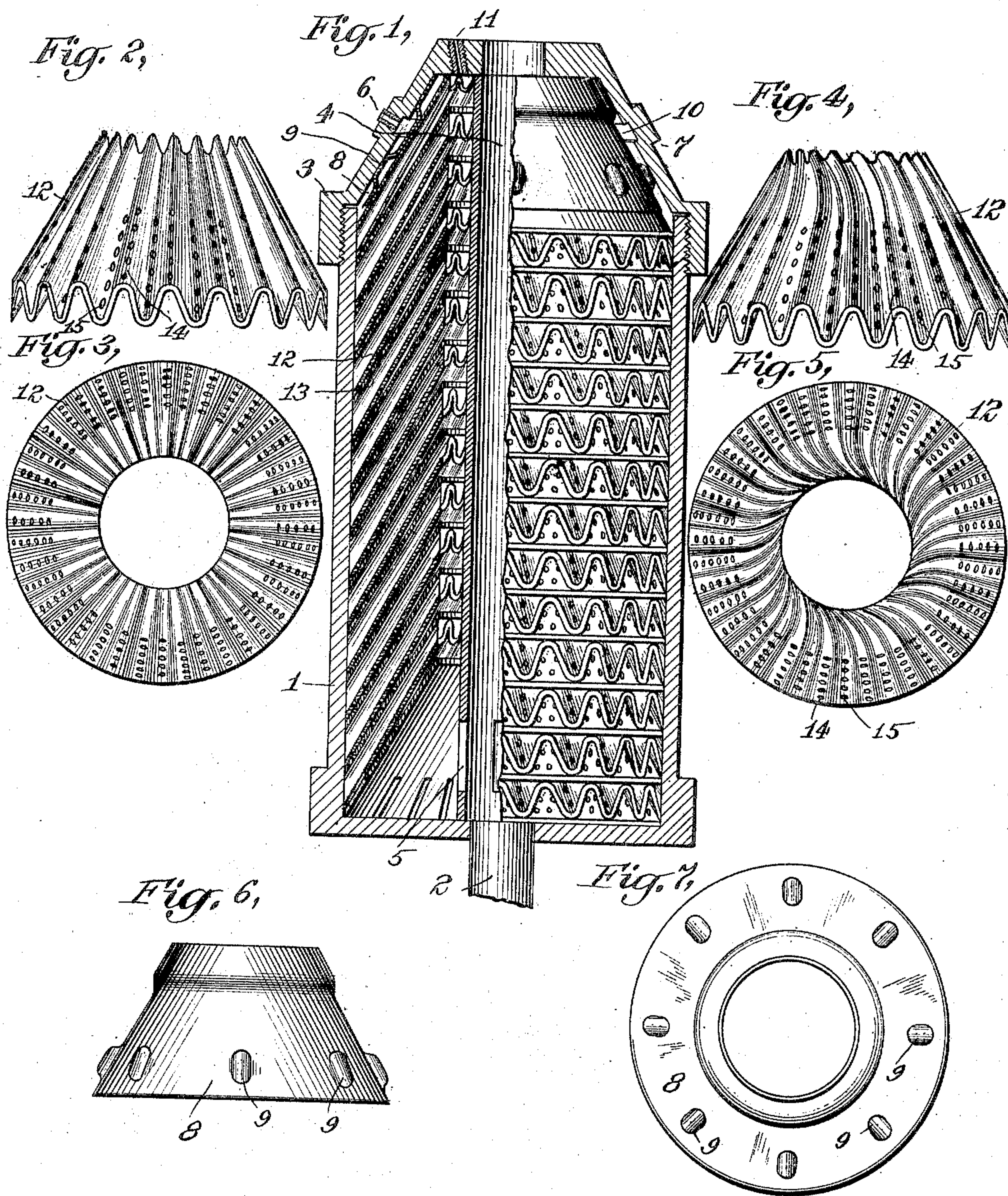


No. 817,465.

PATENTED APR. 10, 1906.

