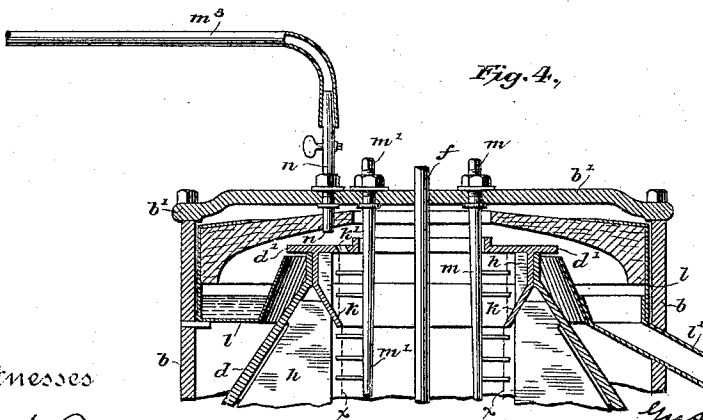
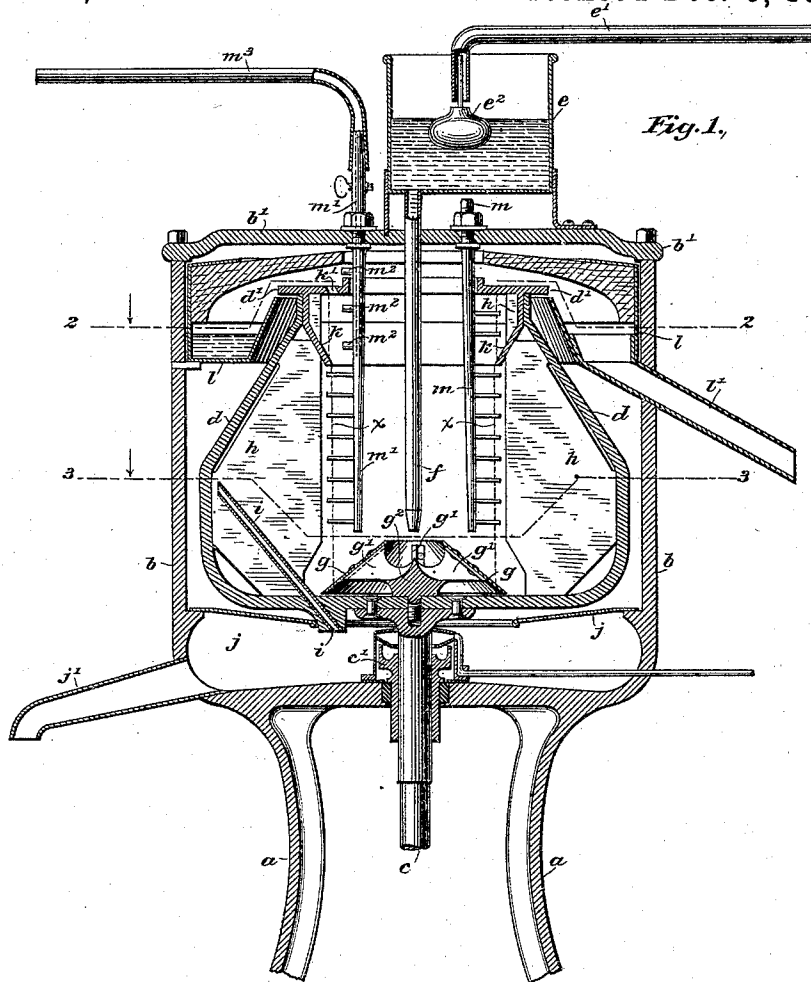


G. M. ANDERSSON.
CENTRIFUGAL BUTTER EXTRACTOR.

No. 487,316.

Patented Dec. 6, 1892.



Witnesses
Geo. W. Greck.
C. C. Mahley

Inventor
Gustaf M. Andersson
By his Attorneys
Witter & Kenyon

(No Model.)

