C. O. ANDERSON.

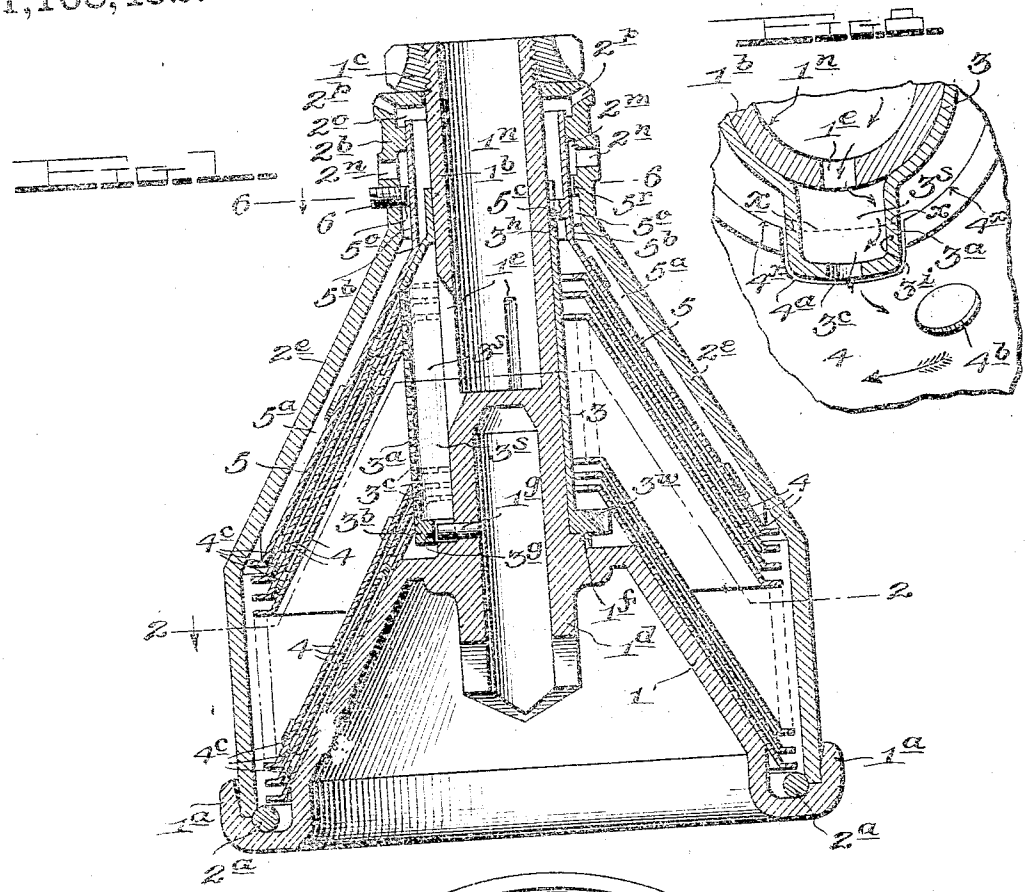
CENTRIFUGAL CREAM SEPARATOR.

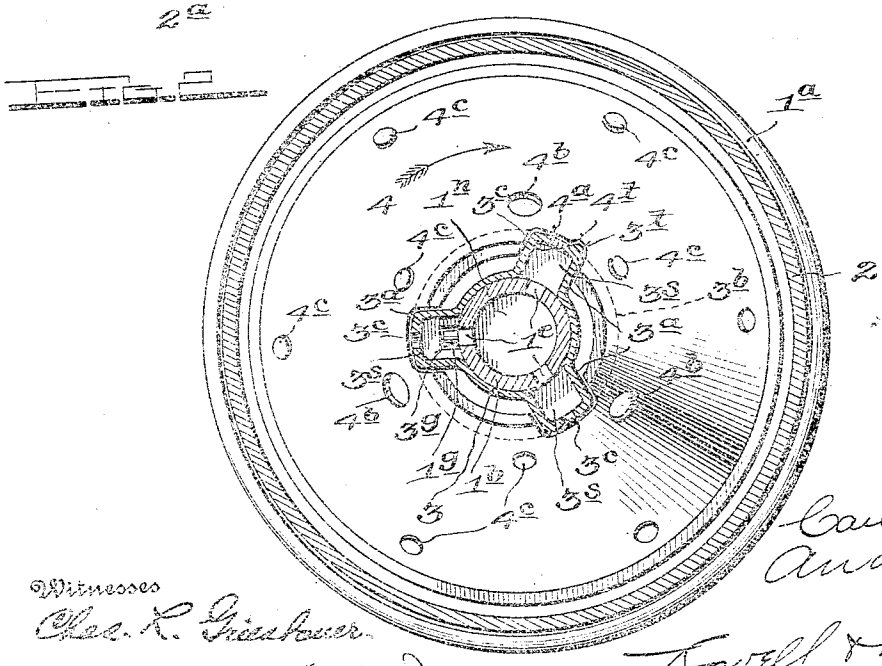
APPLICATION FILED SEPT. 28, 1914.

