H. J. OVERLIN.

APPARATUS FOR SEPARATING LIQUIDS.

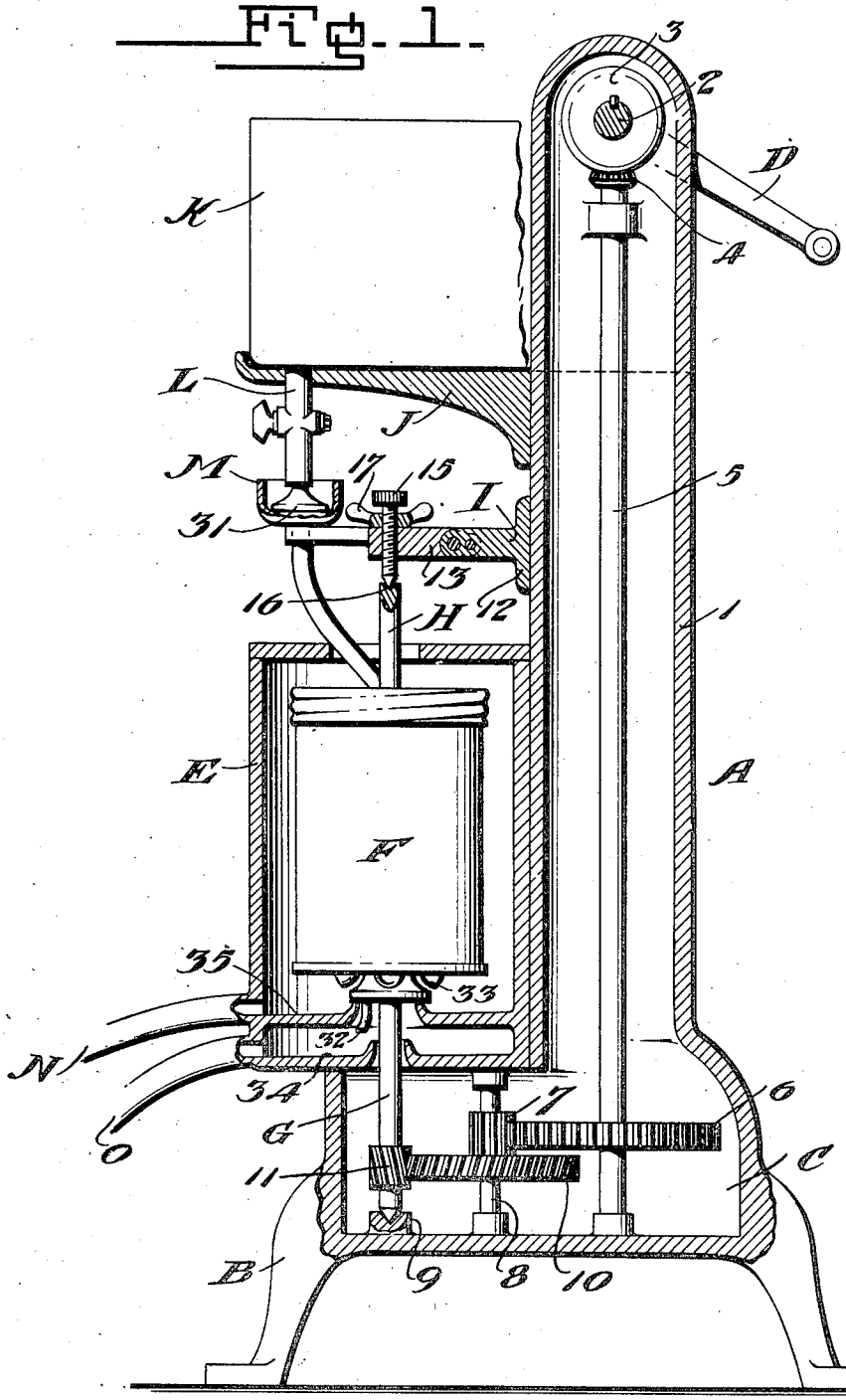
APPLICATION FILED MAY 3, 1918.

1,320,340.

Patented Oct. 28, 1919.

3 SHEETS—SHEET 1.

Fig. 1.



