No. 676,410. Patented June 18, 1901.

J. J. BERRIGAN.

CENTRIFUGAL LIQUID SEPARATOR.

(Application filed Oct. 22, 1898.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

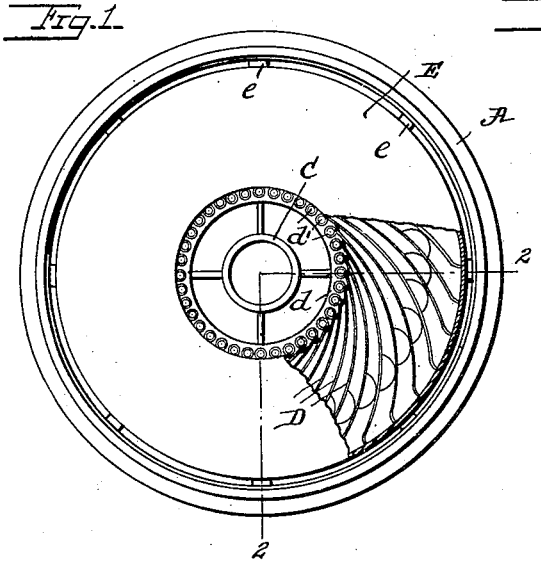


Fig. 3.

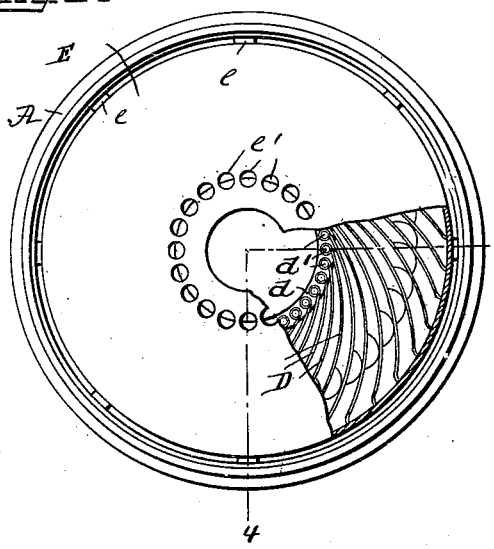


Fig. 2.

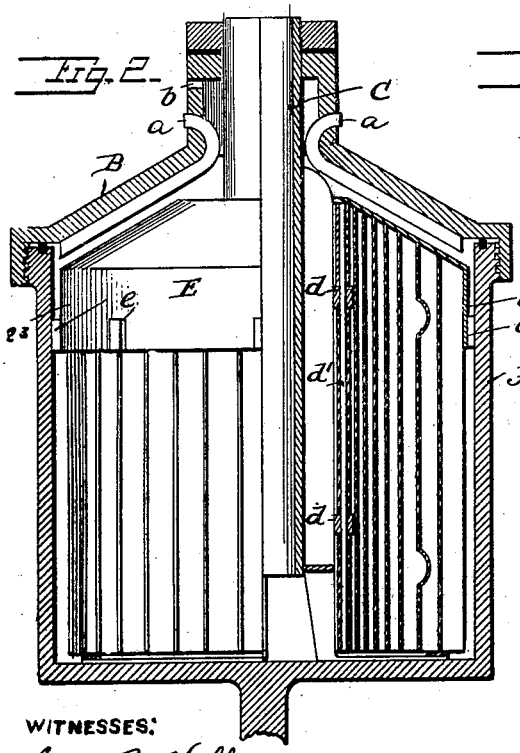
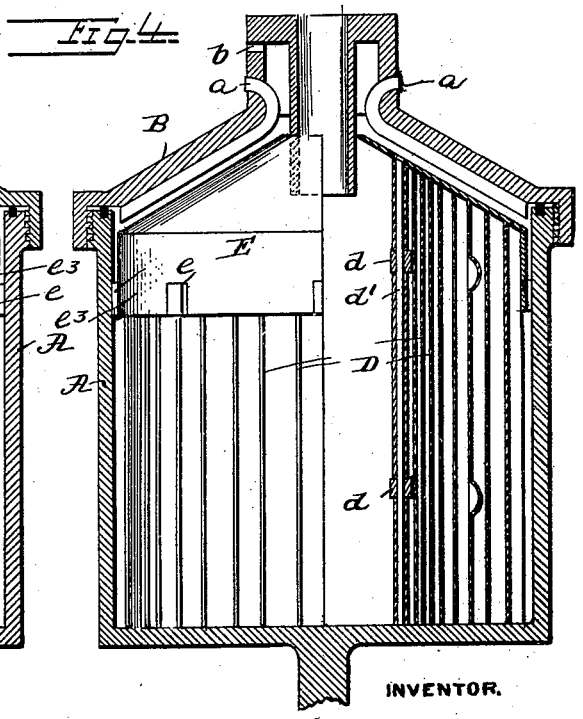


Fig. 4.



