(No Model.)

L. L. NORTHRUP.

DELIVERY TUBE FOR CENTRIFUGAL MACHINES.

No. 550,286. Patented Nov. 26, 1895.

Fig. 1.

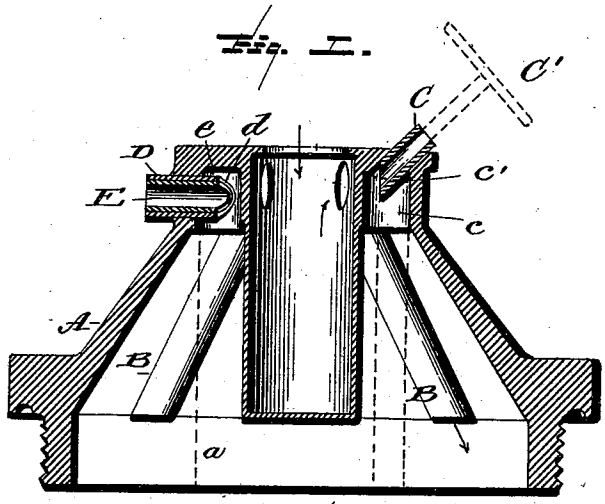


Fig. 2.

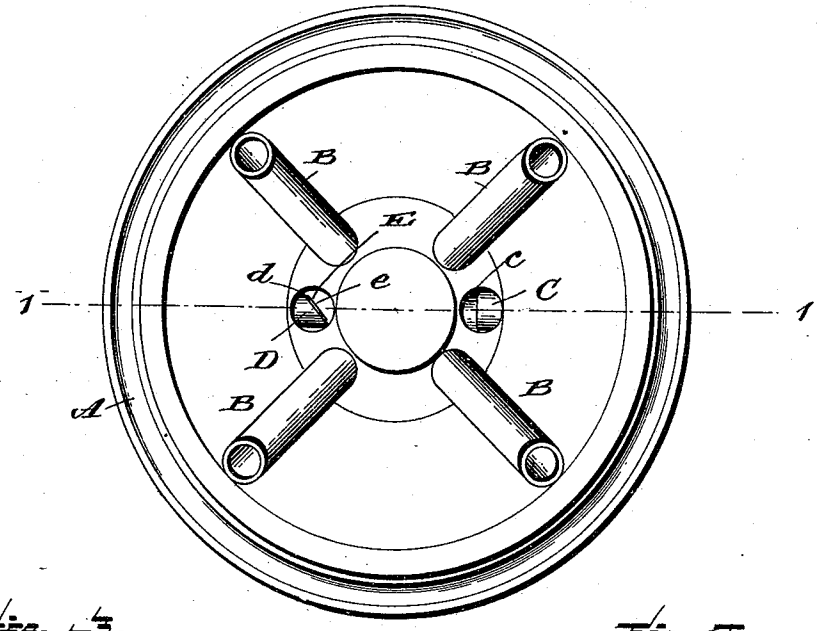


Fig. 3.

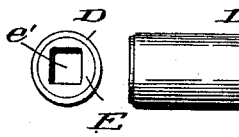


Fig. 4.

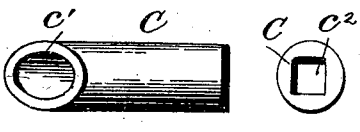
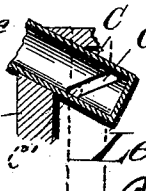


Fig. 5.



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UNITED STATES PATENT OFFICE.

LEWIS L. NORTHRUP, OF BELLOWS FALLS, VERMONT, ASSIGNOR TO THE VERMONT FARM MACHINE COMPANY, OF SAME PLACE.

DELIVERY-TUBE FOR CENTRIFUGAL MACHINES.

SPECIFICATION forming part of Letters Patent No. 550,286, dated November 26, 1895.

Application filed June 3, 1893. Serial No. 476,499. (No model.)

