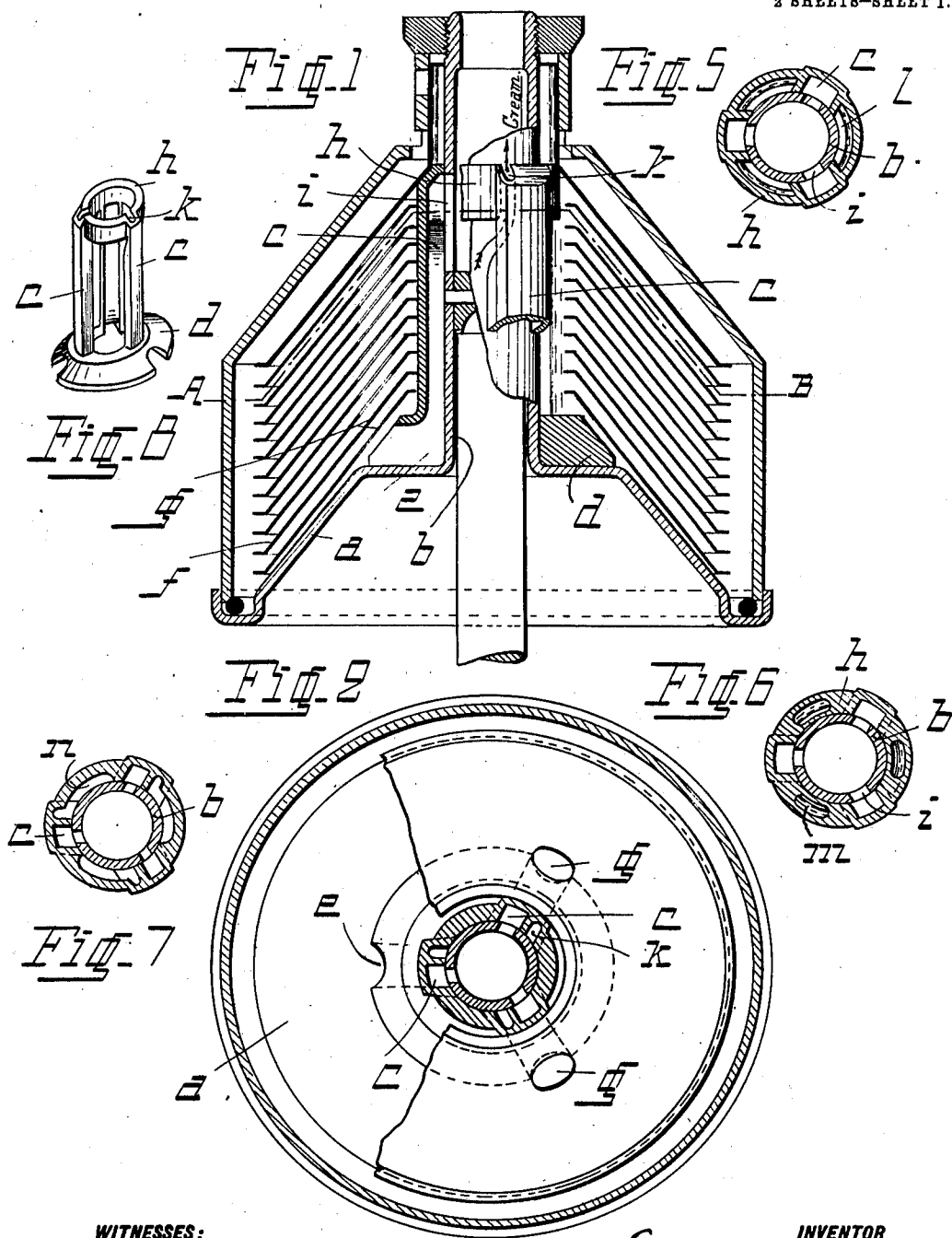


E. A. FORSBERG.
CENTRIFUGAL LIQUID SEPARATOR.
APPLICATION FILED SEPT. 20, 1910.

993,048.

Patented May 23, 1911.