WITNESSES:

Jesse B. Keller,

J. M. Shindler.

INVENTOR.

John Joseph Berrigan

by Harding & Harding

ATTYS.

No. 676,410. Patented June 18, 1901.

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(No Model.) 4 Sheets—Sheet 2.

Fig. 5.

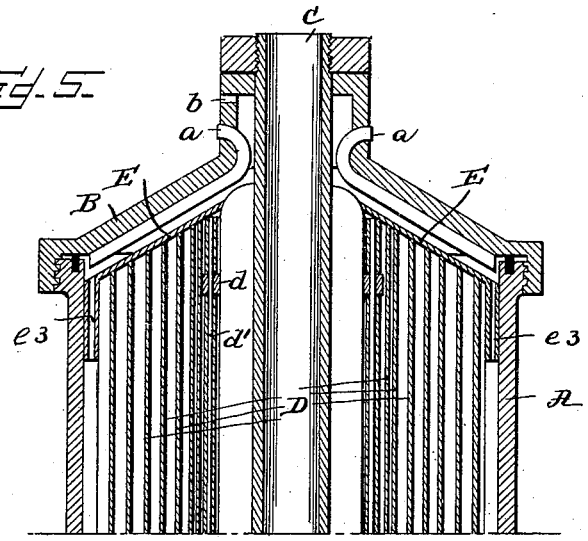
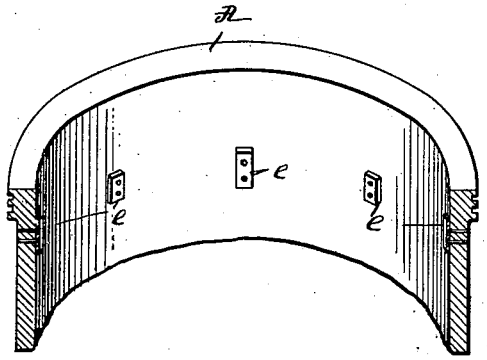


Fig. 6.



Witnesses
Jesse B. Keller
W. M. Hamilton

Inventor:
John Joseph Berrigan
by Harding & Harding
Attorneys.

No. 676,410. Patented June 18, 1901.

J. J. BERRIGAN.

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(No Model.) 4 Sheets—Sheet 3.

Fig. 7.

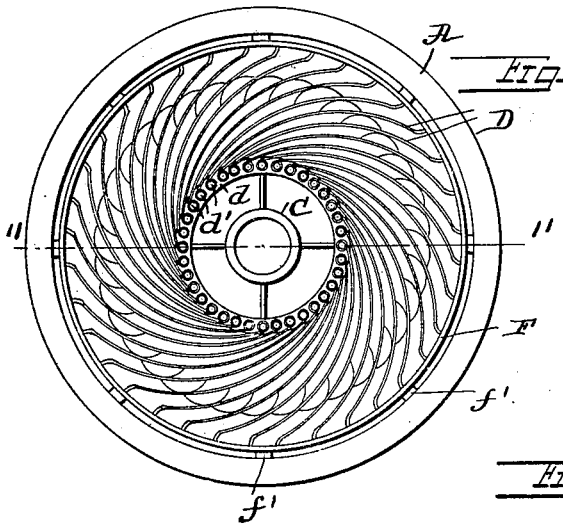


Fig. 9.

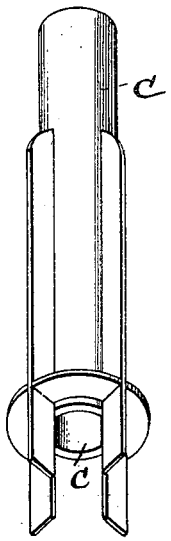


Fig. 8.