To all whom it may concern:

Be it known that I, LEWIS L. NORTHRUP, a citizen of the United States, residing at Bellows Falls, in the county of Windham, State of Vermont, have invented certain new and useful Improvements in Delivery-Tubes for Centrifugal Separators, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention has relation to means for delivering from a centrifugal bowl a separated constituent of a liquid. For the purpose of illustrating one form of the invention it is herein described as employed in the operation of separating cream from milk, the means for delivery of the cream being located and arranged to operate within the cream space or wall of the machine. The invention, however, may be employed in the separation of other liquids into their constituents and the means for delivery may be located to deliver either a heavier or a lighter constituent.

One of the objects of the invention is to provide a device for simply and accurately varying the density or thickness of cream delivered by the machine. Another object is to adapt the device for use in varied positions with relation to said cream space or wall.

Other objects and advantages of the invention will hereinafter appear; and it consists in the novel features particularly pointed out in the claims.

Referring to the drawings, Figure 1 is a sectional view of the top, cover, or head of a centrifugal machine provided with my improved delivery-tube, the section being vertical on the line 1 1 of Fig. 2. Fig. 2 is a bottom plan of the cover or head shown in Fig. 1. Fig. 3 is an end elevation and side elevation of the delivery-tube shown at the left of Fig. 1. Fig. 4 is a side elevation and an end elevation of the delivery-tube shown at the right of Fig. 1. Fig. 5 is a modification.

Like letters of reference indicate like parts throughout all the views.

Before giving a particular description of the construction and mode of operation of my invention I deem it proper to state that it is applicable to any and all forms of centrifugal machines.

I do not wish to be understood as limiting the invention to the particular form of machine or machine-head herein described and illustrated.

It is well known that in the operation of centrifugal machines the constituent of the substance being acted upon having the lesser specific gravity accumulates in an annular body or wall nearer the center of the machine than that of those having a greater specific gravity. In separating cream from milk the cream occupies the inner annular space or constitutes the inner annular wall, and while, as before stated, my invention may be located and arranged to deliver from any one of several annular spaces or walls within a centrifugal bowl to discharge the constituent there existing I have illustrated the invention in Fig. 1 both at the right and at the left thereof as operating within the cream-space to deliver cream, the one at the left (illustrated more largely—that is to say, on a larger scale—in Fig. 3) being of a different form from the one at the right, (illustrated more largely—that is to say, on a larger scale—in Fig. 4,) the former being provided with a suitably-disposed co-operating surface, while the latter is so constructed and arranged as not to make a co-operating surface necessary. By a "co-operating surface" I mean any part, whether fixed or movable, which shall co-operate with another part which is fixed or movable, so as to change the boundary of a discharge-opening or of a cream-wall from which the discharge is to be made, and all the above results follow the location of the discharge-tube on a line at other than a right angle to the axial line of the bowl, whereby said opening is, in fact, presented at different points within an area substantially equal to or greater than the entire cross-section of said delivery-opening.

When a tube with a beveled end is inserted into an aperture in any wall, said aperture being angularly disposed in said wall, the rotation of such tube will cause it to assume at its beveled end different positions with relation to the inner boundary of the opening or aperture in the wall. The beveled end will in one position be flush with the surface of the wall and with the boundary of the aperture therein. If given a half-revolution, the

tube will project beyond the wall for a distance equal to one-half the length of its beveled surface. Now, if liquid or other deliverable substance be confined by and supported against the wall the tube when projected will take from said liquid portions thereof at a distance from the wall greater than when the tube is not so projected, and this without diminishing the discharge capacity of the tube. The tube may be thus projected by a longitudinal movement instead of a rotary.

Instead of presenting the tube and aperture angularly in the wall, as above stated—that is, at other than a right angle to its inner surface—the tube may be employed at a right angle to said surface; but in this case a secondary tube having a beveled end is necessary in order to change the point of egress toward and from the surface of the wall. This point in the case of two tubes is where their beveled edges cross each other. In the diagonally-disposed tube and in a tube so disposed with a closed end and a slot or hole in the wall or the body of the tube the slot or hole rotates in an inclined plane, as does the tip of the beveled end of the diagonally-disposed tube, while in the case of a double tube the tip of the beveled end of the movable tube rotates in a vertical plane; but the beveled edges of the two tubes vary in their point of crossing in an inclined plane. It will therefore be noticed that in all modifications of the invention the point of exit of the liquid is determined by adjustment of the tube to be at a greater or a less distance from the inner surface of the wall in which the tube is mounted, because the tip of the single inclined tube, the meeting edges of the double horizontal tube, and the hole or slot in the closed end tube are each and all made to move by adjustment in an inclined plane extending from the wall and to take the liquid from a point in said plane at a greater or less distance from said wall. The co-operating surface, therefore, is the inner surface of the wall or the beveled end of the second tube in the case where two tubes are used. As hereinafter stated, the delivery-tube may be employed without a co-operating surface, such as the wall above described.