G. J. BRAGG.  
CENTRIFUGAL LIQUID SEPARATOR.  
APPLICATION FILED SEPT. 22, 1905.

2 SHEETS—SHEET 1.



WITNESSES:

*J. Ward Blyce*  
*W. Worden Gibbs*

INVENTOR

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ATTORNEY



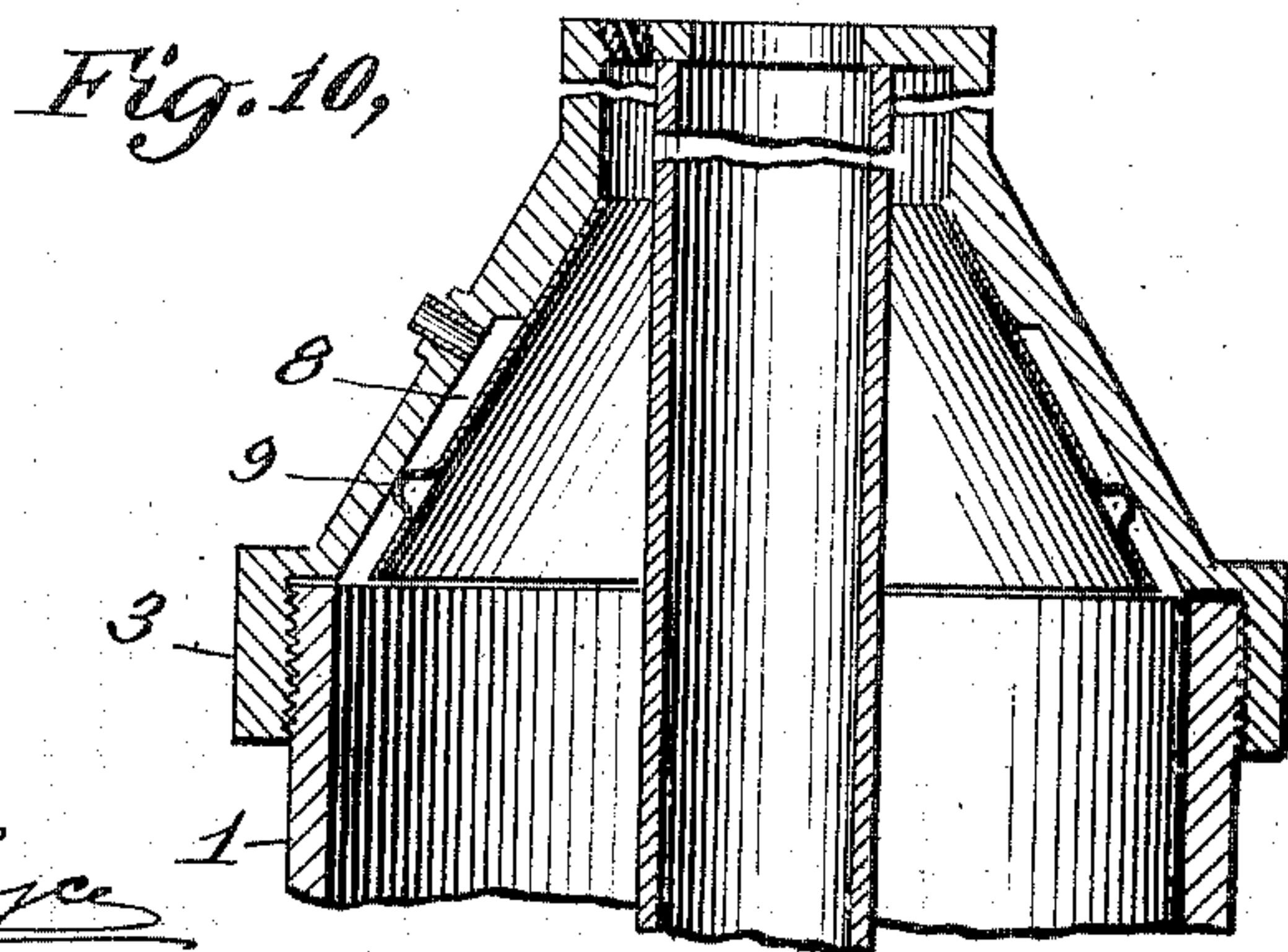
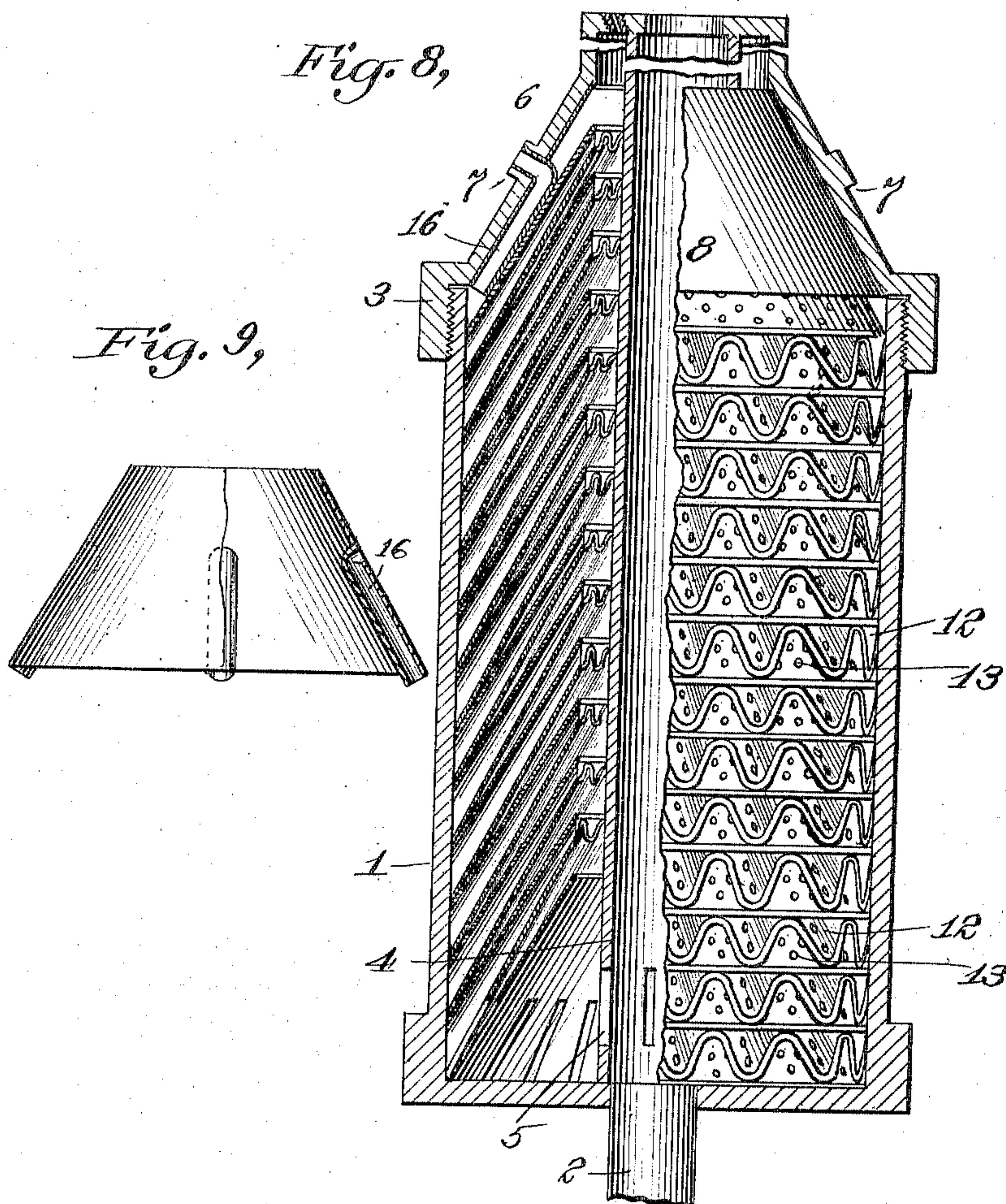
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# UNITED STATES PATENT OFFICE.