2 Sheets—Sheet 2.

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Fig. 2,

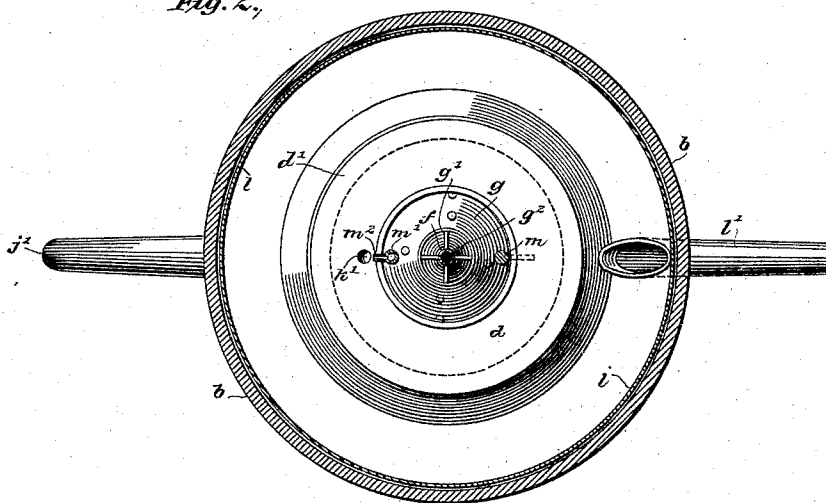
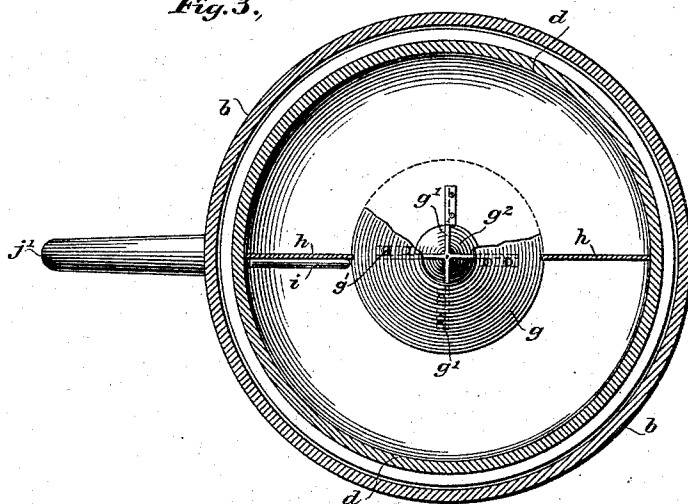


Fig. 3,



Witnesses

Geo. W. Brock.
C. E. Ashley

Gustaf M. Andersson
Inventor

By his Attorneys

Natter & Kenyon

UNITED STATES PATENT OFFICE.

GUSTAF M. ANDERSSON, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE
UNITED STATES BUTTER EXTRACTOR COMPANY, OF NEW YORK, N. Y.

CENTRIFUGAL BUTTER-EXTRACTOR.

SPECIFICATION forming part of Letters Patent No. 487,316, dated December 6, 1892.

Application filed June 30, 1890. Serial No. 357,307. (No model.)

To all whom it may concern:

Be it known that I, GUSTAF M. ANDERSSON, a subject of the King of Sweden and Norway, and a resident of Newark, New Jersey, have
5 invented certain new and useful Improvements in Centrifugal Apparatus, of which the following is a specification, reference being had to the accompanying drawings, forming part hereof.

10 This invention relates generally to centrifugal apparatus for separating substances of different specific gravities, and in some of its features it is particularly adapted for a centrifugal butter-extracting apparatus for carrying out centrifugal butter-making processes,
15 such as are shown in patent to C. A. Johanson, No. 399,618, dated March 12, 1889.

The object of this invention is to improve the construction and increase the efficiency
20 of such machines.