2 SHEETS—SHEET 1.



WITNESSES:

M. M. Hamilton
E. E. Wall

INVENTOR

Erik August Forsberg

BY

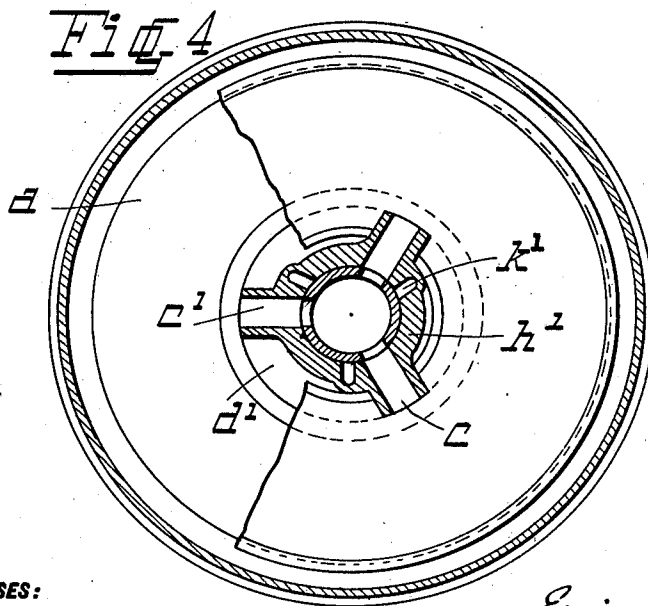
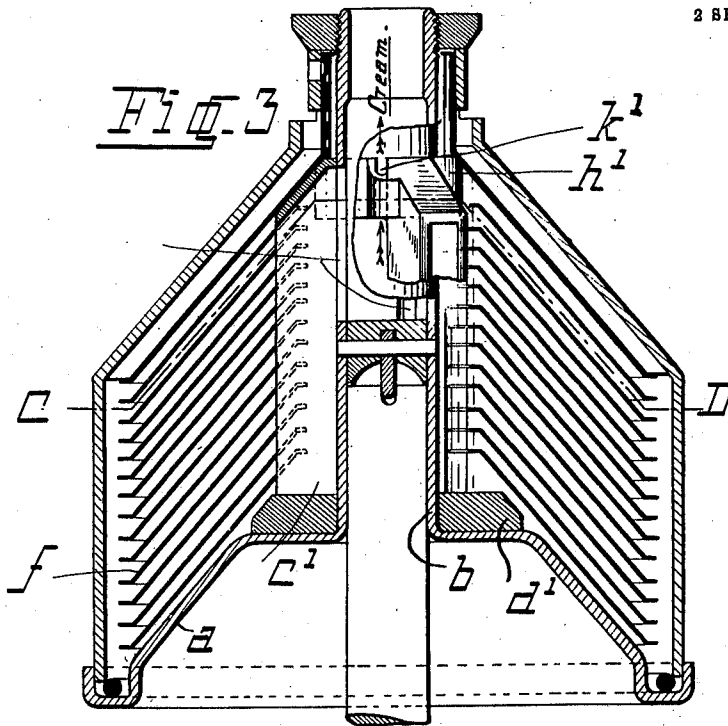
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WITNESSES:

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CENTRIFUGAL LIQUID-SEPARATOR.

993,048.

Specification of Letters Patent. Patented May 23, 1911.

Application filed September 20, 1910. Serial No. 582,861.

To all whom it may concern:

Be it known that I, ERIK AUGUST FORSBERG, chief engineer, a citizen of Sweden, and a subject of the King of Sweden, residing at Stockholm, in the Kingdom of Sweden, have invented certain new and useful Improvements in Centrifugal Liquid-Separators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in centrifugal liquid separators specifically in cream separators, and it particularly relates to a device for the inlet of the fluid to be separated and for the outlet of the separated constituents from the bowl of such centrifugal separators, in which the bowl is suspended on the top of the driving shaft, which penetrates to a relatively high point in the central part of the bowl. Owing to this fact certain difficulties as to the inlet of the separating fluid and the outlet of the separated constituents arise.

