No. 702,441. Patented June 17, 1902.

P. L. KIMBALL.

CENTRIFUGAL SEPARATOR.

(Application filed Sept. 13, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig 1

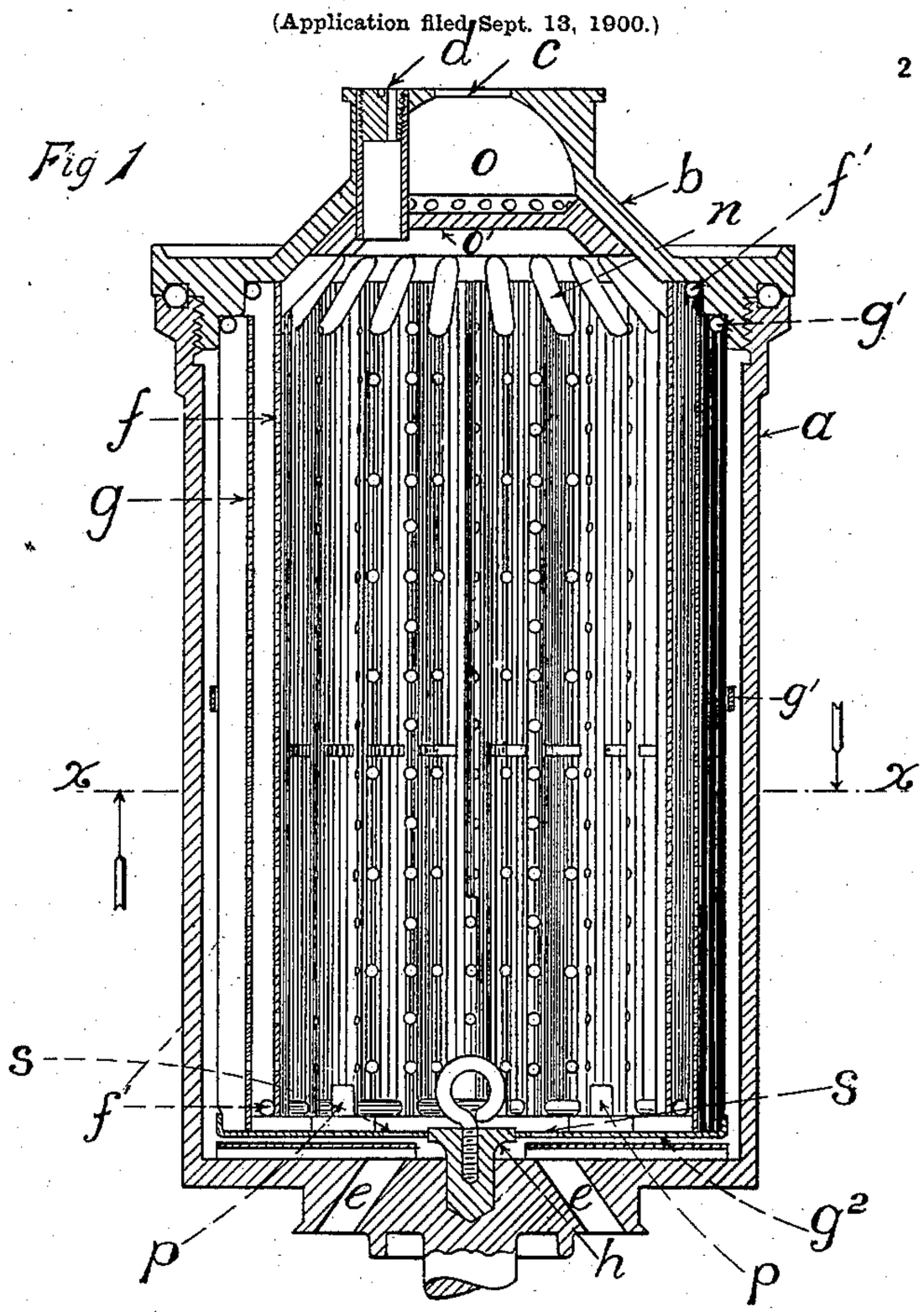

Fig 2

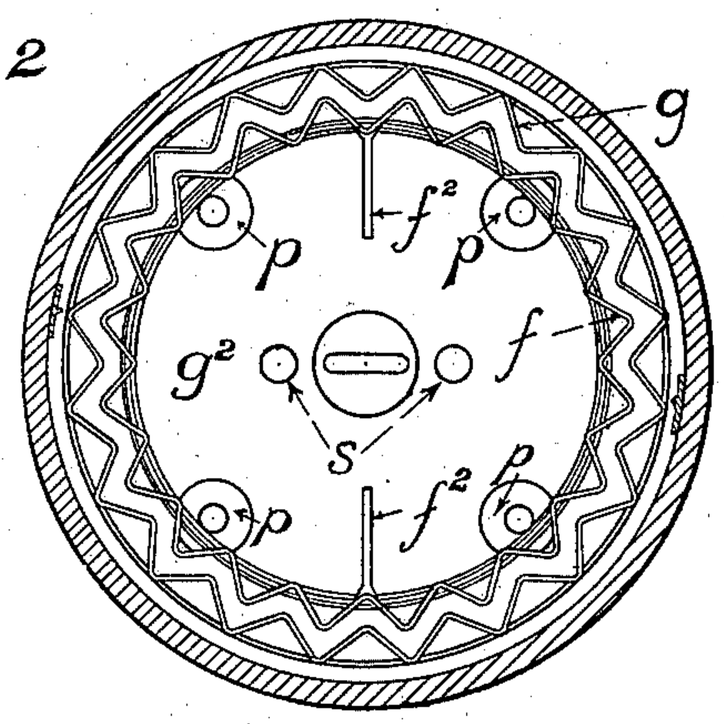

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Fig 3

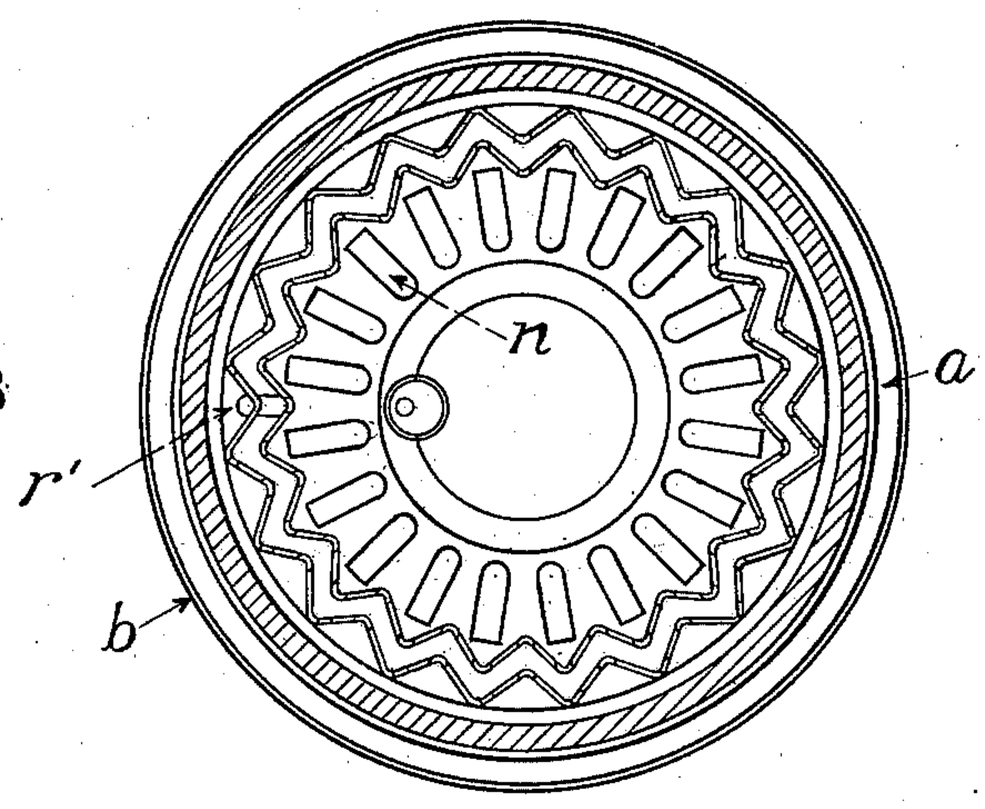