The invention consists in part of new constructions of the feeding device and the devices for guiding, keeping separate, and discharging the separated substances.

25 It also includes new devices for regulating the temperature and for supplying a lubricating fluid—such as water—when the apparatus is used as a butter-extractor to the portions of the apparatus containing the thick masses of separated butter.

30 It also includes various other improvements in the construction of the working parts.

In the accompanying drawings, Figure 1 is a vertical central section, but with the lower
35 portion of the frame broken away, of a centrifugal apparatus embodying my invention. Fig. 2 is a horizontal section of the same on the line 2 2, Fig. 1. Fig. 3 is a horizontal section on the line 3 3, Fig. 1. Fig. 4 is a vertical
40 section of the upper part of the apparatus, showing a modification.

The frame consists of a fixed casing *b*, provided with a removable cover *b'* and supported by a suitable base *a* of ordinary construction, the upper portion only of which is
45 shown. The operating-shaft *c* is arranged vertically and rotatively mounted in bearings of usual construction. The upper bearing *c'* is shown in Fig. 1. It is provided with a device for supplying it with oil and its upper
50

part is covered by a cap secured to the casing *b*.

The separating-drum *d*, which forms the major element of the centrifugal apparatus, is securely fixed upon the upper end of the operating-shaft *c*. This drum is preferably
55 of the shape and construction shown in the drawings, the lower portion being substantially cylindrical, the middle portion being conical or tapering, so that the drum is considerably smaller in diameter at the top than
60 at the bottom and the extreme upper portion cylindrical. In the operation of the machine this drum is revolved at a rate of from six thousand to eight thousand revolutions per
65 minute.

The mixed substances to be separated must be fed into the machine in a substantially-fluid condition and are preferably supplied in a continuous but regulated stream. The vessel *e*,
70 mounted upon the cover *b'*, receives this mixed fluid through the pipe *e'*. A float-valve *e²* is arranged at the end of this pipe *e'* and regulates the supply of fluid by closing whenever a predetermined depth is attained in the vessel *e*. The feed-tube *f* extends from the bottom
75 of the vessel *e* downward into the drum *d*. A spread-cup is arranged in the drum to receive the fluid from the feed-tube and is provided with devices for imparting rotation
80 to the fluid and one or more passages from the cup to the drum. This spread-cup is formed by the downwardly and outwardly inclined or conical partition *g* and the bottom of the drum. The inclined or conical partition *g* is supported just above the bottom of the
85 drum, leaving an opening all around the cup for the passage of the fluid out of the spread-cup. This conical partition is, when my entire invention is used, constructed so that its
90 lower edge projects within the wall of lighter fluid in the drum, and the opening under the lower edge of this conical partition thus supplies the fluid at a point farther from the axis of revolution than this inner wall of material.
95 The devices for imparting rotation to the fluid in the spread-cup consist of the radial blades or ribs *g'* and the central spreader *g²*, and together form the supporting-frame for the partition *g*, such partition being secured to or
100

formed upon the outer edges of the blades, and this supporting-frame is securely fixed to the bottom of the drum *d*. In Fig. 3 the partition *g* is partly broken away to more clearly show the ribs and central spreader. The fluid passes down from the mouth of the feed-tube *f* to the spreader *g*² and is then thrown outward and revolved by the blades *g*¹ and passes under the partition *g* and out toward the periphery of the drum *d*.

Radial blades *h* are provided extending from the bottom to the top of the drum *d* to compel the liquid to partake of the revolution of the drum. These blades are preferably constructed, as shown, with openings at the outer periphery of the drum to permit circulation of the liquid.