Patented Jan. 18, 1916.

3 SHEETS—SHEET 1.

1,168,452.





Witnesses

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CENTRIFUGAL CREAM SEPARATOR.

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3 SHEETS—SHEET 2.

Fig. 2.

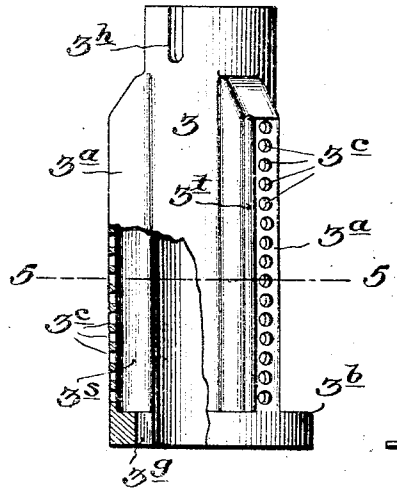


Fig. 4.

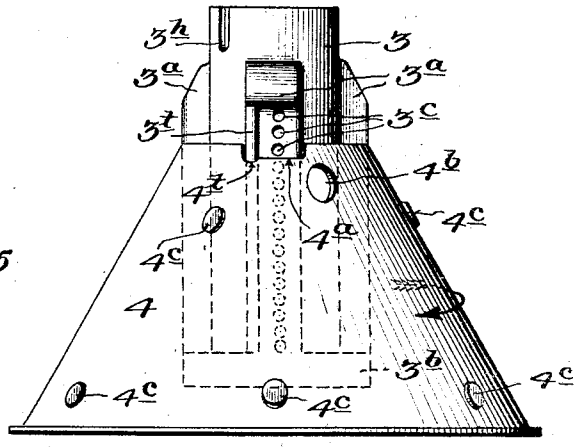


Fig. 3.

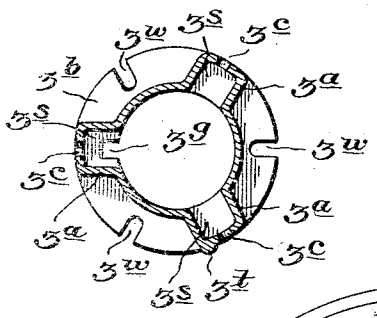


Fig. 6.

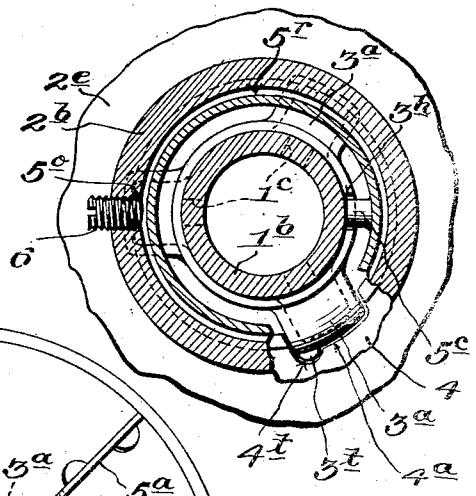
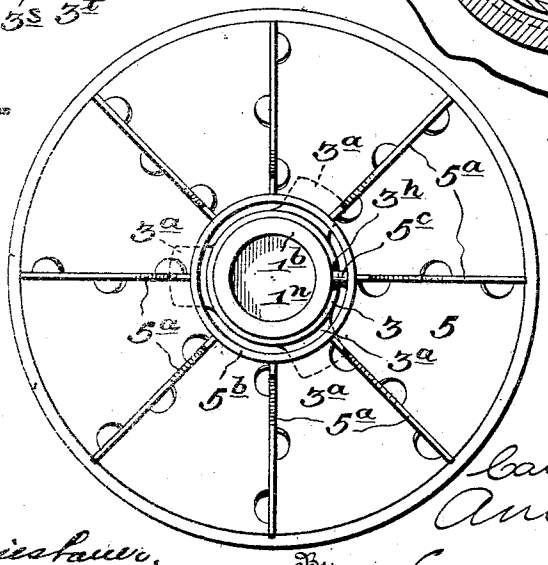