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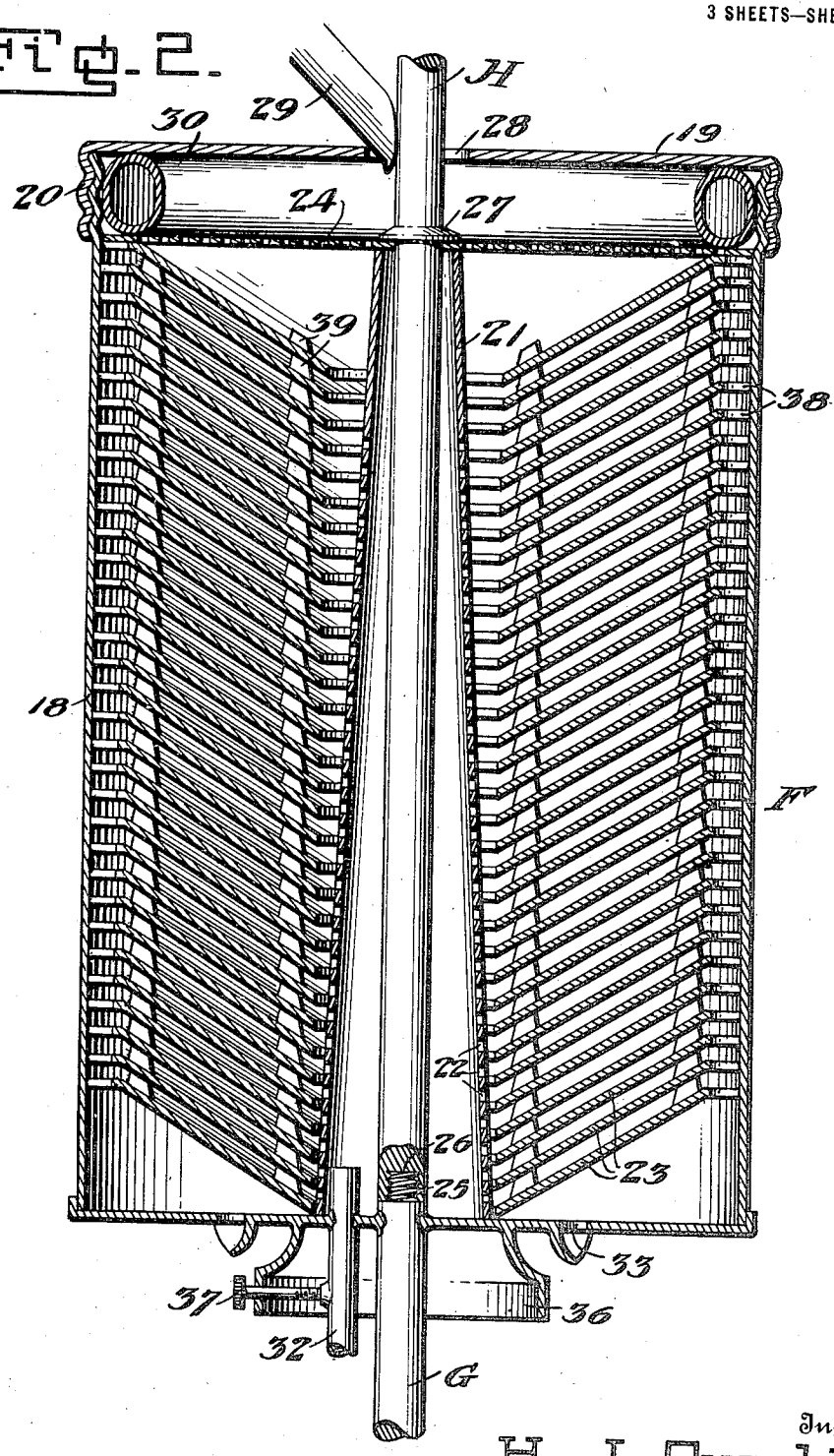
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3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