The intense centrifugal force resulting from the rapid revolution of the drum causes a separation of the particles of the fluid and a rearrangement of these particles, according to their specific gravities, the heavier particles arranging themselves near the periphery of the drum and the lighter particles nearest the center forming a wall, the inner periphery of which will be about in the position indicated by the dotted lines *x*. The outlet for the heavier particles is provided by the inclined tube *i*, extending from a point within the drum, near the outer wall of the drum, downward and out of the drum. This tube is shown secured to one of the radial blades *h*. One such tube is shown in the drawings; but it is obvious that others similarly arranged may be used. A receiver *j* is formed in the bottom of the casing *b*, into which the heavier substance passes from the mouth of the tube *i*, and a spout *j*¹ leads from this receiver out of the machine.

An inwardly-extending partition is arranged in the upper part of the drum concentric with the drum and having its inner edge or lip arranged to lie in the wall of the lighter particles. This partition *k* is preferably formed in one piece with the top of the drum and inclined downward and inward from the periphery of the drum. This partition *k* separates the interior of the drum into two chambers, communicating with each other only over the inner edge or lip of the partition *k*. This inner edge or lip is about in the circle of the inner layer of lighter particles. The lighter particles flow upward over this partition *k* and rise upward in the drum and into the upper chamber, this partition then keeping them separate from the heavier particles, which remain in the lower chamber. The lighter particles escape from the drum through an outlet leading from the upper chamber. This outlet *k*¹ is a hole formed in the top of the drum *d*. One such outlet is shown; but others may be similarly formed in the top of the drum. The lighter particles flow through this outlet and are thrown from the top of the drum into the receiver *l*. This receiver *l* is fixed in the upper part of the casing *b* and has an inner wall, which is arranged under a

circular flange *d*¹, projecting out from the top of the drum *d* to insure catching all the particles. A spout *l*¹ conveys the particles from the receiver out of the machine.

The apparatus thus far described is adapted generally for the centrifugal separation of substances having different specific gravities. When, however, my entire invention is employed, the apparatus is adapted especially for producing butter, and the fluid to be fed into it is cream or milk. I will now describe the parts of my invention peculiar to butter-making apparatus.

The cream dividing and separating device or cream-disturber consists of one or more upright stationary combs arranged to extend within the drum, so that their teeth will enter the inner layer or wall of lighter material, which in a butter-extractor is the cream-wall. This cream-disturber resembles that shown in Patent to Johansson, No. 406,171, and has a similar operation. Two of such combs *m* *m*¹ are shown, and are mounted so as to be rotatively adjustable in the top or cover *b*¹ of the casing and clamped in desired positions by nuts at their upper ends. The teeth of the combs may be caused to enter a greater or less depth into the cream-wall, and thus the desired adjustability secured by slacking the nuts and turning the combs. In the drawings, the teeth are in radial lines and therefore their outer points are in the positions farthest from the axis of the drum.

The lower chamber of the drum, when the apparatus is used as a butter-extractor, is the separating-chamber, in which the initial separation of cream from the milk and the final separation or extraction of the butter takes place, and the upper chamber is the butter-chamber, in which the separated butter is collected and from which it flows out of the drum. Two of the teeth of the comb *m* are shown projecting into the butter-chamber. Their operation is usually to further divide and concentrate the already-separated butter. They may in some cases be omitted.

The device for regulating the temperature and for supplying a lubricating fluid consists of a fluid-supply duct arranged adjacent to the butter-outlet, and when my entire invention is used adapted to supply water, brine, milk, or other suitable fluid to the upper or butter chamber of the drum. The fluid thus supplied not only regulates the temperature of the butter and lubricates the chamber and outlets, but also floats the butter out through the outlet-opening *k*. The fluid is heavier than the butter, and thus forces the butter toward the axis or floats it until it flows out through the outlet-opening. It is of course evident that a butter scoop or knife, such as is shown in the above-mentioned Johansson patent, No. 406,171, may be used to remove the butter, in which case the fluid would similarly float and lubricate the butter. In the construction shown in the main views of the

drawings such fluid-supply duct is formed in the cream-separating comb m' . The water or other fluid is supplied to this duct from a pipe m^3 , secured to an upward extension of the comb m' , and this upward extension is provided with a cock for controlling the flow. Three nozzles or openings m^2 are provided in the comb m' , through and out of which the fluid flows. The two lower nozzles m^2 direct streams of fluid upon the butter or partly-formed butter in the interior of the drum above the partition k . The upper nozzle m^2 directs a stream of fluid upon the top of the drum. The fluid thus supplied flows out of the machine with the butter into the receiver l . The spout l' extends up a short distance into the receiver l , so that some of the fluid is retained in the receiver.