In order to have sufficient strength the driving shaft must have a relatively large diameter. It must further be surrounded by a central sleeve connected with the bowl, which must also be of sufficient thickness. There is thus formed in the center of the bowl a conical or cylindrical tap rising from the bottom of same. In the constructions hitherto known the liquid distributing organ envelops this central tap, and as this organ also must have a certain solidity, the result is that a body of relatively great extension in radial direction occupies the central part of the bowl. And further, as the cream outlet must be located at such a distance from the center line of the bowl that the cream cylinder formed during rotation does not touch at the central part of the bowl—causing an obstruction of the cream flow—the result is that the cream outlet, and consequently also the skim-milk outlet, must be located at a relatively great distance from the center of the bowl. This means,

however, a loss of power in the driving of the bowl.

My invention has for its object the construction of a milk distributing organ, by which the inconveniences mentioned above may be removed, and I attain this by limiting the dimensions in radial direction of the central parts of the bowl to what is strictly necessary with respect to the fixed part surrounding the driving shaft, or, in other words, I construct a liquid distributing organ, which does not itself take up any room in radial direction, whereby the upward flow of the cream would be checked.

Another object of my invention is that the milk distributing organ may be simple in manufacturing and easy to clean.

My invention is illustrated on the annexed drawing, on which—

Figure 1 is a vertical section of the rotating bowl showing the fluid distributing device partly sectioned and partly in elevation. Fig. 2 is a plan section taken on the broken line A—B in Fig. 2. Fig. 3 is a sectional view of another embodiment of my invention, showing a part of the fluid distributing device partly in elevation, and Fig. 4 is a plan section on the broken line C—D in Fig. 3. Figs. 5, 6, and 7 show different arrangements for the outlet of the separated lighter constituent, and Fig. 8 is a perspective view in smaller size of the independent distributing organ.

In the embodiment shown in Figs. 1 and 2 *a* is the body of the bowl, supporting the central sleeve *b* surrounding the top of the driving shaft. The sleeve *b* is in its turn surrounded by the fluid distributing organ, which is composed of a number (in the drawing three) of vertical gutters *c*, independent of the central sleeve, said gutters facing inward and abutting with their side walls against the central sleeve. The gutters are at their lower extremity connected with a bottom part *d*, in which channels *e* are provided, forming continuations of the gutters. These channels issue into the series of distributing holes *g* existing in the separating disks. At the upper end the gutters are closed and held together by means of, preferably, sector-formed connecting pieces *h*, which preferably are made in one with the

gutters *c*. These connecting pieces may be either entire, in which case the upward directed flow of the lighter fluid is conducted past the connections through channels *k* 5 formed in the gutters (Figs. 1 and 2), or the connections themselves may be arranged to leave free passage for the said fluid flow.

According to the modification shown in Fig. 5 there are left spaces between the connections and the central feed pipe, leaving 10 free passage for the lighter fluid.

In the embodiment shown in Fig. 6 the connections touching to the central feed pipe are provided with apertures, and in 15 the embodiment illustrated in Fig. 7 passages are forwarded both in the gutters and in the connecting pieces, forming one issue.

Should it prove necessary, one or more connecting pieces may be arranged at suitable places along the length of the gutters, these connecting pieces being also arranged 20 so as to leave free passage for the rising lighter fluid.

The distance from the axis of the bowl to the outer circumference of the connecting pieces may either be equal to the distance 25 from the axis to the outer wall of the gutters, or less. In the latter case, the separating disks are guided between the opposite walls of the gutters. In the feed pipe forming a continuation of the sleeve *b* there are 30 vertical apertures *i* corresponding to the inwardly open gutters.

The operation of the device is as follows: 35 The fluid to be separated is introduced in the central feed pipe, flows through the apertures *i* and the gutters *c* down to the channels *e* and is further distributed in the liner through the series of holes in the separating disks. As will be seen, the space 40 between the gutters is free in radial direction up to the outer wall of the central sleeve *b* and no room is taken up by the milk distributing organ. The outflow openings for 45 the separated constituents may consequently be located as near to the center as the construction in other respects permits. And since the liquid distributing organ is independently adapted to the central sleeve, the 50 same may be easily removed and effectively cleaned.

In the modified construction shown in Figs. 3 and 4 the milk is in the known manner distributed to the separating chamber 55 by means of split wings *e'*. Said wings correspond thus to the gutters in the embodiment before described and are, like these, connected below by means of a central supporting body *d'*, in which, however, no distributing channels are provided, and above 60 by means of a ring *h'*. The splits communicate with the apertures *i* in the feed pipe. At the one side of each wing there are made vertical channels *k'* ending over and under

the connecting pieces *h'* for conducting the 65 lighter fluid past these connecting pieces. Instead of such channels there may be holes or slits in the connecting pieces themselves.