Fig. 7.



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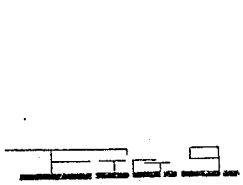
CENTRIFUGAL CREAM SEPARATOR.

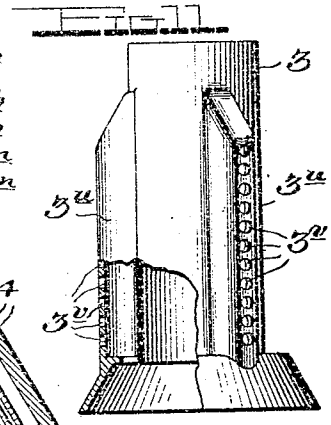
APPLICATION FILED SEPT. 28, 1914.

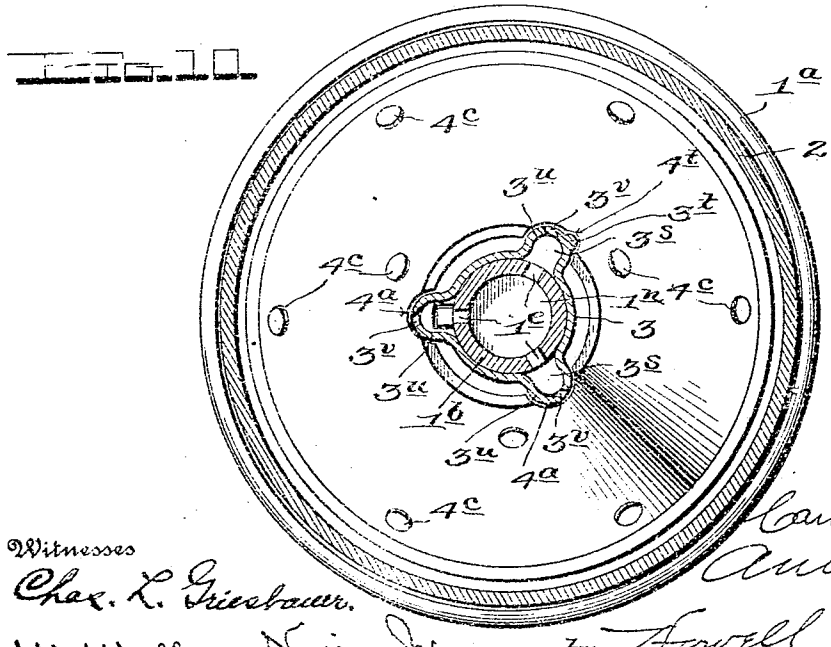
1,168,452.

Patented Jan. 18, 1916.

3 SHEETS—SHEET 3.







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UNITED STATES PATENT OFFICE.

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CENTRIFUGAL CREAM-SEPARATOR.

1,168,452. Specification of Letters Patent. **Patented Jan. 18, 1916.**

Application filed September 28, 1914. Serial No. 863,891.

To all whom it may concern:

Be it known that I, CARL OSCAR ANDERSON, a citizen of the United States, residing at Lancaster, in the county of Lancaster and State of Pennsylvania, have invented certain new and useful Improvements in Centrifugal Cream-Separators; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This invention relates to centrifugal cream separators of that type in which a series of superposed conoidal separating disks are employed at the center of which series the whole milk is introduced, and having means for dividing and separately discharging the skim milk and cream.