Fig 4

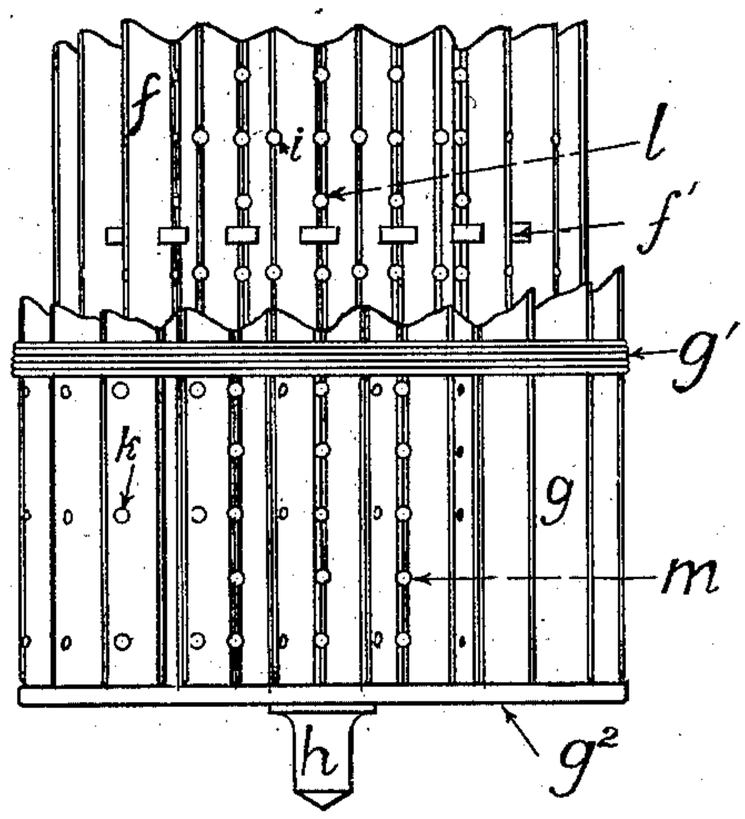
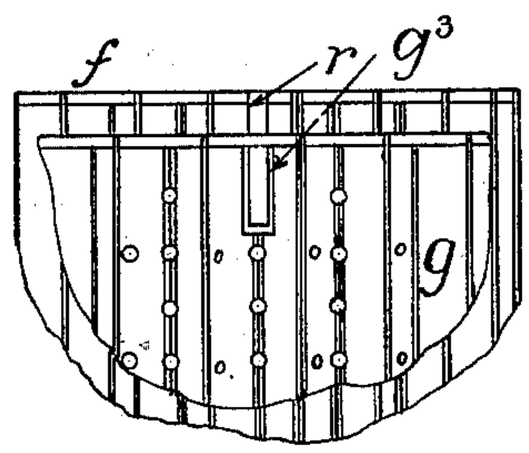


Fig 5



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CENTRIFUGAL SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 702,441, dated June 17, 1902.

Application filed September 13, 1900. Serial No. 29,926. (No model.)

To all whom it may concern:

Be it known that I, PERLEY L. KIMBALL, a citizen of the United States of America, residing and having post-office address at Bellows Falls, in the county of Windham and State of Vermont, have invented a certain new and useful Improvement in Centrifugal Separators, of which the following is a description, reference being had to the accompanying drawings.