What I claim is:—

1. In centrifugal liquid separators, in 70 combination, a driving shaft, a bowl on the top of said shaft, a sleeve rising from the bottom of the bowl and surrounding the upper part of the shaft, a central feed pipe forming prolongation of said sleeve, a liner 75 in the separating chamber of the bowl, and a liquid distributing device interposed between the liner and the sleeve independent of both and consisting of upright gutters, in communication with the feed pipe above 80 the sleeve and with the lower portion of the separating chamber to conduct the fluid to be separated from the feed pipe to the separating chamber.

2. In centrifugal liquid separators, in 85 combination, a driving shaft, a bowl on the top of said shaft, a sleeve rising from the bottom of the bowl and surrounding the upper part of the shaft, a central feed pipe forming prolongation of said sleeve, a liner 90 in the separating chamber of the bowl, a liquid distributing device interposed between the liner and the sleeve independent of both, and consisting of a plurality of upright gutters communicating with the interior of the feed pipe above the sleeve and 95 with the lower portion of the separating chamber to conduct the fluid to be separated from the feed pipe to the separating chamber, and means to conduct the separated 100 lighter constituent to the outlet.

3. In centrifugal liquid separators, in combination, a driving shaft, a bowl on the top of the said shaft, a sleeve rising from the bottom of the bowl and surrounding the 105 upper part of the shaft, a central feed pipe forming prolongation of said sleeve, a liner in the separating chamber of the bowl, a liquid distributing device interposed between the liner and the sleeve, independent 110 of both, and consisting of a plurality of outwardly closed upright gutters communicating with the interior of the feed pipe above the sleeve and with the lower portion of the separating chamber, to conduct the fluid to 115 be separated from the feed pipe to the separating chamber, and means to conduct the separated lighter constituent to the outlet.

4. In centrifugal liquid separators, in 120 combination, a driving shaft, a bowl on the top of said shaft, a sleeve rising from the bottom of the bowl and surrounding the upper part of the shaft, a central feed pipe forming prolongation of the said sleeve, a 125 liner in the separating chamber of the bowl, consisting of superposed conical disks provided with series of holes, a liquid distribut-

ing device interposed between the liner and the sleeve, independent of both and consisting of a plurality of outwardly closed upright gutters communicating with the interior of the central feed pipe above the sleeve and abutting beneath the series of holes in the separating disks, and means to conduct the separated lighter fluid to the outlet.

5. In centrifugal liquid separators, in combination, a driving shaft, a bowl on the top of said shaft, a sleeve rising from the bottom of the bowl and surrounding the upper part of the shaft, a central feed pipe forming prolongation of the said sleeve, a liner in the separating chamber of the bowl, consisting of superposed conical disks provided with series of holes, a liquid distributing device interposed between the liner and the sleeve, independent of both and consisting of a plurality of outwardly closed upright gutters communicating with the interior of the central feed pipe and abutting beneath the series of holes in the separating disks, connecting pieces between the said gutters, and means to conduct the rising flow of the lighter constituent from the under to the upper side of these connecting pieces.

6. In centrifugal liquid separators, in combination, a driving shaft, a bowl on the top of said shaft, a sleeve rising from the bottom of the bowl and surrounding the upper part of the shaft, a central feed pipe forming prolongation of the said sleeve, a liner in the separating chamber of the bowl, consisting of superposed conical disks provided with series of holes, a liquid distributing device interposed between the liner and the sleeve, independent of both and consisting of a plurality of outwardly closed upright gutters communicating with the interior of the central feed pipe and abutting beneath the series of holes in the separating disks, connecting pieces between the said gutters and passages in the body of the gutters issuing beneath and above the conducting pieces to conduct the rising flow of the separated lighter constituent past the said connecting pieces.

