

(No Model.)

2 Sheets—Sheet 1.

C. D. HELLSTRÖM.
CENTRIFUGAL LIQUID SEPARATOR.

No. 496,412.

Patented May 2, 1893.

Fig. 1.

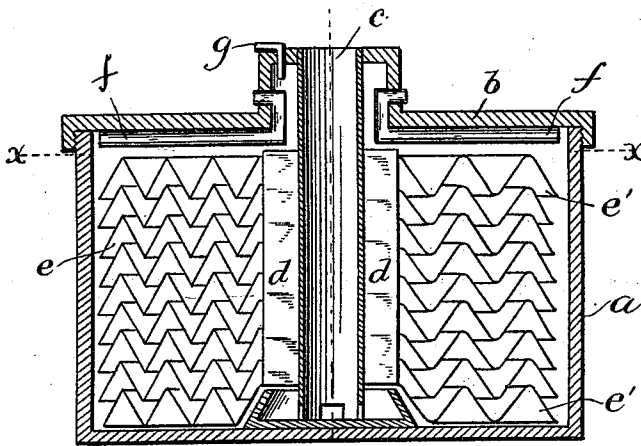
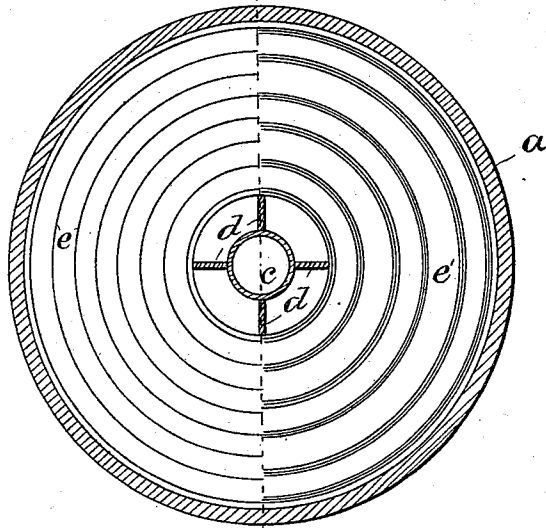


Fig. 2.



WITNESSES

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INVENTOR

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By
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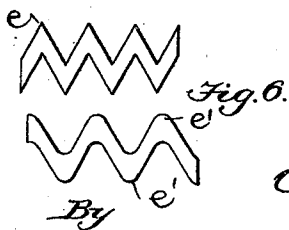
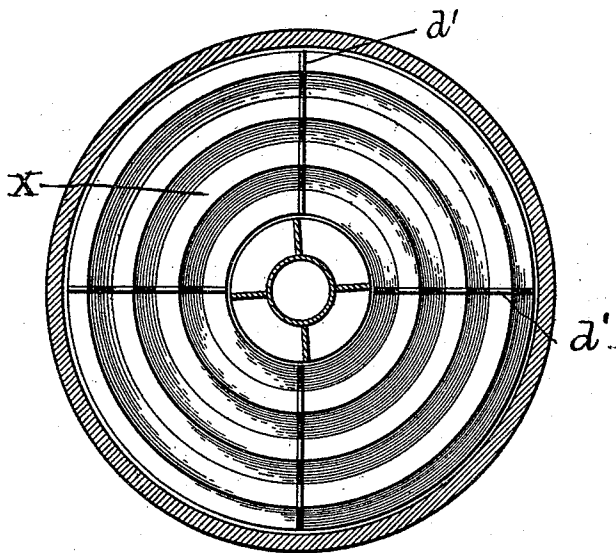
Fig. 3.



Fig. 4.



Fig. 5.



Witnesses
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Geo. Chandler

Inventor
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UNITED STATES PATENT OFFICE.

CARL DIDRIK HELLSTRÖM, OF SALA, SWEDEN.

CENTRIFUGAL LIQUID-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 496,412, dated May 2, 1893.

Application filed October 23, 1891. Renewed March 6, 1893. Serial No. 464,858. (No model.)

To all whom it may concern:

Be it known that I, CARL DIDRIK HELLSTRÖM, residing at Sala, Sweden, have invented certain new and useful Improvements in Centrifugal Liquid-Separators; and I do hereby declare that the following is a full, clear, and exact description of the invention, which 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 of reference marked thereon, which form a part of this specification.

With fat-emulsions, in which the fat-balls are met with in different sizes, (as in milk for instance,) the thoroughness of the fat-extraction mainly depends on the quantity of the smaller globules or fat-balls, that are extracted. By the "Schwarz" method of creaming, the rapid and entire result is considered to be owing to circulations in the milk, taking place in a certain manner, by which the large fat-balls on their way up toward the surface are working upon and carrying along with themselves some part of the smaller ones, which otherwise are not able to float up and consequently would therefore fail to be separated.

This invention relates to an improved method and to an apparatus therefor, by which an analogous, but more efficient action is called forth by extraction of fat from an emulsion, by means of centrifugal force.