The object of the present invention is to increase the efficiency of such separators; to simplify their construction and render them more durable and easier to clean and to regulate.

These objects are attained by the novel and improved construction of parts whereby the whole milk will be distributed in such manner that substantially the same amount of whole milk will be passed to and through each space between the separating plates or disks, at a substantially uniform rate of flow or velocity so that the maximum separating efficiency will be realized in each space.

The invention will be explained in detail with reference to the accompanying drawings which illustrate a practical embodiment thereof, and will enable others skilled in the art to manufacture and use the same; and the claims summarize the novel features of the invention for which protection is desired.

In the drawings:—Figure 1 is a vertical sectional view through a complete centrifugal separator embodying the invention. Fig. 2 is a transverse section taken on line 2—2 of Fig. 1, looking downward. Fig. 3 is a view of the distributing sleeve shown in Fig. 1, detached. Fig. 4 is a side view of one of the disks on said distributing sleeve. Fig. 5 is a transverse section on line 5—5, Fig. 3. Fig. 6 is an enlarged transverse section on line 6—6, Fig. 1, looking downward. Fig. 7 is a top plan view of Fig. 1 with the cover or outer casing removed. Fig. 8 is an enlarged diagrammatic view illustrating the action of the milk in a distributing channel. Fig. 9 is a sectional view like Fig. 1, illustrating a slight modification of the separator. Fig. 10 is a transverse section on line 10—10, Fig. 9, looking downward. Fig. 11 is a view of the distributing sleeve shown in Fig. 9, detached.

The separator bowl resembles an ordinary centrifugal separator in appearance; and is composed of a conical base 1 and cylindro-conical top or casing 2. The lower end of the casing sets within a flange 1^a of the base, and the joint between these parts may be closed by a packing ring 2^a as usual.

The base 1 has an axially disposed vertical tubular standard 1^b rising from the apex thereof and extending centrally through the tubular neck 2^b of the casing; and the casing and base are detachably united by means of a nut 1^c screwed on the upper end of the tubular standard 1^b as usual. The base 1 also has a central depending tubular portion 1^d which is in axial alinement with the tubular standard 1^b and is socketed for the engagement of a vertical shaft or spindle (not shown) upon which the bowl is supported and by which it can be rotated in the usual manner.

The tubular standard 1^b has an axial bore 1^n in its upper part for the reception of the whole milk, and it is provided with apertures, preferably radial slots, 1^e near the bottom of the bore for the exit of the whole milk, which may be supplied to the bore 1^n by suitable feeding means, not shown, such being well known.

Removably fitted upon the tubular standard 1^b within the casing 2 is a distributing member or sleeve 3 which is provided at a plurality of points, coinciding with the slots 1^e in the tubular standard 1^b, with radially disposed vertical hollow projections 3^a, which are closed at top and bottom but open at the inner side forming channels 3^s to receive the whole milk from the slots 1^e. I will hereafter refer to these channels 3^s as distributing channels, or simply channels. These channels 3^s terminate below the upper end of the distributing sleeve and are closed at top, as shown in Figs. 1 and 3. The channels 3^s extend beyond the cream line and in the outermost wall of each chan-

nel are milk distributing apertures, preferably perforations 3^c.

The upper end of the distributing sleeve is cylindric and fits closely to the tubular standard 1^b, while the portions of the sleeve between the hollow projections also fit closely against the tube, which is thus clasped by the sleeve so that no milk can escape from said distributing sleeve except through the perforations 3^c. On the lower end of the distributing sleeve is a flange 3^b by which it is supported upon a shoulder 1^f adjacent the base of the tubular standard 1^b. The flange 3^b may be provided with notches 3^w to permit the ascent or escape of any milk or cream which might work its way to the center of the bowl beneath said flange.