When the tube, Fig. 4, is angularly disposed and projected into the annular body of a constituent, so as to bring its beveled end parallel with the surface of said annular constituent, as illustrated at the right of Fig. 1, only the richest portion of said constituent can escape through the tube, because of its imperforate portions which lie within the annular body of said constituent. However, by rotating said tube its delivery-aperture will be presented in inclined planes across said annular body and including more or less of its area in accordance with the extent of the rotation of the tube. In this instance, therefore, there is no co-operating surface extraneous to the tube itself.

I do not consider it absolutely essential that the discharge capacity of the delivery-opening shall remain substantially the same in all of the adjustments of the invention; but in the forms shown such fact is present, and the invention in this regard is distinct from devices heretofore used for varying the quality of the cream by impeding the quantity allowed to escape from the machine. In the present illustrative application of my invention the discharge is at full capacity, while the density is determined by selecting the portion—inner, intermediate, or entire—of the cream line or wall from which the cream shall be taken. It is a well-known fact that the purity of the cream—that is, its freedom from milk—enhances as an approach to the inner annular surface of the cream-wall is made, and hence by making the discharging device adjustable, so as to discharge from a greater or less distance from the inner surface of the cream-wall, I can regulate the density of the discharge.

Referring now to the details of the drawings by letter, A designates a cover or head provided with the inclined tubes B, the lower ends of which extend back of the cream-wall *a* and are designed to conduct the full milk into the separator, the skimmed milk being delivered at the bottom by well-known means.

As above stated, my invention is not restricted to location in the head. At the right of Fig. 1 and in enlarged detail in Fig. 4 it comprises a tubular part C, mounted in an inclined position in a suitable bearing or opening in the upper portion of the head and arranged to communicate with the cream-space of the machine by an opening *c*, as seen best in Fig. 1. The inner end of this tube is beveled, as seen at *c'*, the bevel extending across the end of the tube at an angle of about forty-five degrees, more or less, and the tube is so mounted in the head as to be moved so as to change the point of ingress of the cream from the cream-space nearer to or farther from the center of the machine. This movement of the tube may be accomplished in any suitable manner. In this instance I have shown the outer end of the tube as having a rectangular opening c^2, to receive a key or bar or analogous device C' for moving it; but this is but one of the many ways which may be adopted. The means for moving the tube forms no part of the present invention. By reason of the taper or bevel of the inner end of the tube only slight movement thereof is necessary to change the cream-line—that is, the point or line in the cream space or wall from which the cream is taken through the tube. Slight movement of the tube will bring this line nearer to or farther from the center as may be desired, according to the density of the cream required. When tapered at an angle of forty-five degrees a half-turn of this tube gives a maximum variation of the cream-line.

The form shown at the left of Figs. 1 and 2 and in enlarged detail in Fig. 3 embodies

a tubular portion D with beveled or tapered inner end *d*, this part D being in most cases relatively fixed in the head. It may be, if desired, a part thereof.

The inner tube may be moved relatively to the part D in any suitable manner. It is shown as adapted to be operated in the same manner as the tube C, being provided with a rectangular hole *e'*, as seen in Fig. 3; but of course it may be moved in any other way. When the tubes are arranged with their bevels or tapers coinciding, as seen in Figs. 1 and 2, the cream will be taken from the cream wall or space farthest from the center; but by a partial turn of the movable tube the point from which the tube takes the cream will be changed. The dotted lines in Fig. 3 illustrate the different points from which the cream is taken by simply changing the relative position of the tubes. This change in position is determined by the relative positions of the movable tube and its co-operating measuring-surface. In the form shown in Fig. 3 this measuring-surface is the tube D.