In the modification shown in Fig. 4 the fluid-supply duct is a separate pipe n , vertically held in the cover b' of the casing and open at its lower end, so as to direct a stream downward upon the top of the drum, and the nozzle does not enter the butter-chamber. I have found it advisable in centrifugal butter-extractors to regulate and generally to reduce the temperature of the butter-fat particles as they coalesce into palpable masses of butter. This result can be readily accomplished with the apparatus just described, as fluid can be readily supplied at any desired temperature and acts by direct contact upon the butter particles as well as the adjacent parts of the machine. The fluid also acts efficiently as a lubricant to prevent adherence of the butter to the parts of the machine.

My spread-cup is highly efficient in combination with a cream-disturber acting upon the cream-wall, as the inclined partition supports the cream-wall while the unseparated milk or cream flows beneath the partition to the periphery of the drum.

What I claim, and desire to secure by Letters Patent, is—

1. In a centrifugal apparatus, the combination, with the drum and means for revolving it, of a feed-tube and a spread-cup arranged within the drum adjacent to the mouth of the feed-tube, consisting of a conical partition, a central spreader, one or more passages from the lower part of the spread-cup to the drum, and radial blades or ribs within the spread-cup for imparting rotation to the fluid passing through the spread-cup, substantially as set forth.

2. In a centrifugal butter-extracting apparatus, the combination, with the drum provided with one or more butter-outlets and means for revolving the drum, of a fluid-supply duct arranged adjacent to the butter-outlets, substantially as set forth.

3. In a butter-extracting apparatus, a centrifugal vessel provided with a separating-chamber and a butter-chamber communicating therewith and having separate outlets from said chambers, in combination with means for introducing milk or cream into the

apparatus and means for separately introducing water or similar fluid into such butter-chamber, substantially as set forth.

4. In a centrifugal apparatus, the combination, with the drum and means for revolving it, a feed-tube, a spread-cup arranged within the drum adjacent to the mouth of the feed-tube and covered by a conical partition, the lower edge of which projects within the wall of lighter fluid in the drum and having openings at the bottom of such conical partition, and blades within the spread-cup for imparting rotation to the fluid passing through the spread-cup, of an inwardly-extending partition arranged in the upper part of the drum, with its inner edge or lip arranged to lie in the wall of lighter fluid in the drum, one or more outlets above such partition, and one or more outlets below such partition, substantially as set forth.

5. In a centrifugal butter-extracting apparatus, the combination, with the drum and means for revolving it, a feed-tube, a spread-cup arranged within the drum adjacent to the mouth of the feed-tube covered by a conical partition, the lower edge of which projects within the cream-wall and having openings in the bottom of such conical partition, and blades within the spread-cup for imparting rotation to the fluid passing through the spread-cup, of a cream-disturber arranged within the drum and arranged to project into the inner layer of the rapidly-revolving cream-wall, and an inwardly-extending partition arranged in the upper part of the drum and having its edge or lip arranged to lie in the cream-wall, one or more outlets above the partition, and one or more outlets below the partition, substantially as set forth.

6. In a centrifugal butter-extracting apparatus, the combination, with a drum provided with a separating-chamber and with a butter-chamber and butter-outlet and means for revolving the drum, of a fluid-supply duct provided with one or more nozzles adjacent to the butter-outlet, substantially as set forth.