Within the separating bowl and exterior to the distributing sleeve are a series of conoidal separating disks 4. These disks preferably have cylindric openings at top, or center, slightly larger in diameter than the distributing sleeve 3, and are notched as at 4^a to fit over the projections 3^a which extend radially beyond the inner wall or edge of the separating disks. The disks 4 are nested closely one over the other in the usual manner, and their outer or lower edges terminate near to the inner wall of the cylindric portion of the casing 2, leaving a skim milk passage between the disk edges and the casing or bowl; the series of disks practically filling the entire interior space of the bowl as usual. The disks may be provided with projections or lugs 4^c by which the superposed disks are slightly separated to form separating spaces between them conforming in shape to the disks.

The disks 4 are also preferably provided with small openings 4^b for the passage of milk, such openings being located at a point radially beyond and in rear of the perforations 3^c in the distributing sleeve, see Fig. 2, with regard to the direction of rotation of the disks. The disks will be centered on and caused to rotate with the distributing sleeve by reason of the engagement of their notches 4^a with the projections 3^a on said sleeve. And such sleeve is caused to rotate with the bowl by means of a pin or lug 1^s engaging the notch 3^s in the flange 3^b of the distributing sleeve as shown. If it is desired that the several separating disks always have the same circular relation when assembled one of the projections 3^a may be provided with a vertical rib 3^t which may be engaged by notches 4^t in the plate as indicated in Figs. 2 and 4.

A dividing conoidal-shaped disk 5 is placed above the nest of separating disks 4, within the conoidal part 2^e of the casing; and such dividing disk is provided on its upper surface with radially disposed ribs 5^a, which may be formed thereon or attached thereto in any suitable manner. The ribs 5^a are adapted to reduce the outflowing or skimmed milk to the same speed of rotation as the neck of the bowl, and to properly space the series of separating disks from the conoidal part 2^e of the bowl; and to also hold such disks down and together when the parts are assembled. The dividing disk 5 has a tubular neck 5^b which projects upwardly into the neck 2^b of the casing and its exterior wall fits closely within and against said neck. The neck 5^b is slightly larger interiorly than the distributing sleeve 3 and tubular standard 1^b so as to allow the cream to ascend therethrough. The neck 5^b is provided with an inwardly projecting lug 5^c adapted to engage a notch 3^h in the upper end of the distributing sleeve 3, so as to locate the distributing disk properly relatively to the separating disks and to cause it to rotate with the bowl.

The neck 2^b of the casing is provided with an interior annular channel 2^m into which the skimmed milk is admitted from above the divider 5 through an annular passage 5^r as usual having at one side a vertical slot 5^o, the depth of which may be regulated by an adjustable screw 6 in the usual manner. In the neck 2^b above the channel 2^m is a second annular channel 2^o with which the interior of the tubular neck 5^b of the dividing disk communicates and through which the cream passes into the channel 2^o. From channel 2^o the cream escapes through radial openings 2^p into a suitable receiver, not shown; and from channel 2^m the milk passes through openings 2^n into a separate receiver, not shown, such being well understood.

The distributing sleeve shown in Figs. 9 and 10 is the same in general construction as that above described, but the projections of the distributing sleeve are approximately semi-cylindric in cross section instead of rectangular. The projections 3^u forming the milk distributing channels are approximately cylindric, rather than rectangular, in cross section; and the milk distributing perforations 3^v are inclined. The disks 4 shown in Fig. 10 are similar in form to the disks in Fig. 3, but without openings 4^b. The parts in Figs. 1 to 11 corresponding with those in Figs. 1 to 8 and already described, are similarly lettered, and it is unnecessary to describe same in detail herein.

Operation: The parts being properly assembled, the whole milk is fed as usual into the upper end of the channel 1^n in any preferred or suitable manner. The milk descends in the channel 1^n and passes radially outward through the slots 1^o; and said slots being narrow their walls impart an initial rotary motion to the milk; the whole milk issuing from the slots enters the distributing channels 3^s; and as said slots are widened outwardly the whole milk has less linear veloc-

ity at the outer edges of the slots 1^e than at the inner edges thereof, and as the channels 3^s are much wider and deeper than the slits, the milk entering such channels 3^s tends to move toward and against the rear wall 3^i thereof, with regard to the direction of rotation of the bowl, (see Fig. 8) and will travel along the rear wall 3^i of the channel and be uniformly distributed over the surface of such wall and throughout the length of the channel before it reaches the perforations 3^c.