In Fig. 5 the tube C has (though not essential) a closed inner end and an angularly-disposed receiving-slot *c'* at or near its inner end, or it may be a hole *c'*, as shown by dotted lines. If the inner end be projected inwardly beyond the cream-wall, it need not be closed. Rotation of the tube causes the slot to pass through the cream-wall in an angular plane, and in case the hole be employed it also traverses the cream-wall angularly, so that as in the other modifications the cream enters the discharge-tube from different points transversely thereof.

In all the forms shown the receiving-opening of the delivery-tube is disposed or traverses angularly to or with relation to the axis of the tube, so that without varying the quantity of the discharge the density of the constituent is varied as desired, limited only by the extent in area of the cream-wall covered by the tube or its receiving aperture.

While the forms shown and described are what I at this time consider the preferable ones, still I do not wish to be understood as restricting myself thereto, as modifications may be resorted to without departing from the spirit of the invention or sacrificing any of its advantages.

What I claim is—

1. A movably mounted delivery tube for a centrifugal machine having a receiving aperture the margin of which is disposed at an angle other than a right angle to the axial line of the tube and adapted to be rotated in the wall of the bowl to bring the inner oblique end of the tube flush with the inner wall of said bowl, substantially as specified.

2. A movably mounted delivery tube for a centrifugal machine disposed angularly with relation to the axis of the bowl and having a receiving aperture at an angle other than a right angle to the axial line of the tube and mounted in the wall of the bowl so that the inner oblique end of said tube may be rotated so as to be flush with the inner wall of the bowl, substantially as specified.

3. A movably mounted delivery tube for a centrifugal machine disposed angularly with relation to the axis of the bowl and having a receiving aperture at an angle other than a right angle to the axial line of the tube and adapted to be rotated in the wall of the bowl to bring the inner oblique end of the tube flush with the inner wall of said bowl, substantially as specified.

4. A bowl of a centrifugal machine combined with a delivery tube mounted therein and having a receiving aperture movable by rotation in a plane angularly with relation to the axis of the tube to bring the inner oblique end thereof flush with the inner wall of the bowl, substantially as specified.

5. A delivery tube having its receiving end beveled and movable by rotation angularly across a constituent space of a separator bowl and over an area covered by the diameter of the tube to vary the character of the material to pass through said tube, substantially as specified.

6. A delivery tube for a centrifugal machine movably mounted for adjustment and having a beveled end open and adapted by rotation to be brought with its inner oblique end to rest flush with the wall of the bowl in one of its adjustments, substantially as specified.

7. In a centrifugal machine a rotatably mounted delivery tube having a receiving aperture disposed at other than a right angle to the axial line of the tube to be rotated so that its inner oblique end will be flush with the inner wall of the bowl, substantially as specified.

8. In a centrifugal machine a rotatably mounted delivery tube having a beveled inner end combined with the cooperating part through which said tube passes, substantially as specified.

9. The combination with a bowl of a centrifugal machine, of a tube mounted therein for rotation and a second tube rotatably supported within the outer tube and having a beveled inner end, substantially as specified.

10. The combination with a bowl of a centrifugal machine, of a tube mounted therein for rotation and a second tube rotatably supported within the outer tube and movable independent thereof and having a beveled inner end, substantially as specified.

11. A delivery tube for a centrifugal machine comprising two tubes one within the other and having a beveled inner end and one movable with relation to the other, substantially as specified.

12. The combination with a bowl of a centrifugal machine, of a tube having other than a right angularly disposed receiving aperture with relation to the axis of said tube and projecting through the cream space of the machine and rotatably mounted to have its in-

ner oblique end brought flush with the inner wall of the bowl and to deliver from different portions of the cream space, substantially as specified.

13. The combination with the bowl of a centrifugal machine, of a tube having other than a right angularly disposed receiving aperture with relation to the axis of said tube and projected through the cream space of the machine and rotatably mounted to deliver from different portions of the cream space, and an independent rotatable tube the one being mounted within the other, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

LEWIS L. NORTHRUP.

Witnesses:

PERLEY L. KIMBALL,

FRANK G. DAY.