

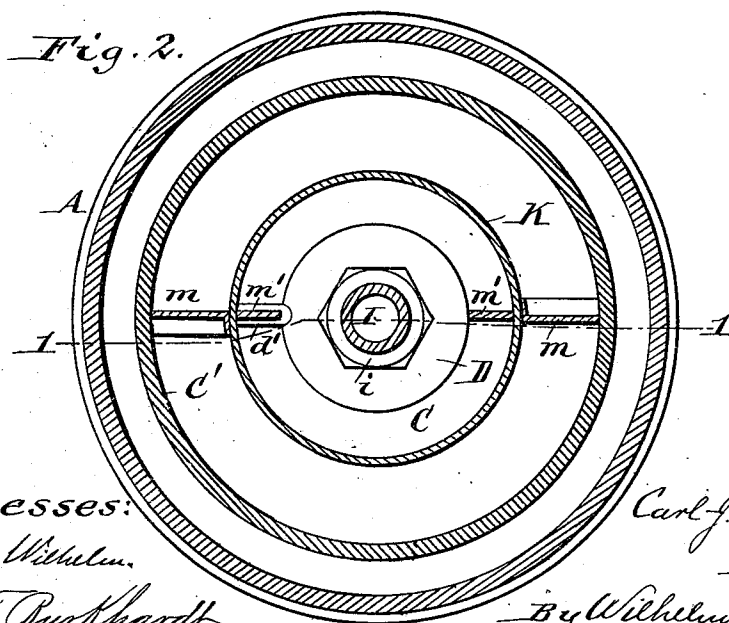
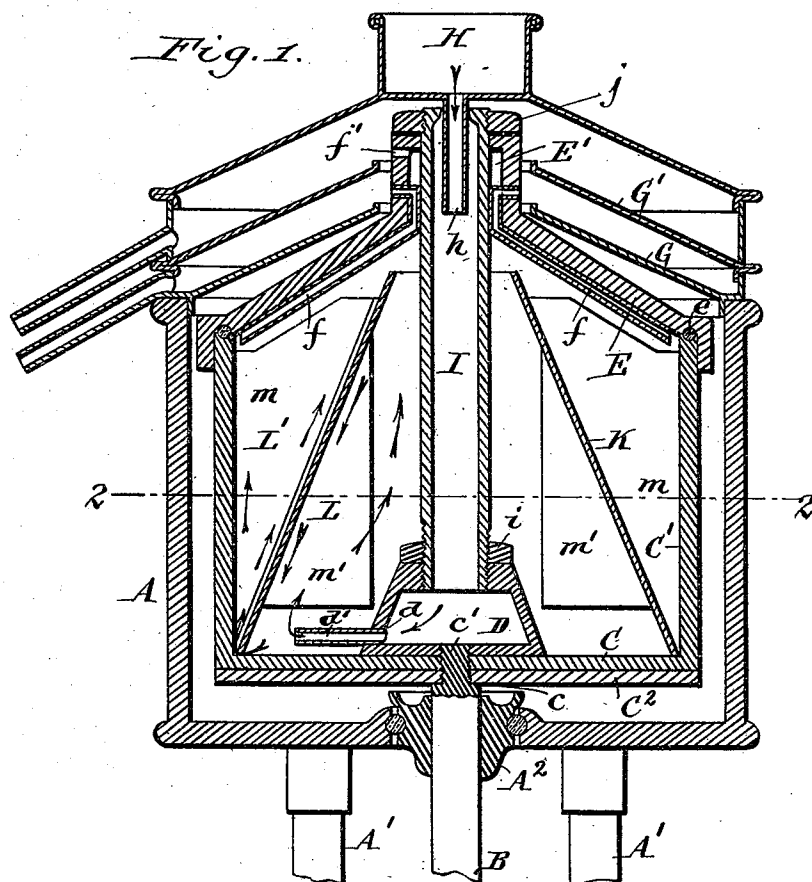
(No Model.)

2 Sheets—Sheet 1.

C. J. LUNDSTROM.
CENTRIFUGAL LIQUID SEPARATOR.

No. 514,156.

Patented Feb. 6, 1894.



Witnesses:

F. J. J. J. J. J.

Chas. F. Burkhardt.

Carl J. Lundstrom
Inventor

By Wilhelm Bonnet
Attorneys.

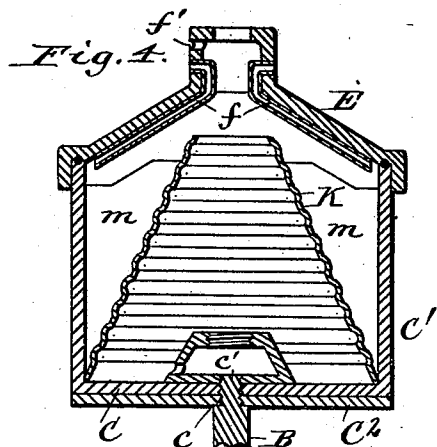
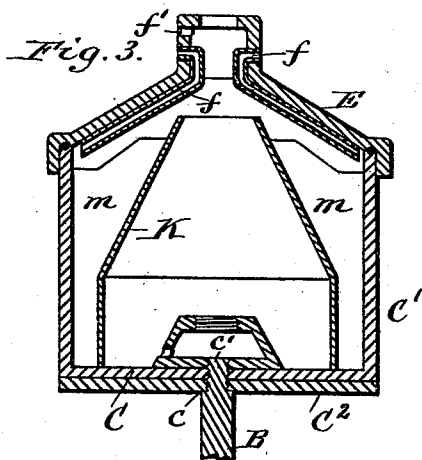
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2 Sheets—Sheet 2.