Referring to Fig. 8 it will be seen that the channels 3^s extend beyond the cream line or zone whose outer edge is coincident with the inner edge 4^x of the disks 4, the line of the cream wall or zone being indicated by the dotted line x—x, and the whole milk is introduced to the separating disks at a point radially beyond the cream line or zone. As stated the whole milk will hold against and be distributed over the entire surface of the walls 3^i of the channels by the centrifugal action and will eventually pass out through the perforations 3^c beyond the cream zone into the thin conoidal spaces between the separating disks 4, being thus practically uniformly and evenly distributed through the entire length of each channel 3^s before it reaches the perforations 3^c, and the pressure and supply of the milk will be practically uniform at each perforation 3^c, throughout the entire length of the distributing channel; which insures an equal supply of milk to the several spaces between the separating disks, and prevents some of the disks obtaining milk under greater lateral pressure than some of the other disks, such as would, and does, occur in ordinary centrifugal separators wherein the whole milk has direct flow from the supply to the distributing channels, and as would occur if the milk was admitted bodily into the channels 3^s instead of through restricted slots 1^e.

Should there be any slight over-supply of milk to any separating space, or a difference in the rate of velocity of the currents between the disks at any point, such differences will be equalized by the presence of the passages 4^b through which milk can pass from one space to another until the supply and rate of movement is equalized, the passages 4^b in the whole series of disks preferably being in vertical alinement.

As the bowl rotates the milk is separated, the cream passing toward the center and the skim milk toward the periphery of the disks. The skim milk passes up and above the divider 5 to the outlets 2^a; while the cream passes up along the outer wall of the distributing sleeve and between the projections 3^a thereon, to the top of the separating chamber, and through the neck 5^b into channel 2^c.

In practice the perforations 3^c should be so spaced apart that each one will deliver a jet of milk into the space between two adjacent separating disks.

The degree of separation, and proportion of skim milk and cream obtained, is regulated by adjusting the screw 6 to increase or diminish the extent of the outlet for the milk.

What I claim is:

1. The combination, in a cream separator, of a bowl provided with a centrally disposed feed-tube having discharge openings therein, a distributing sleeve surrounding said tube having radially extending hollow projections forming vertically disposed channels; said projections having perforations in their outer walls and open sides facing said discharge openings and said sleeve fitting closely against said tube between said projections, together with separating devices surrounding said sleeve between which the milk is discharged through said perforations.

2. In combination, a bowl provided with a centrally disposed feed-tube having vertically disposed slots therein, a distributing sleeve surrounding said tube having spaced integral radially extending hollow projections forming vertically disposed channels with perforations in their outer walls and open sides facing said slots; the parts of the sleeve between said projections fitting closely against said tube, and separating disks surrounding said sleeve adapted to receive therebetween the milk issuing through said perforations.

3. In a cream separator, a bowl having a central standard provided with a whole milk feed passage and discharge openings therein, a distributing sleeve surrounding said standard having radially extending hollow projections with open sides facing said discharge openings and perforations in their outer walls; said outer walls being located beyond the cream zone, and a series of slightly separated conical plates surrounding said sleeve between which the whole milk is discharged through the perforations in said projections.

4. In a cream separator, the combination with a casing having a centrally disposed feed-tube with discharge openings therein, a distributing sleeve surrounding said tube having radially extending hollow projections with open sides facing said discharge openings and perforations in their outermost walls; said walls being located beyond the cream zone, conical separating disks surrounding said sleeve having notches therein to receive said projections, and a conical divider-plate arranged between the outermost disk and the casing and having a tubular neck surrounding but slightly separated from the feed-tube and fitting closely within the neck of the casing; the latter having an

interior annular channel with a milk exit in communication with the space between the casing and the divider-plate, and the neck of the divider-plate being open at its upper end and in communication with a cream exit in the neck of the bowl.