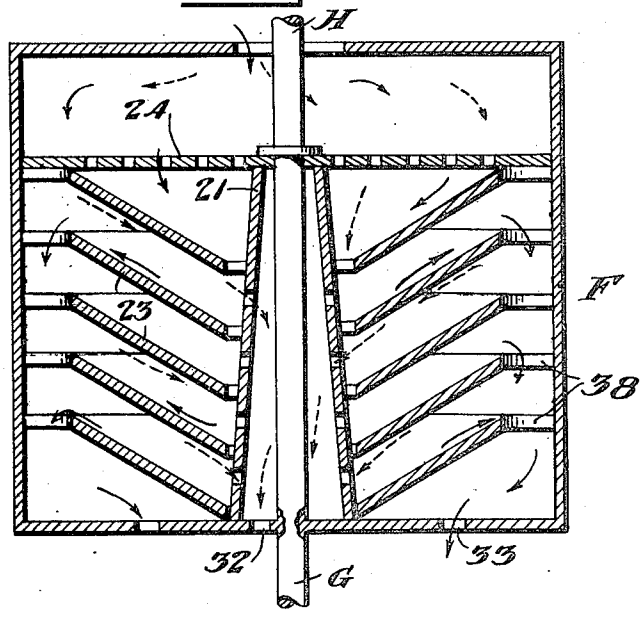


Fig. 4.

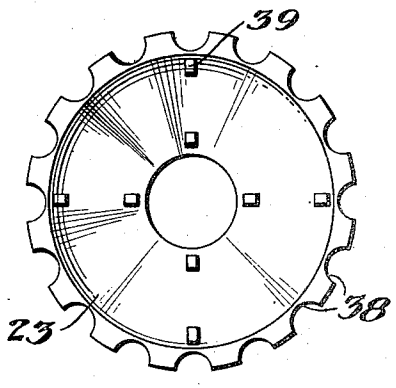


Fig. 5.

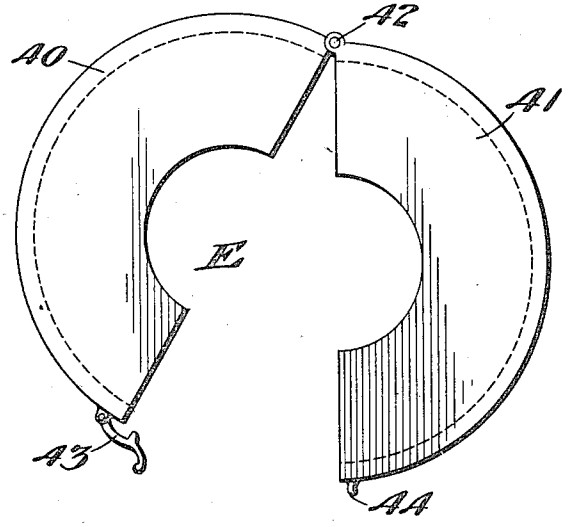
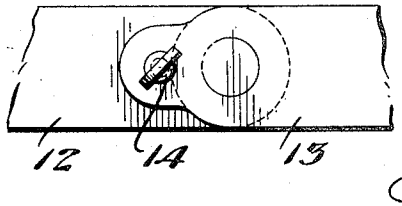


Fig. 6.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR SEPARATING LIQUIDS.

1,320,340. Specification of Letters Patent. Patented Oct. 28, 1919.

Application filed May 3, 1918. Serial No. 232,412.

To all whom it may concern:

Be it known that I, HAROLD J. OVERLIN, a citizen of the United States, and a resident of Buffalo Gap, in the county of Custer and State of South Dakota, have invented certain new and useful Improvements in an Apparatus for Separating Liquids, of which the following is a specification.

My present invention relates to an apparatus for and method of separating liquid, and more particularly to a mechanism and a process whereby cream can be efficiently separated from milk, or other liquid compounds made up of two or more ingredients in mechanical mixture can be separated out and will be discharged through separate tubes or spouts.

The principal object of my invention is to provide an apparatus which has the parts so constructed and arranged that when the liquid compound, as a mechanical mixture, is supplied thereto and the apparatus is operated, the separation will be accomplished by taking advantage of the difference in the specific gravity of the liquid components of the compound, while centrifugal force will also be made to play an important part in the separating action.

A further object lies in arranging substantially truncated cone-shaped disks within a separating bowl which bowl is spun or turned upon a central axis, and in so arranging the disks that the apex of the cone-shape is disposed downwardly, the arrangement of the parts in accordance with this plan being such that the supply of the liquid to be separated is to the disks as liquid would be poured into a funnel.

Yet another important object is to provide a support for the separating bowl, by which this bowl is given bearing at both its upper and lower ends, and to so arrange one of the bearings that takeup is provided to compensate for wear and to insure that the separating bowl will at all times be true upon its turning axis.

A still further object of the invention resides in providing a process by which the liquid to be separated is treated to take advantage of the difference in the weight of the liquids making up the compound, in the fullest measure, when using centrifugal force in the separating process.