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Witnesses:
Chas. F. Burkhardt.
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UNITED STATES PATENT OFFICE

CARL JOHAN LUNDSTROM, OF LITTLE FALLS, NEW YORK, ASSIGNOR TO D.
H. BURRELL & CO., OF SAME PLACE.

CENTRIFUGAL LIQUID-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 514,156, dated February 6, 1894.

Application filed January 24, 1893. Serial No. 459,533. (No model.)

To all whom it may concern:

Be it known that I, CARL JOHAN LUNDSTROM, a subject of the King of Sweden and Norway, residing at Little Falls, in the county of Herkimer and State of New York, have invented a new and useful Improvement in Centrifugal Liquid-Separators, of which the following is a specification.

This invention relates to that class of centrifugal separating machines which are employed for separating a compound liquid or emulsion into its constituent liquids of different densities, particularly for separating full milk into cream and skim milk. These separators are provided with imperforate drums or bowls which are in many cases filled with numerous division rings whereby the body of liquid is divided into thin layers and which are designed to increase the separating capacity of the machine.

The object of my invention is to simplify the means placed within the liquid space of the bowl for the purpose of increasing its separating capacity.

In the accompanying drawings consisting of two sheets:—Figure 1 is a vertical section of the centrifugal creamer provided with my improvements, the section being taken in line 1—1, Fig. 2. Fig. 2 is a horizontal section in line 2—2, Fig. 1. Figs. 3 and 4 are vertical sections, on a reduced scale, showing different forms of the internal cone.

Like letters of reference refer to like parts in the several figures.

A represents the stationary curb or inclosing case of the machine which is of any ordinary construction and supported in the usual way on standards A' and provided in its bottom with a bearing A² in which the upper part of the spindle B is journaled. The spindle is rotated in the usual way by a belt and pulleys, or by a steam turbine, or by other suitable mechanism.

C represents the bottom and C' the vertical peripheral wall of the bowl, formed in one piece with or secured to the bottom.

C² represents a bottom plate which may be arranged underneath the bottom C of the bowl and which rests upon a shoulder c formed at the upper end of the spindle B around an upwardly projecting screw shank

c' of less diameter than the spindle. This bottom plate reinforces the bottom of the bowl and is secured thereto by rivets, or otherwise.

D represents the feed cup arranged centrally on the bottom of the bowl and provided in its bottom with a screw-threaded opening by means of which it is screwed to the upper end of the shank c' of the spindle, so that the feed cup serves as a screw nut for securing the bowl to the spindle. The feed cup is preferably made flaring downwardly and provided in its peripheral wall with one or more apertures d through which the full milk escapes therefrom. These apertures may be provided with discharge pipes d' projecting outwardly from the cup, if desired.

E represents the cover of the bowl, which rests near its outer edge upon a packing ring e arranged in a groove formed in the top of the peripheral wall of the bowl, and which tapers upwardly to a contracted neck E'. This cover is provided on its under side with the usual skim milk discharge pipes f and in its contracted neck with the cream outlet f'.

G G' are two superposed receptacles supported upon the curb A and receiving respectively the skim milk and the cream from the skim milk pipes f and the cream outlet f'.

H represents the milk receptacle which receives the milk to be separated and which is provided with a depending discharge pipe h.

I represents a tubular stem arranged axially in the drum and secured with its lower screw-threaded end in a screw-threaded opening formed in the top of the feed cup D. A jam nut i is preferably applied to this tubular stem upon the top of the feed cup. The upper portion of this tubular stem passes loosely through the contracted neck of the cover and is provided at its upper end with an external screw thread to which a screw nut j is applied which bears upon the neck of the cover and presses the cover down upon its seat on the bowl, so that by means of this stem and screw nut the cover is secured to the bowl in a very simple manner, and can be lifted off upon removing the screw nut.

The depending pipe h of the milk receptacle is arranged centrally in the upper portion of the tubular stem and is so much smaller

in diameter than the stem that the milk, issuing from the pipe *h*, drops directly into the feed cup and does not come in contact with the inner surface of the stem, the rotation of which would retard the downward movement of the milk coming in contact therewith. In order to prevent any milk which may come in contact with the inner surface of the stem from being driven out of the upper end thereof by centrifugal force, the stem may be provided above the outlet of the tube *h* with an inwardly projecting rim or flange.

While I prefer the construction of the parts hereinbefore described I do not wish to limit myself to the same as other suitable or well known constructions may be employed, if desired.