7. In a centrifugal apparatus, the combination, with the drum and means for revolving it, of the feed-tube f and a spread-cup arranged at the bottom of the drum adjacent to the mouth of the feed-tube, consisting of the conical partition g , arranged above the bottom of the drum, with an opening around its lower edge, and the central spreader g^2 and the radial blades or ribs g' , secured to the bottom of the drum and supporting the conical partition g , substantially as set forth.

8. In a centrifugal apparatus, the combination, with the drum and means for revolving it, the feed-tube f , and a spread-cup arranged at the bottom of the drum adjacent to the mouth of the feed-tube and consisting of the conical partition g , arranged above the bottom of the drum with an opening around its lower edge, and the central spreader g^2 and the radial blades or ribs g' , secured to the bottom of the drum and supporting the conical partition g , substantially as set forth.

each partition g , of an inwardly-extending partition arranged in the upper part of the drum concentric therewith and having its inner edge or lip arranged to lie in the wall of the drum, one or more outlets above the partition, and one or more outlets below the partition, substantially as set forth.

9. In a centrifugal butter-extracting apparatus, the combination, with the drum and means for revolving it, the feed-tube f , and a spread-cup arranged at the bottom of the drum adjacent to the mouth of the feed-tube and consisting of the partition g , arranged above the bottom of the drum, with an opening around its lower edge, and the central spreader g^2 , and the radial blades or ribs g' , secured to the bottom of the drum and supporting the partition g , of an inwardly-extending partition arranged in the upper part of the drum concentric therewith and having its inner edge or lip arranged to lie in the cream-wall, a fluid-supply duct provided with one or more nozzles above the inclined partition, a cream-disturber, one or more butter-outlets above the partition, and one or more blue-milk outlets below the partition, substantially as set forth.

10. In a centrifugal butter-extracting apparatus, the combination, with the drum and means for revolving it and suitable outlets for the separated blue milk and butter, of an upright stationary cream-disturber arranged to extend within the drum, a fluid-supply duct formed in the cream-disturber, and nozzles or openings from the ducts adjacent to the butter-outlet, substantially as set forth.

11. In a centrifugal butter-separating apparatus, the combination, with the drum provided with a separating-chamber and with a butter-chamber and butter-outlet and means for revolving the drum, of an upright stationary cream-disturber arranged to extend within the drum and a fluid-supply duct formed in such cream-disturber and having one or more nozzles or openings adjacent to the butter-outlet, substantially as set forth.

12. In a centrifugal butter-extractor, the combination, with the drum d , the top of which is provided with the flange d' , and means for revolving the drum, of an inwardly-extending partition arranged in the upper part of the drum and having its lower edge or lip arranged to lie in the cream-wall, one or more blue-milk outlets below such partition, one or more butter-outlets formed through the top of the drum, and the butter-receiver l , substantially as set forth.

13. In a centrifugal butter-separating apparatus, the combination, with the drum provided with a separating-chamber and with a butter-chamber and butter-outlet and means for revolving the drum, of the combined cream-disturber and fluid-supply device consisting of the rotatively-adjustable upright comb m' , having teeth adapted to project into the inner layer of the rapidly-revolving

cream-wall, a suitable nut for adjustably clamping the comb to the cover of the casing, and the fluid-supply duct and the nozzles or openings m^2 , formed in the comb m' , substantially as set forth.

14. In a centrifugal butter-extracting apparatus, the combination, with the drum d , having its lower part substantially cylindrical, its middle part conical or tapering, and its extreme upper part cylindrical and smaller than the lower part, and means for revolving the drum and a cream-disturber, of the inwardly and downwardly inclined partition k , one or more butter-outlets above the partition k , and one or more blue-milk outlets below the partition k , substantially as set forth.