The object of the improvement is the production of an apparatus for separating by centrifugal force mixed fluids of different densities, notably for separating cream from milk containing it. The apparatus is herein described as applied to such separation of cream from milk.

In the accompanying drawings, Figure 1 is a view in central vertical section of a centrifugal separator embodying said improvement. Fig. 2 is a view of the same separator in horizontal cross-section on the plane *x x* looking downward. Fig. 3 is a view of the same separator in horizontal cross-section on the plane *x x* looking upward. Fig. 4 is an elevation view of a portion of each of the corrugated partitions. Fig. 5 is a side view of a portion of the upper part of both partitions. Its purpose is to show the stop-pin and its relation to the two partitions.

In the accompanying drawings the letter *a* denotes the separator-body or outer drum, which, as is well known, is given some thousands of revolutions per minute when in operation.

The letter *b* denotes the separator-cover, which may be secured to the separator-body by screw-thread connections with a suitable packing-ring between the body and the cover. This cover is provided with central inlet *c* for the inflow of full milk and an adjustable non-central outlet *d* for the outflow of cream. The blue milk from which the cream has been separated escapes through the outlets *e*.

The letter *f* denotes a downwardly-extending and longitudinally-corrugated partition, the top of which is supported laterally by the cover. Preferably it fits snugly into its socket in the cover; but a pull of the operator's hands will separate the two.

The letter *g* denotes an upwardly-extending and longitudinally-corrugated partition supported underneath by the floor of the separator-body both vertically and laterally through the medium of the pintle-journal *h* and supported laterally at the top by the cover.

The letter *i* denotes milk-flow passages through the inner partition, and *k* denotes milk-flow passages through the outer partition. Those of the inner partition are located at the outer apexes of the corrugations; but those of the outer partition are located a little off the outer apexes of the corrugation—that is, these two sets of milk-flow passages are non-alined as to each other, so as in a measure to obstruct the direct movement of the milk toward the inner wall of the separator-body and by that obstruction afford increased time and opportunity for separation of cream.

The letter *l* denotes cream-flow passages through the inner partition, and *m* denotes cream-flow passages through the outer partition. Both sets of these are located at the inner apexes of the corrugations.

The letter *o* denotes a chamber in the cover. Its sides and top are formed by the cover, and its floor is formed by the plate *o'*, which is secured to the cover. The full-milk inlet *c* lets into this chamber.

The letter *n* denotes tubes for distributing the incoming full milk. They deliver it directly within the corrugations of the inner partition.

The letter *f'* denotes reinforce-rings carried by the inner partition, and *g'* denotes reinforce-rings carried by the outer partition. The inner partition carries blades f^2.

The letter *p* denotes chairs fast to the floor g^2 of the outer partition. They support the foot of the inner partition both vertically and laterally. They bear on the interior of the inner partition. The inner partition is substantially closed at the top and open at the bottom. The outer partition is substantially closed at the bottom and open at the top.

The letter *r* denotes a stop-pin which is fast to the inner partition. It fits into a stop-pin socket *r'* in the separator-cover. A portion of the stop-pin intermeshes with the mortise g^3 in the outer partition. This stop-pin causes the two partitions to rotate with the separator-body.