If to a working centrifugal machine, within the interior of the vessel, be horizontally applied a bottom or ring concentrically corrugated from its central opening to its circumference, the lighter or fatty particles (say, the cream) will tend to collect or congregate on those parts or faces of such annular corrugations which are turned or face outwardly from the axle; and the serum of heavier particles (the milk) will tend to collect on the concentric inner faces of the corrugations, namely, those whose faces are turned toward the axle. The fat particles are thereby detained in their motion until a layer or bed covering the surface of this part of the annular corrugation has come to be formed. This bed next becomes merged into a poorer fat and which therefore is a heavier liquid, whereby the floating ability of the fatty bed, and at the same time, the separating effect of the

centrifugal force is heightened so that this bed or layer may be carried forward just as if pushed off from the annular concentric corrugation against and over the crest or top of that corrugation which is nearest to the axle. From the surrounding emulsion, more fat particles are continually settling, so that this pushing of the bed against the top is continually taking place. The serum-bed congregated on that part or face of the corrugation turned toward the axle is subjected to a pressure, caused in an analogous manner, against a top situated farther from the axle. At every one of the tops of the corrugations, a bed of richer fat going inward is now met with a serum-bed of poorer fat going outward, so that these beds are pervading each other, whereby the smaller fat-balls existing in the serum-bed come in contact with the larger fat-balls going inward, the effect of which in carrying the former along with them now is increased, because they have assembled in conglomerates, in consequence of the pressure against one another and against the corrugation, to which they have been subjected.

If now to the above mentioned corrugated middle-bottom or ring another similar corrugated ring be placed near it in such way that the corrugations of the former enter into the depressions of the latter, the effect of the arrangement is so increased thereby, that the emulsion, being in the space between the rings, settles its fat-particles on the corrugations more rapidly: and moreover the remaining liquid, in which the richer fat-bed which is on the corrugation is merged, becomes heavier, and the effect of the centrifugal force is consequently greater. The richer fat-bed coming from a top, situated farther off from the axle, settles hereby on the nearest corrugation and thus promotes the pressure of the bed previously deposited there, against the next top or crest of a corrugation. In the cream-bed nearest the free surface of the rotating liquid, an analogous action of the larger fat-balls and conglomerates upon the smaller ones is also taking place. The emulsion, that through the inlet tube comes into the centrifugal is emulsioned together with the bed of richer fat lying on the surface and with the richer-fat currents coming out of each interspace. The struggle of the

centrifugal force to eject even by the lower spaces the entered emulsion that is heavier than the liquid contained in the free space, is thereby counteracted.

- 5 The accompanying drawings show sufficiently to illustrate my invention, a milk-centrifugal having my improvements applied thereon; Figure 1, being a central vertical section: and Fig. 2 a horizontal section: in
10 the line *xx* of Fig. 1; Figs. 3 and 4, details, showing the manner of supporting the corrugated plates one upon another; Fig. 5, a horizontal section in the case where the space between two adjacent rings is divided into
15 sections by diametric planes; and Fig. 6, elevations of pieces of such diametric planes.

a. represents the centrifugal vessel, the cover of which *b.* is screwed on the shell part of the vessel, and thus easily removable.

- 20 *c.* illustrates a central inlet tube for the milk on which four wings or vanes *d.* are fixed. Outside these vanes annular plates concentrically corrugated—either sharp-cut, as at *e.*, or undulatory as at *e'.*—are put in, one placed
25 above the other in such a way that the projections of an underlying plate enter in the depressions of another lying above it.

- The left part of Fig. 1 illustrates as an instance, annular plates with concentric sharp-cut or angular corrugations, while the right
30 part represents plates with rounded or undulatory ones. The plates may be kept at a suitable distance from each other by means of any suitable metallic pieces *k*, shown, soldered on the plates, or through elevations *k'*
35 pressed out in the plate, and these plates do not reach out or extend to the shell *a.* of the vessel. An annular shaped space is thus left or formed, in which the separated heavier
40 liquid (the milk) congregates and is led off in ordinary way through one or more skim-

tubes *f.* The lighter liquid (the cream) issues through the pipe *g.*

By experiments it has been proved that a comparatively very good result is attained
45 even by putting in rings or plates of little radial extension and which consequently reach only a short stretch or distance into the rotating liquid-mass. In such case the rings can not be considered as middle-bottoms, but
50 as only forming a concentric grate around the axle.

In conclusion I beg to mention that if the space between two rings be divided into sections by diametrical planes, the action within
55 each section of the interspace will be analogous with that above described. This is even the case if the surfaces of the corrugation are not rotating surfaces. The characteristic of this invention is however that the liquid that
60 has to be separated in a centrifugal be forced to run through a corrugated (broken or undulatory) way by means of middle bottoms or plates of a convenient cross-section, put in
65 and arranged in a suitable manner in the centrifugal.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

In a centrifugal machine, a series of bottom or ring-plates each concentrically corrugated in a series of undulations extending from its center to near the periphery of the shell of the machine, as described, such plates being placed one above and within each other
75 and between the center and the shell of the machine, substantially as set forth.

CARL DIDRIK HELLSTRÖM.

Witnesses:

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