15. In a centrifugal butter-extractor, the combination, with the drum and means for revolving it, of the combined cream-disturber and fluid-supply device consisting of the rotatively-adjustable upright comb m' , having teeth adapted to project into the inner layer of the rapidly-revolving cream-wall, a suitable nut for adjustably clamping the comb to the cover of the casing and the fluid-supply duct and the nozzles or openings m^2 , formed in the comb m' , an inwardly-extending partition arranged in the upper part of the drum and having its inner edge or lip arranged to lie in the cream-wall, one or more butter-outlets above the partition, and one or more blue-milk outlets below the partition, the nozzles or openings m^2 in the comb m' being formed above such partition, substantially as set forth.

16. In a centrifugal butter-extracting apparatus, the combination, with the drum and means for revolving it, the feed-tube f , and a spread-cup arranged at the bottom of the drum adjacent to the mouth of the feed-tube and consisting of the partition g , arranged above the bottom of the drum with an opening around its lower edge, and the central spreader g^2 and the radial blades or ribs g' , secured to the bottom of the drum and supporting the partition g , of an inwardly-extending partition arranged in the upper part of the drum concentric therewith and having its inner edge or lip arranged to lie in the wall of the drum, one or more butter-outlets above the partition, and one or more blue-milk outlets below the partition, and the combined cream-disturber and fluid-supply device consisting of the rotatively-adjustable upright comb m' , having teeth adapted to project into the inner layer of the rapidly-revolving cream-wall, a suitable nut for adjustably clamping the comb to the cover of the casing, and the fluid-supply duct and the nozzles or openings m^2 , formed in the comb m' above the partition in the upper part of the drum, substantially as set forth.

17. In a centrifugal butter-extracting apparatus, the combination, with the drum d , having its lower part substantially cylindrical, its middle part conical or tapering, and its extreme upper part cylindrical and smaller than the lower part, and means for revolving the

drum, of the inwardly and downwardly inclined partition k , the feed-tube f , and a spread-cup arranged at the bottom of the drum adjacent to the mouth of the feed-tube and
 5 consisting of the partition g , arranged above the bottom of the drum, with an opening around its lower edge, and the central spreader g^2 and the radial blades or ribs g' , secured to the bottom of the drum and supporting the
 10 partition g , and one or more butter-outlets above the partition k and one or more blue-milk outlets below the partition k , substantially as set forth.

18. In a centrifugal butter-extracting apparatus, the combination, with the drum d , having its lower part substantially cylindrical, its middle part conical or tapering, and its extreme upper part cylindrical and smaller than the lower part, and means for revolving the
 15 drum, of the inwardly and downwardly inclined partition k , the feed-tube f , and a spread-cup arranged at the bottom of the drum adjacent to the mouth of the feed-tube and consisting of the partition g , arranged above
 20 the bottom of the drum, with an opening around its lower edge, and the central spreader g^2 and the radial blades or ribs g' , secured to the bottom of the drum and supporting the partition g , and one or more butter-outlets
 25 above the partition k and one or more blue-

milk outlets below the partition k , and the combined cream-disturber and fluid-supply device, consisting of the rotatively-adjustable upright comb m' , having teeth to project into the inner layer of the rapidly-revolving cream-wall, a suitable nut for adjustably clamping
 35 the comb to the cover of the casing, and the fluid-supply duct, and the nozzles or openings m^2 , formed in the comb m' above the partition k , substantially as set forth. 40

19. In a centrifugal butter-extracting apparatus, the combination, with the drum and means for revolving it, of the cream-disturber consisting of one or more rotatively-adjustable upright stationary combs arranged to extend within the drum and arranged so that
 45 their teeth will project into the inner layer of the rapidly-revolving cream-wall, means for adjustably clamping the combs, an inwardly-extending partition arranged within
 50 the drum concentric therewith, having its inner edge or lip arranged to lie in the cream-wall, one or more butter-outlets above the partition, and one or more blue-milk outlets below the partition, substantially as set forth. 55

GUSTAF M. ANDERSSON.

Witnesses:

HENRY D. WILLIAMS,
 HENNING G. TAUBE.