In the operation of the machine the separator as a whole is given some thousands of revolutions per minute. The full milk is fed into the separator through chamber *o*. It goes thence through the tubes *n* to and within the corrugations of the inner partition, the delivery ends of those tubes being outside of the circle which is described by the cream-outlet when in rotation. The milk takes on the whirling motion of the separator, and the cream being of less specific gravity than the watery portions of the milk forms a core at the center, then rises, and finally escapes through the cream-outlet *d*. Meanwhile a portion of the milk works downwardly along the inner surface of the inner partition and a portion passes laterally through the milk-flow passages of the inner partition. When the downward current of milk reaches the lower end of the partition, centrifugal action forces it outward laterally against the inner wall of the outer partition, and it travels upward on that inner wall, some of it escaping through the milk-flow passages in the outer partition. When the milk completes that upward travel, it passes over the upper end of the outer partition and thence downwardly along the interior wall of the separator-body, finally escaping through the blue-milk outlets *e*. While the milk is traveling, as described, down the inner wall of the inner partition, up the inner wall of the outer partition, and down the inner wall of the separator-body more or less of cream is passing laterally inward through the cream-flow passages of both partitions to the cream-core at the center of the separator. The final effect is that the cream is thoroughly separated from the more watery constituents of the milk, commonly called "blue milk." The cream-flow passages of the inner partition are within the circle which is described by the delivery ends of the tubes *n* in their rotation. The orifices *s* in the floor of the outer partition permit any cream which may be beneath that floor to join the cream-core already mentioned.

As already stated, the inner partition is separable from the separator-cover.

I claim as my improvement—

1. In combination, the separator-body, the separator-cover secured to the top of the body, and the partition smaller in diameter than the interior diameter of the body; said partition being separable from both the body and the cover and supported at foot vertically and laterally by the floor of the separator-body and raised a short distance above the same, and at top laterally by the separator-cover, all substantially as described and for the purposes set forth.

2. In combination, the separator-body, the separator-cover secured to the top of the body, and the partition, open at one end, smaller in diameter than the interior diameter of the body; said partition being separable from both the body and the cover and supported at foot vertically and laterally by the floor of the separator-body and raised a short distance above the same, and at top laterally by the separator-cover, and openings formed through the bottom of said partition, all substantially as described and for the purposes set forth.

3. In combination; the separator-body; the separator-cover; and the longitudinally-corrugated, open-top partition separable from both body and cover and provided with sets of flow-passages at different distances from the center of rotation and supported at foot vertically and laterally by a pintle entering the floor of the separator-body and at the top laterally by the separator-cover; all substantially as described and for the purposes set forth.

4. In combination; the separator-body; the separator-cover; the partition separable from both body and cover and supported at foot vertically and laterally by the floor of the separator-body and at top laterally by the separarator-cover; and the open-bottom partition supported laterally and vertically at foot by the first-named partition and at top laterally by the separator-cover, all substantially as described and for the purposes set forth.

5. In combination; the separator-body; the separator-cover; the partition separable from both body and cover and supported at foot vertically and laterally by the floor of the separator-body and at top laterally by the separarator-cover; and the open-bottom partition, separable from both body and cover, and supported laterally and vertically at foot by the first-named partition and at top laterally by the separator-cover; all substantially as described and for the purposes set forth.

6. In combination; the separator-body; the separator-cover; the corrugated, open-top partition separable from both body and cover provided with sets of flow-passages at different distances from the center of rotation and supported at the foot laterally and vertically by a pintle entering the floor of the separator-body and at the top laterally by the separator-cover; and the corrugated open-bottom partition separable from both body and cover, provided with sets of flow-passages at different distances from the center of rotation, and supported at the foot laterally and vertically by the floor of the said first-mentioned partition and at the top by the separator-cover, all substantially as described and for the purposes set forth.

7. In combination; the separator-body; the separator-cover provided with the stop-pin socket; the two partitions both separable from body and cover and both supported laterally at top by the cover; and the stop-pin attached to one of the partitions and intermeshing with the other partition; all substantially as described and for the purposes set forth.

8. In a separator the corrugated partition and reinforcing-rings therefor passing through the inner apices of the corrugations.

9. In a separator the corrugated parti-

tion and reinforcing-rings therefor located in notches formed in the outer apices.

10. The combination in a separator with the body, the removable partitions located one within the other in said body, of the reinforcing-rings secured to the inside of the inner partition and to the outside of the outer partition.

11. The combination in a separator with the body and the longitudinally-corrugated partitions located one within the other in said body, of reinforcing-rings for the inner partitions passing through the inner apices of the corrugations and reinforcing-rings for the outer partition located in notches formed in the outer apices.

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