7. In centrifugal liquid separators, in combination, a driving shaft, a bowl on the top of said shaft, a sleeve rising from the bottom of the bowl and surrounding the upper part of the shaft, a central feed pipe forming prolongation of the said sleeve, a liner in the separating chamber of the bowl, consisting of superposed conical disks provided with series of holes, a liquid distributing device, interposed between the liner and the sleeve, independent of both and consisting of a plurality of outwardly closed upright gutters communicating with the interior of the central feed pipe and abutting beneath the series of holes in the separating disks, connecting pieces between the said

gutters and passages in said connecting pieces for the flow of the separated lighter constituent.

8. In centrifugal liquid separators, in combination, a driving shaft, a bowl on the top of said shaft, a sleeve rising from the bottom of the bowl and surrounding the upper part of the shaft, a central feed pipe forming prolongation of the said sleeve, a liner in the separating chamber of the bowl, consisting of superposed conical disks provided with series of holes, a liquid distributing device interposed between the liner and the sleeve, independent of both and consisting of a plurality of outwardly closed upright gutters communicating with the interior of the central feed pipe and abutting beneath the series of holes in the separating disks, connecting pieces between the said gutters and passages in the body of said gutters and in the said connecting pieces, forming one issue, to conduct the upright directed flow of the separated lighter constituent.

9. In centrifugal liquid separators, in combination, a driving shaft, a bowl on the top of said shaft, a sleeve rising from the bottom of the bowl and surrounding the upper part of the shaft, a central feed pipe forming prolongation of the said sleeve, a liner in the separating chamber of the bowl, consisting of superposed conical disks, a liquid distributing device interposed between the liner and the sleeve, independent of both, and consisting of a plurality of inwardly and outwardly open upright gutters communicating with the interior of the feed pipe above the sleeve and with lower portion of the separating chamber and means to conduct the separated lighter fluid to the outlet.

10. In centrifugal liquid separators, in combination, a driving shaft, a bowl on the top of said shaft, a sleeve rising from the bottom of the bowl and surrounding the upper part of the shaft, a central feed pipe forming prolongation of the said sleeve, a liner in the separating chamber of the bowl, consisting of superposed conical disks, a liquid distributing device interposed between the liner and the sleeve, independent of both, and consisting of a plurality of inwardly and outwardly open upright gutters communicating with the interior of the feed pipe and with the separating chamber of the bowl, connecting pieces between said gutters and means to conduct the rising flow of the lighter constituent from the under to the upper side of these connecting pieces.

11. In centrifugal liquid separators, in combination, a driving shaft, a bowl on the top of said shaft, a sleeve rising from the bottom of the bowl and surrounding the

upper part of the shaft, a central feed pipe forming prolongation of the said sleeve, a liner in the separating chamber of the bowl, consisting of superposed conical disks, a
5 liquid distributing device interposed between the liner and the sleeve, independent of both, and consisting of a plurality of inwardly and outwardly open upright gutters communicating with the interior of the feed
10 pipe and with the separating chamber of the bowl, connecting pieces between said gutters, and passages in the body of the gutters issuing beneath and above the connecting pieces.

15 12. In centrifugal liquid separators, in combination, a driving shaft, a bowl on the top of said shaft, a sleeve rising from the bottom of the bowl and surrounding the upper part of the shaft, a central feed pipe
20 forming prolongation of the said sleeve, a liner in the separating chamber of the bowl, consisting of superposed conical disks, a liquid distributing device interposed between the liner and the sleeve, independent
25 of both, and consisting of a plurality of inwardly and outwardly open upright gutters communicating with the interior of the feed pipe and with the separating chamber

of the bowl, connecting pieces between said gutters, and passages in said connecting pieces.

13. In centrifugal liquid separators, in combination, a driving shaft, a bowl on the top of said shaft, a sleeve rising from the bottom of the bowl and surrounding the upper part of the shaft, a central feed pipe forming prolongation of the said sleeve, a liner in the separating chamber of the bowl, consisting of superposed conical disks, a liquid distributing device interposed between
4 the liner and the sleeve, independent of both, and consisting of a plurality of inwardly and outwardly open upright gutters communicating with the interior of the feed
5 pipe and with the separating chamber of the bowl, connecting pieces between said gutters, and passages in the body of said gutters and in the said connecting pieces, forming one issue.

In testimony, that I claim the foregoing
as my invention, I have signed my name in
presence of two subscribing witnesses.

ERIK AUGUST FORSBERG.

Witnesses:

HARRY ALBIHN,
L. BERGMAN.