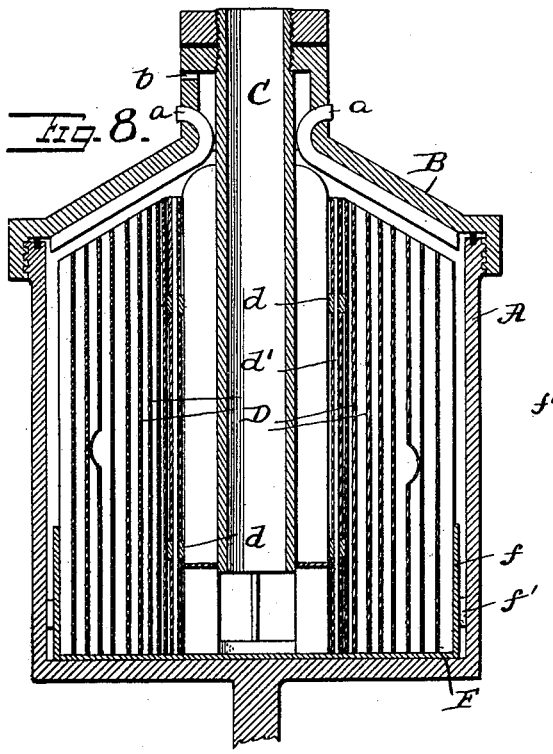
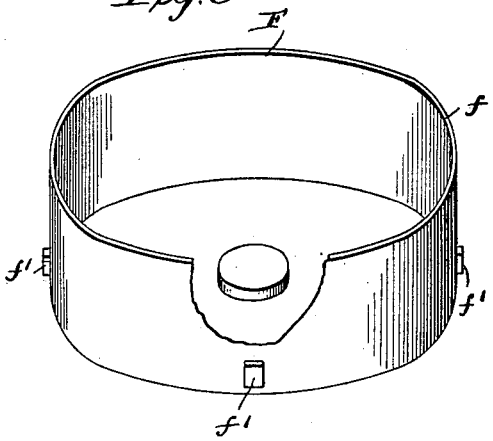


Fig. 9a



WITNESSES:

Jesse B. Keller.

John W. Shindler.

INVENTOR:

John Joseph Berrigan

by Harding & Harding

ATTYS.

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(No Model.) 4 Sheets—Sheet 4.

Fig. 10.

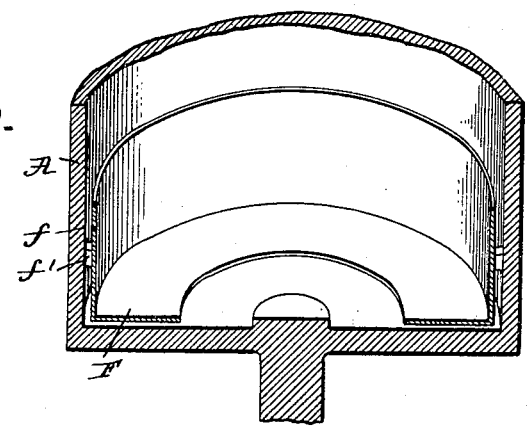
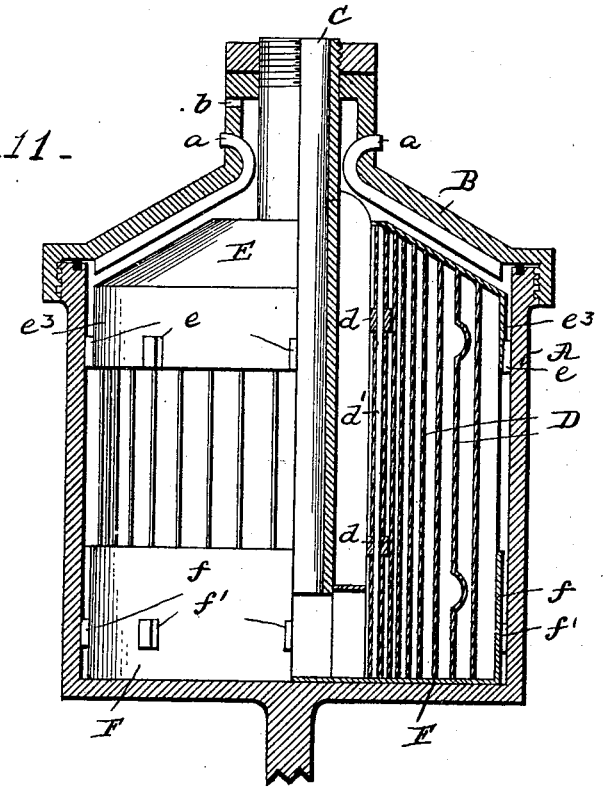


Fig. 11.



WITNESSES:

Jesse B. Keller

John W. Shindler

INVENTOR:

John Joseph Berrigan

by Harding & Harding

ATTYS.

UNITED STATES PATENT OFFICE.