GEORGE J. BRAGG, OF NEWARK, NEW JERSEY.

## CENTRIFUGAL LIQUID-SEPARATOR.

No. 817,465.

Specification of Letters Patent.

Patented April 10, 1906.

Application filed September 22, 1905. Serial No. 279,646.

*To all whom it may concern:*

Be it known that I, GEORGE J. BRAGG, a British subject, residing in Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Centrifugal Liquid-Separators, of which the following is a specification.

My invention relates to improvements in machines for separating liquids of different specific gravities, and is particularly intended for use as a cream-separator, and in the following specification will be referred to as a "cream-separator," and will be described as adapted for use as such, though it will be understood that I do not limit myself to the use of my improved separator in separating cream from milk, but, to the contrary, may use such machine for any purpose for which it is suitable.

My invention consists in the novel means employed for directing the blue milk or skim-milk to the proper outlets therefor, in the novel construction of the skimming devices, and in other features of invention, all as hereinafter described, and particularly pointed out in the following claims.

The objects of my invention are to facilitate the thorough cleaning of cream-separators, to avoid the use of the commonly-employed blue-milk tubes attached to the cover, which are difficult to clean; to improve and simplify the skimming devices employed; to facilitate the assembling and separation of the parts; to cheapen the construction of the separator, and generally to make the separator efficient, reliable, easy to operate, and free from liability to derangement.

I will now proceed to describe my invention with reference to the accompanying drawings and will then point out the novel features in claims.

In the said drawings, Figure 1 shows a central vertical section of the bowl and a partial central section and partial elevation of the skimming devices of a cream-separator constructed in accordance with my invention. Fig. 2 shows a side elevation, and Fig. 3 a top view, of one form of corrugated skimming-cone which I may employ, the corrugations being radial. Fig. 4 shows a side view, and Fig. 5 a top view, of an alternative form of skimming-cone which I may employ, the corrugations being spiral. Fig. 6 shows a side view, and Fig. 7 a top view, of the cone employed to direct the blue milk to the outlets therefor. Fig. 8 is a view similar to Fig.

1, illustrating an alternative construction of bowl-top and an alternative form of device for directing the blue milk to the proper outlets. Fig. 9 is a partial elevation and partial section of this alternative form of directing-cone, and Fig. 10 shows a detail vertical section of the upper portion of a separating-bowl and directing-cone, illustrating an alternative construction of said cone and of the bowl-top.

In the drawings I do not illustrate a complete cream-separator, as it will be understood that the bowl and contained parts are adapted to be employed in the customary manner.

Referring now to the accompanying drawings, and at first to Figs. 1 to 7, inclusive, the separator-bowl comprises, as is customary, a cylinder 1, closed at the bottom and provided with a spindle 2, by which it may be rotated, and a removable cover 3, having at the top a central orifice for the entrance of the whole-milk. In line with this opening is the feed-tube 4, which in the construction shown is a plain tube having openings 5 near its bottom for the flow of the milk out into the main portion of the separator-bowl.

The cover 3 is provided with the usual outlet-orifices 6 for the blue milk or skim-milk; but contrary to common practice I do not provide these orifices in a cylindrical neck projecting upwardly from the conical portion of the cover, but instead provide said orifices in the conical portion of the cover. Said orifices are formed by short tubes projecting slightly from a ring 7, formed on the outside of the cover. Contrary to common practice, I do not convey the blue milk to these orifices through small tubes secured to the inside of the cover, which tubes are highly objectionable, because they are difficult to clean, because their interior surfaces cannot be exposed to the sterilizing action of sunlight, and for other well-known reasons; but instead I employ a cone 8, which near its top fits closely against the inner surface of the cover above the openings 6; but from said openings 6 downward is spaced away somewhat from the inner surface of the cover—as, for example, by bosses 9 pressed in its surface—so that between the cone and the inner surface of the cover there is a passage through which blue milk may flow from near the side of the bowl upward to the outlets 6. This cone 8 is preferably drawn or pressed, so that it is seamless, and its upper portion is