5. The combination, in a cream separator, of a casing having a tubular neck, a feed-tube within said casing, a distributing device around said tube having vertically disposed channels into which the feed-tube discharges; said channels having discharge apertures therein, a series of conical separating disks arranged to receive therebetween the milk issuing from the apertures in said distributing device, and a conical divider-plate arranged between the uppermost disk and the casing and having radially disposed ribs on its upper surface converging toward its neck, said neck of the divider-plate surrounding but slightly separated from the feed-tube and fitting closely within and against the tubular neck of the casing, together with means for causing said parts to rotate with the feed-tube.

6. In a cream separator, a casing having a centrally disposed feed-tube, in combination with a distributing device surrounding said tube and having radially extending hollow projections with outer perforated walls, and a series of separating disks supported upon and revoluble with said distributing device; said disks having milk passages therethrough located at a point radially beyond and in rear of the perforations in the distributing device with respect to the direction of rotation of the disks.

7. In a cream separator, a bowl or casing having a tubular neck with an interior annular end-flange and interior annular channels below said flange, a centrally disposed feed-tube projecting through said neck closely fitting within the opening through said end-flange and having an outwardly flaring or conical base supporting said bowl, in combination with a liner including a conical disk adjacent the inner wall of the bowl and having a tubular open-ended neck larger than and surrounding the feed-tube within the neck of the bowl, to provide a cream passage leading to the uppermost annular channel; said disk neck fitting closely against the interior of the neck of the bowl and said uppermost channel being in communication with said cream passage and having a cream exit, and said lower channel being in communication with the space between said disk and casing and having a skimmed milk exit, and means for holding said parts together.

8. The combination with a feed-tube having spaced lateral discharge openings, a distributing sleeve surrounding and fitting closely against said tube between said openings and having coincident therewith spaced radially extending hollow projections forming vertically disposed channels with open sides facing said openings and also having outer perforated walls; the channels being closed at both ends.

9. In combination with a feed-tube having a series of discharge openings therein spaced apart around the tube between said openings, a distributing sleeve fitting closely against said tube and having a corresponding series of radially projecting portions with perforated outer walls forming vertically disposed trough-like channels into which the whole milk is discharged intermediate their ends; said ends being closed and said channels having open sides facing said openings; said sleeve having a tubular neck closely fitting said tube above said channels.

10. In combination with a feed-tube having a series of discharge openings therein spaced apart around the tube, a distributing sleeve embracing said tube and having a corresponding series of radially projecting portions with perforated outer walls forming vertically disposed trough-like channels with closed ends and open sides facing said openings; said sleeve having a tubular neck fitting closely around the tube above said channels and the portions thereof between said channels fitting closely against the tube.

11. In combination, a feed tube having a series of vertically disposed slots therein spaced apart around the tube, a series of slightly separated disks surrounding the tube, and a distributing sleeve clasping said tube and having spaced radially projecting portions forming vertically disposed distributing channels with open sides facing said slots and having outer perforated walls adapted to direct the milk through the perforations therein into the spaces between said disks; said channels extending above and below the slots and having their ends closed.

12. A cream separator comprising a feed-tube having discharge openings therein and a conical portion flaring outwardly at its lower end, a cylindro-conical casing supported on said flaring portion and having a tubular neck surrounding but slightly separated from the upper end of the tube, separating disks supported on said tube, and means for distributing the milk exuding through the openings in said tube into the spaces between said disks, together with a divider-plate between the uppermost disk and the casing having a tubular neck fitted around but slightly separated from said feed-tube to provide a cream passage and closely fitting within the neck of the casing with its upper end open and radially disposed ribs thereon converging towards its neck; there being a space between the neck of the divider-plate and the neck of the cas-

ing leading to a skimmed milk outlet in the casing neck, and an annular space between the tube and the neck of the divider-plate communicating with a cream outlet in the neck of the casing.

13. The combination in a cream separator with a feed-tube having spaced lateral discharge openings, of a distributing sleeve surrounding and fitting closely against said tube between said openings and having coincident therewith spaced radially extending hollow projections forming vertically disposed channels with closed ends and open sides facing said openings and also having outer perforated walls, and superposed slightly separated conical disks surrounding said sleeve between which the milk is discharged through said perforations beyond the cream wall.

In testimony that I claim the foregoing as my own, I affix my signature in presence of two witnesses.

CARL OSCAR ANDERSON.

Witnesses:
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ARTHUR M. SMITH.