JOHN JOSEPH BERRIGAN, OF AVON, NEW YORK, ASSIGNOR TO THE DE LAVAL SEPARATOR COMPANY, OF NEW JERSEY.

CENTRIFUGAL LIQUID-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 676,410, dated June 18, 1901.

Application filed October 22, 1898. Serial No. 694,249. (No model.)

To all whom it may concern:

Be it known that I, JOHN JOSEPH BERRIGAN, a citizen of the United States, residing at Avon, county of Livingston, and State of New York, have invented a new and useful Improvement in Centrifugal Liquid-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 that class of liquid-separators in which in the liquid-space of the bowl there are a plurality of upright blades or plates which intersect the radial line of the bowl. In many constructions these blades or plates are curved and are either separate and independent of each other or are loosely connected with each other, so as to be readily moved when out of the bowl for the purpose of cleaning. With this class of devices there are several defects. First, there is a tendency of the blades under the action of centrifugal force to separate from one another and contact with the inner peripheral wall of the bowl, and, second, there is a tendency of the milk to rise vertically between the upright blades and escape at the top of the bowl. This has a tendency to prevent the full milk passing outward and all of it receiving the maximum action of centrifugal force and the skim-milk being delivered to its proper flow-passage at the periphery of the bowl and the cream to its proper flow-passage central of the bowl.

In the operation of liquid-separators with upright plates or blades as now generally used the full milk is fed to a point below the bottom of these blades and is fed between them from the bottom. This enables the full milk to pass too directly to the outer periphery or skim-milk zone of the bowl and prevents an even distribution of the milk between the blades or plates. I overcome these difficulties as follows: I place over the top of the blades a flanged top or cover, which prevents the egress of milk vertically over the top of the upright blades. This top or cover may be made with a central orifice fitting around the central shaft or core, (if such shaft or core be used,) or the cap is provided with an orifice at the proper point to enable the cream to escape and also an orifice for the incoming full milk. Of course if the last-mentioned orifice is itself on a line with the cream-zone no other cream-outlets are necessary. The flange prevents the blades from separating beyond the desired distance and from contacting with the wall of the bowl. This flange may be provided with projections to form the desired space between it and the wall of the bowl. I also use an annular cap or cover, which fits around the bottom of the blades. This cap or cover may be imperforate, enveloping the bottom of the blades or plates with an upwardly-extending flange, which encircles the lower part of the outer edge of the blades. The cap prevents the incoming milk entering the blades between their under ends, compelling the more even distribution of the milk by causing it to enter between the blades from their inner edge, and also regulates the position of the blades with reference to each other. This cap may, like the cap at the top of the blades, be provided with projections.

As will be seen hereinafter when I describe the embodiments of my invention shown in the drawings, I do not intend to limit myself to any particular form of flanged cap or cover nor that it shall be imperforate. It may be made with an orifice, so that the solid portion envelops only the under ends of the blades in that portion which is termed the "skim-milk zone" and extends upward a sufficient distance along the outer edges of the blades to prevent the skim-milk from passing directly to the skim-milk flow-space between the edges of the blades and the peripheral wall of the bowl. This form of construction permits of the entering of the full milk under the ends of the blades into what may be termed the "unseparated or mixed milk zone," but does not permit its so entering into the skim-milk zone or of its passing directly to the outer skim-milk space.

In the device hereinbefore described the top and bottom caps or covers may be used together or separately.

I will now describe the embodiment of my invention as shown in the accompanying drawings, in which—

Figure 1 is a plan view of the bowl, plates,

and cap with cover of the bowl removed. Fig. 2 is a view showing on the right-hand half thereof a section on line 2 2, Fig. 1, and on the left-hand half thereof a section of cover and bowl and a side elevation of cap. Fig. 3 is a plan view, similar to Fig. 1, of modified form. Fig. 4 is a view showing on the right-hand half thereof a section on line 4 4, Fig. 3, and in the left hand thereof a section of cover and bowl and a side elevation of cap. Fig. 5 is a view, similar to Fig. 6, of modified form. Fig. 6 is a detail view of the bowl, showing flanges projecting therefrom. Fig. 7 is a plan view of a bowl and blades with the cover of the bowl removed. Fig. 8 is a section on the line 11 11 of Fig. 10. Figs. 9 and 9^a are perspective views of the core and cap of Figs. 7 and 8. Fig. 10 is a perspective view of a modified form of cap or cover. Fig. 11 is a view similar to Fig. 4 with a cap at the top and bottom.