capable of fitting closely against the inner surface of the cover, preventing the leakage of blue milk upward past the openings 6. To further reduce the possibility of such leakage, I may provide in the cover 3 a groove 10, communicating with the openings 6. Centrifugal force tends to draw into this groove any liquid which might otherwise tend to pass upward between the upper portion of the cone 8 and the inner surface of the cover. However, this groove is not absolutely necessary, and I may dispense with it, as shown in certain of the following views, for since the openings 6 are in the conical portion of the cover there is little tendency for liquid to flow between the cone 8 and the cover up above the openings 6, provided said openings are of proper size, owing to the smaller diameter of the space above said openings 6.

In the upper portion of the cover I provide the usual cream-outlet 11, which may be provided with any usual or customary device, such as the cream-screw shown, for adjusting the quality or richness of the cream.

Any suitable skimming device or devices may be employed in the bowl; but the skimming devices preferred by me and which form one feature of my invention comprise a plurality of cones, which alternately are corrugated cones 12 and plain cones 13. The plain and corrugated cones together form passages extending upward and inward toward the cream-space. To facilitate the collection of the cream globules on the surface of the cones and their passage inward and the corresponding passage outward of blue milk, I provide the corrugations with openings 14 near or in their bases, and provide other openings 15 near the apices of the corrugations. The plain cones 13 may also be perforated, but preferably not above half their height, and I may not perforate them at all, if this appears more desirable. In operation the cream globules collect on the surfaces of the cones, and pass inward, the cream gathering on the corrugated cones passing through the openings 14, while the blue milk being heavier passes out through openings 15. The angle of these cones has an important effect upon the efficiency of the action of the separator. I have determined experimentally that an angle of about fifty-five degrees gives the highest efficiency and believe such an angle to be preferable.

The corrugations of the cones may be radial, as indicated in Figs. 2 and 3, or they may be spiral, as shown in Figs. 4 and 5, the latter construction being the one which I prefer. When the direction of rotation of the bowl is clockwise, as is assumed in the construction shown, the twist of the corrugations should preferably be upward and in the same direction, as shown, as this causes the most impingement of the fat globules against the corrugations of the cones.

In a bowl, such as shown in Fig. 1, having the blue-milk outlets in the conical portion of its cover, an elongated cylindrical or nearly cylindrical neck, such as commonly employed, is not necessary, and in Fig. 1 no such neck is shown. If such a neck is preferred, however, it may be provided, as illustrated in Fig. 8.

In Fig. 8 I also illustrate an alternative device for conveying the blue milk to the outlets 6. In this construction the cone 8 fits the inside of the cover closely throughout its length, but is provided on its inner side with tubes 16, which form blue-milk tubes. Tubes, such as 16, on the inside of the cone 8 are not as objectionable as tubes on the inside of the cover, according to former constructions, especially when the blue-milk outlets are in the conical portion of the cover, for then the tubes may be straight up to the orifices in the sides of the cone, and, moreover, are short, and are thus easy to clean. Moreover, they may be of large size, and this fact and the relative lightness of the cone 8 make it easy to keep the tubes clean.

In the construction shown in Fig. 10 the blue milk passes to the outlets 6 through an annular space between the cone 8 and the cover; but instead of forming a shoulder on the cone above the openings 6, as in Fig. 1, I provide the shoulder on the cover, the cone 8 being a plain cone except for the bosses 9.

In the operation of my improved separator in its various forms the whole-milk enters the feed-tube 4 and passes out through the openings 5 in the bottom thereof, into the main portion of the bowl. Said bowl being in rapid rotation, the centrifugal force causes the cream to pass inward through the channels between the plain and perforated cones to the central portion of the bowl and thence to pass upward to the cream-outlet, the finer cream particles collecting on the surfaces of the cones and then passing in with the others. The blue milk, on the contrary, being forced to the outer portion of the bowl passes up along the wall of the bowl and thence to the blue-milk outlets. The blue milk and cream may be caught in pans in the ordinary manner.