Further objects of my invention will appear in the following detailed description, taken in connection with the accompanying drawings, forming a part of this specification, and in which drawings:

Figure 1 is a view partly in section and partly in elevation of a machine constructed after the manner of my invention and adapted to accomplish the method.

Fig. 2 is an enlarged sectional view through the separating bowl to show the arrangement of the parts therein.

Fig. 3 is a view made up diagrammatically after Fig. 2 to better disclose the flow of the liquid in the separating operation.

Fig. 4 is a detail view showing one of the disks as placed within the separating bowl.

Fig. 5 is a detail view showing the construction of the bowl pot.

Fig. 6 is a fragmentary detail view illustrating the construction of one of the bearing mountings for the separating bowl by which the same is supported removably in place.

In the drawings, where similar characters refer to similar parts throughout the views, A designates the main supporting structure which is carried by supporting legs B. This main supporting structure has a gear case C provided in the base thereof, and connection is established from an operating handle D to drive gears within the gear case C. At one side, a bowl pot E is supported on the main structure, and a separating bowl F is mounted revolubly in this bowl pot by the lower and upper bowl spindles G and H, a driving connection being established from the drive gears within the case C to the bowl spindle G to cause the separating bowl to be revolved as the operating handle is turned. The bracket I by which the upper bowl spindle H is mounted is adjustable and movable, in a manner and for a purpose to be hereinafter more fully set forth, and above this bearing I a bracket or spider J is provided on the supporting structure A, by which a milk supply tank K is carried. A milk supply faucet L leads from this milk supply tank, and through the feed cup M, and a milk supply tube leading therefrom, milk is conducted from the supply tank K to be fed to the separating bowl F. As has been stated, the separation is accomplished through centrifugal force exerted when the separating bowl is spun or turned, and the separated liquid, as for instance skim milk and cream, will be discharged

through the spouts N and O, beneath the discharge ends of which spouts, cans or other containers can be placed to catch the separated liquids.

The main supporting structure includes an upright casing portion 1 which extends above the gear case C, and the operating handle D is mounted on a shaft 2 journaled adjacent the upper end of this upright extension and at such a height that it is conveniently accessible to the party operating the separator. This shaft 2 has a bevel gear 3 secured thereon and this bevel gear meshes with a gear 4 on the main shaft 5, which latter shaft is journaled in bearings provided in the upright extension 1 of the supporting structure and has the lower end thereof within the gear case. A drive gear 6 is mounted on the shaft 5 within the gear case, and this drive gear meshes with a pinion 7 on the intermediate shaft 8. The lower spindle G of the separating bowl is made of conical form at its end and this conical end is received in a step or thrust bearing 9 provided within the gear case, so that the spindle is held to be properly centered even after the parts have been subjected to considerable wear. An intermediate drive gear 10 is provided on the intermediate shaft 8, and this gear meshes with a pinion 11 on the spindle G, it of course being understood that through this train of gears from the shaft 2, to the spindle G, the speed of revolution is quite materially built up or increased.

On the upright portion 1 of the casing, the adjustable bearing for the separating bowl is provided, this adjustable bearing including a supporting member 12, which has a swinging member 13 hingedly mounted thereon, a pin 14 being provided, as better shown in Fig. 6, to be fitted in place to hold the swinging member 13 in a fixed position with respect to the portion 12. A pivot screw 15 is adjustably fitted through a screw-threaded opening provided in the swinging member 13, this pivot screw being made of substantially conical form at its lower end, and the head of the screw being knurled or otherwise roughened to provide a convenient thumb hold for turning of the screw in the adjustment of the same. The upper spindle H of the bowl F has a bearing center opening 16 therein, and when the separating bowl is fitted in place and is brought to the upright relation, the pivot screw 15 will fit within this bearing opening 16 and in consequence an upper bearing is provided for the bowl. As the parts wear, the pivot screw can be adjusted to at all times maintain the proper mounting of the spindles G and H, and the settings of the pivot screw will be locked by use of the jam nut 17. When the pin 14 is fitted in place, the swinging member 13 of the bearing I will be maintained in the position shown in Fig. 1, but when this pin is removed the swinging extension may be raised to disengage the pivot screw 15 from the spindle H, and the separating bowl may then be removed.