K represents a hollow separating cone which is arranged in the liquid space of the bowl and which rests upon the bottom of the bowl, at or near the peripheral wall thereof, and extends obliquely upwardly and inwardly from the bottom toward the cream outlet and terminates with its contracted end in the vicinity of the cream outlet. This cone extends diagonally through the thickness of the annular body of liquid in the bowl and divides that body into an inner portion *L*, arranged between the point at which the full milk is received at the bottom of the bowl and the inner surface of the cone, and an outer portion *L'*, arranged between the outer surface of the cone and the skim milk outlet. The diameter of the small end of this truncated cone is somewhat larger than the inner diameter of the cream wall so that the cream, which is separated from the milk on the inner side of the cone, can pass upwardly beyond the small end of the cone and so reach the cream outlet in the neck of the bowl.

The full milk enters first after escaping from the feed cup, the liquid space on the inner side of the cone and is there subjected to centrifugal action, whereby the cream globules are crowded toward the axis of rotation while the globules of blue milk are driven outwardly.

The cream globules accumulating in the inner layer of the inner body *L* of liquid are moved upwardly, toward the cream outlet by the incoming supply of milk at the bottom of the bowl, while the particles of skim milk or blue milk reach in their outward course the inner surface of the cone and travel downwardly along the latter under the influence of the centrifugal force and finally escape around the lower edge of the cone into the outer portion *L'* of the body of liquid. This cone is constructed of tin, or other suitable material, and rests loosely on the bottom of the bowl, so that the centrifugal force can drive the partially skimmed milk past the lower edge of the cone. In the outer portion of the body of liquid this partially skimmed milk is further separated, the cream globules being crowded inwardly and flowing upwardly along the outer surface of the cone, while the

particles of skimmed milk are massed against the inner side of the peripheral wall of the bowl and flow upwardly along the latter to the outer ends of the skim milk pipes *f*, which they enter. The cream separated on the inner side of the cone and that separated on the outer side of the cone come together at the small upper end of the cone and pass thence to the cream outlet. The full milk is by this means subjected to a primary separation on the inner side of the cone, whereby the largest cream globules, which have the greatest buoyancy and are most readily separated, are first separated from the milk, and this partially skimmed milk, which accumulates in the outer layer of the inner portion of the body of the liquid, is then subjected on the other side of the cone to a further or secondary separation, whereby the smaller cream globules, having less buoyancy, are separated from the skimmed milk and whereby the operation of skimming is completed.

The cone is preferably provided on its outer side with radial blades *m* which prevent the liquid from changing its position circumferentially with reference to the cone and bowl and it may also be provided on its inner side with radial blades *m'*. When it is desired to clean the bowl, the receptacles for the milk, the cream and the skim milk are removed, the cover is taken off and the cone is lifted out, whereby the entire inner surface of the bowl is quickly made accessible, and these parts are as quickly replaced for restoring the machine to its operative condition.

Instead of making the cone flaring to its extreme lower edge, as shown in Fig. 1, it may be flaring only part way down and its lower part may be made cylindrical, as represented in Fig. 3.

In order to increase the separating capacity of the cone its superficial area may be increased by corrugations, for instance, by providing it with horizontal corrugations forming alternate ridges and depressions of gradually decreasing diameter toward the small end of the cone, as represented in Fig. 4.

My improved cone adds but little to the weight of the bowl, which latter, when provided with this cone, is much lighter than a bowl provided with a nest of division rings. This permits the machine to be operated at a higher speed without an increase in power, and whereby a corresponding increase in separating capacity is obtained.

I claim as my invention—

1. The combination with the separating bowl having an inlet for the full milk, a discharge for the skim milk communicating with the peripheral portion of the bowl and a cream discharge communicating with the cream space of the bowl, of a hollow separating cone extending through the liquid space of the bowl and terminating with its small end near the cream outlet thereof, whereby the full milk is first separated within the cone, and the cream is discharged at the small end of

the cone, while the partially skimmed milk passes from the large end thereof into the space between the cone and the peripheral wall of the bowl, in which space the partially skimmed milk is further separated and from which the cream and the skim milk are separately discharged, substantially as set forth.

2. The combination with the separating bowl having an inlet for the full milk near the bottom of the bowl and having its top provided with a skim milk discharge pipe and with a contracted neck in which the outlet of the skim milk pipe and the cream outlet are arranged, of a hollow separating cone extending through the liquid space of the bowl and opening with its small end below the contracted neck, whereby the cream separated within the cone and the cream separated outside of the cone are together deliv-

ered through the same cream outlet, substantially as set forth.

3. The combination with a separating bowl having an inlet for the full milk at its bottom and discharges for the separated cream and skim milk at its top, of a hollow separating cone extending diagonally through the liquid space of the bowl from the bottom toward the cream outlet and terminating with its small end near the cream outlet, and upright wings secured to the outer side of said cone, substantially as set forth.

Witness my hand this 18th day of January, 1893.

CARL JOHAN LUNDSTROM.

Witnesses:

GEO. W. SEARLES,
HARVEY FELDMEIER.