The cones 8, 12, and 13 I customarily form of thin sheet metal, said cones being drawn or pressed to shape, so as to be seamless. When the parts are all in place within the bowl and the top 3 thereof screwed down, the cones are all pressed together tightly and the cone 8 is pressed tightly against the top 3.

By reason of their simple form the cones 8, 12, and 13 are easily formed and are capable of being formed with great accuracy. The form of the top 3 is also such that said top may be formed relatively easily. As will be seen, it is a simple matter to remove the contents of the bowl and also to replace the same properly, and all of the parts being small and



of simple form it is very easy to clean them thoroughly. The absence of the customary skim-milk tubes on the inner surface of the top 3 makes it particularly easy to clean said top thoroughly, a matter of much importance, and also makes it easy to balance the bowl.

What I claim is—

1. In a centrifugal liquid-separator, the combination with a separator-bowl and a top therefor having an inclined surface and having an outlet for the heavier liquid in such inclined surface, of a removable tapering cap within the top, fitting closely to the inclined surface of the top above the heavy-liquid outlet and provided with means forming a passage to direct the heavy liquid to the outlet.

2. In a centrifugal liquid-separator, the combination with a separator-bowl and a top therefor having an inclined surface and having an outlet for the heavier liquid in such inclined surface, of a liner for said bowl and a removable cap surmounting the liner and fitting closely to the inclined surface of the top above the heavy-liquid outlet and provided with means forming a passage to direct the heavy liquid to the outlet.

3. In a centrifugal liquid-separator, the combination with a separator-bowl and a top therefor having an inclined surface and having an outlet for the heavier liquid in such inclined surface, of a liner for said bowl and a removable cap surmounting the liner, said cap being formed of thin sheet metal and arranged to be pressed up against the inner surface of the top above the heavy-liquid outlet and being provided with means forming a passage to direct the heavy liquid to the outlet.

4. In a centrifugal liquid-separator, the combination with a separator-bowl and a top therefor having an inclined surface and having an outlet for the heavier liquid in such inclined surface, of a removable liner-cap within the bowl and fitting closely to the inclined surface of the top above the heavy-liquid outlet and separated from such inclined surface below the outlet by a space forming a liquid-

passage, said cap being provided with projections engaging the top and serving to maintain the passage.

5. In a centrifugal liquid-separator, the combination with a separator-bowl of skimming means therein comprising a plurality of hollow truncated cones arranged one above the other within said bowl, alternate cones having corrugated and plane surfaces, the corrugated cones being perforated at the upper apices of the corrugations.

6. In a centrifugal liquid-separator, the combination with a separator-bowl of skimming means therein comprising a plurality of hollow truncated cones arranged one above the other within said bowl, alternate cones being corrugated and the others plane-surfaced, the corrugated cones having perforations at about the bottoms of their corrugations and also perforations near the tops of such corrugations.

7. In a centrifugal liquid-separator, the combination with a separator-bowl of skimming means therein comprising a plurality of hollow truncated cones arranged one above the other within said bowl, certain of said cones being corrugated at an angle to the radius of the bowl and having perforations permitting inflow of cream particles and outflow of blue milk, and others of said cones being plane-surfaced.

8. In a centrifugal liquid-separator, the combination with a separator-bowl of skimming means therein comprising a plurality of hollow truncated cones arranged one above the other within said bowl, alternate cones being corrugated at an angle to the radius of the bowl and the others plane-surfaced, said corrugated cones being provided with perforations permitting inflow of cream particles and outflow of blue milk.

In testimony whereof I affix my signature in the presence of two witnesses.

GEORGE J. BRAGG.

Witnesses:

H. M. MARBLE,  
L. S. ANDREWS, Jr