Taking up first Figs. 1 and 2, A is the bowl; B, the cover; C, a tubular feed-shaft; *a*, the skim-milk outlet; *b*, the cream-outlet, and D a series of upright blades or plates intersecting the radial line of the bowl. As shown, these blades or plates are connected to a ring *d* by vertical pivot-pins or hinges *d'*, so that what is shown is a series of these blades or plates loosely connected together. E is a cap or cover, resting on and covering the top of the vertical blades, having a circular orifice, the edges of which fit around the shaft C. This cap conforms to the angle and shape of the top of the blades and, as shown, is provided with a depending flange e^3, provided with projections *e*, which prevent the blades from expanding under the action of centrifugal force sufficiently to contact with the inner peripheral wall of the bowl, and thus providing for the maintenance of a skim-milk flow-passage.

As shown in Figs. 3 and 4, the fixed shaft C is dispensed with, the orifice in the cap E being sufficient to enable the introduction of the full milk. In this construction I have shown the cream-discharge outlet out of alinement with the orifice in the cap, in which case orifices *e'* are placed in the cap. If the orifices in the cap are in line with the cream-zone, the orifices *e'* may be eliminated.

In Fig. 5 I have shown the depending flange e^3 of the cap of thickness sufficient to fill the space between the inner peripheral wall of the bowl and the outer edges of the plates. With such construction I provide vertical holes or perforations *x* in this flange to provide skim-milk passages.

In Fig. 6 I have shown the projections *e* connected to the peripheral wall of the bowl instead of to the flange e^3, as in Fig. 1.

I do not intend to limit myself to the use of a cap made in a single piece.

I will now describe the construction shown in Figs. 7, 8, 9, and 9^a. The construction shown in these figures is similar to that shown in Figs. 1 and 2, except for the omission of cap E. I will now describe the additional points. F is an imperforate circular cap or cover fitting over the bottom of the upright blades or plates D and is provided with an upwardly-extending flange *f*, which encircles the lower part of the outer edges of the blades or plates. This flange *f* has projections *f'* contacting with the inner peripheral wall of the bowl. The cap prevents the incoming milk entering the blades between their under ends, compelling the more even distribution of the milk between the blades from their inner edges, and the flange *f* acts to prevent the blades from extending under the action of centrifugal force to contact with the inner peripheral wall of the bowl. I do not intend, however, to limit myself to the imperforate form of bottom cap or cover. The cap or cover may be made with a circular orifice, the solid portion covering or enveloping the under ends of the blades in what is termed the "skim-milk zone," and the flange *f* extends upward a sufficient distance along the outer edges of the blades to prevent the skim-milk from immediately passing to the skim-milk flow-space. This form is shown in Fig. 10.

In Fig. 11 I have shown the caps of Figs. 1 and 2 and Figs. 7 and 8 combined in a single machine. As previously stated, they can both be advantageously used together in the same machine or each may be used separately.

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

1. In a centrifugal liquid-separator, in combination with a plurality of upright plates intersecting the radial line of the bowl, of a cap covering the top of said plates, and provided with a depending flange encircling the outer edges of said blades.

2. In a centrifugal liquid-separator, in combination with a plurality of upright plates intersecting the radial line of the bowl, of a cap covering the top of said plates and provided with a depending flange encircling the outer edges of said blades, said flanges being provided with projections adapted to contact with the inner peripheral wall of the bowl.

3. In a centrifugal liquid-separator, in combination with a plurality of upright plates intersecting the radial line of the bowl, of a cap covering the lower edges of said plates and provided with an upwardly-extending flange encircling the outer edges of said plates.

4. In a centrifugal liquid-separator, in combination with a plurality of upright plates intersecting the radial line of the bowl, of a cap covering the lower edges of said plates and provided with an upwardly-extending flange encircling the outer edges of said plates, said flange being provided with projections adapted to contact with the inner peripheral wall of the bowl.

5. In a centrifugal liquid-separator, in combination with a plurality of upright plates intersecting the radial line of the bowl, of a cap covering the top of said plates, and a cap cov-

ering the lower edges of said plates, each cap being provided with a flange encircling the outer edges of said plates.

6. In a centrifugal liquid-separator, in combination with a plurality of upright plates intersecting the radial line of the bowl, of a cap covering the top of said plates, and a cap covering the lower edges of said plates, each cap being provided with a flange encircling the outer edges of said plates, and said flanges being provided with projections adapted to contact with the inner peripheral wall of the bowl.

In testimony of which invention I have hereunto set my hand, at Philadelphia, on this 30th day of September, 1898.

JOHN JOSEPH BERRIGAN.

Witnesses:

CHAS. COBB VAN RIPER,

M. F. ELLIS.