This separating bowl F, is made up of a shell 18 comprising a side wall of substantially cylindrical form, and a bottom portion, and a top or cover 19 is provided to be fitted to and close the open upper end of the shell, this top or cover being provided with a rim flange 20 which is bent to form a thread or has threads cut therein, and fits upon the upper edge of the shell. As the structure is well adapted for use as the cream separator and as mechanism of this sort is now very commonly employed in that connection, I will hereinafter describe the use of the structure in separating cream from milk, and the parts will be particularly referred to in this connection, although it will of course be understood that the mechanism can be employed in other connections with equal efficiency. A central tube 21, which will be hereinafter referred to as the cream tube, is adapted to be fitted centrally within the shell 18, and has perforations 22 provided therethrough for passage of cream from the main portion of the shell. A plurality of disks, generally indicated at 23, are to be mounted within the shell 18 around the tube 21, and a perforated plate 24 is mounted upon the uppermost disk to be spaced somewhat below the top 19 as the same is fitted to the shell. The lower spindle G is rigidly mounted in conjunction with the bottom of the shell 18, and extends upwardly from the inner side thereof, this extension being reduced and being formed into an externally screw-threaded stem or nipple 25. The upper spindle H is made of sufficient length to have the lower end thereof passed into the shell 18 and connected with the lower spindle G, the spindle H having a screw-threaded socket 26 at the lower end thereof for reception of the threaded nipple 25, and the parts being thus rigidly connected together. The spindle H has a collar 27 near the upper end thereof and this collar is so located that as the spindle is fitted through a central opening in the perforated disk 24 and is tightened upon the threaded nipple 25, the collar will bear down upon the perforated disk and will cause the same to clamp against the disks 23 to hold the same in proper mounting. The top 19 has the opening through which the spindle H is received somewhat enlarged as indicated at 28, to provide clearance for a milk supply tube 29 from which milk is discharged into the receiving chamber formed between the top 19 and the perforated disk 24, and as centrifugal force exerted upon the liquid when the separating

bowl is being spun will cause the same to carry to the side of this chamber formed in the upper part of the shell, the packing ring 30 is provided to guard against the leaking of the liquid between the upper edge of the shell and the top, where these parts are connected together.

The milk supply tube 29 leads from the feed cup M, which in turn receives its supply from the milk faucet L connected with the milk supply tank K, and it will of course be appreciated that the flow of milk can be governed by regulation of the setting of the faucet. However to guard against overflow at the feed cup, it is preferable that the float valve 31 be provided within the feed cup M to close the milk faucet L when the supply to the feed cup is excessive. In the supply of milk through the tube 29, the perforated plate 24 spreads the flow of milk and breaks up eddies to thus insure that the milk supplied to the disks to be separated will receive the full effect of the separating force exerted by the spinning of the bowl, without counter-forces or eddies acting to hinder in the treatment, and as the skim milk and cream have a gravity flow to be discharged from the shell, the cream outlet tube 32 is provided through the bottom of the shell to open within the tube 21, while milk outlet passages 33 are provided through the bottom of the shell concentrically around the tube 21. The cream tube 32 discharges into a pan 34 provided in the bottom of the bowl pot E, and the spout O receives the cream from this pan. The discharge of skim milk is into the pan 35, from which the spout N leads, and to guard against skim milk finding its way into the pan 34, an apron 36 is provided on the lower side of the bottom of the shell, the apron being made sufficiently wide to cover over the opening provided centrally within the pan 35 to accommodate the cream tube 32 and the bowl spindle G. As for different uses, it may be desirable to bring the cream to greater or lesser density, a cream screw 37 is provided in the cream discharge tube 32, and by regulation of this screw the rate of flow through the tube will be governed and the length of time for which the cream is held within the shell can be regulated.

As has been previously stated, the disks are of substantially truncated cone-shape, and these disks are so placed in their mounting within the shell 18, that the slope of the walls is downwardly from the shell wall 18 toward the tube 21, the apex of the conical form being cut away sufficiently that a central opening is provided which gives clearance around the tube 21. The disks 23 have their edges turned down or flattened out, and then the notches 38 are provided in the turned down edges. Spacing blocks 39 are soldered or otherwise secured upon the disks to give clearance therebetween when the several disks are mounted within the shell. By providing the spacing blocks 39, forming the central openings of the disks to give clearance around the tube 21, and notching the edges of the disks, the arrangement of the parts is such that when the disks are mounted in place provision is made for free circulation of the liquid within the shell 18, the main body portions of the disks acting only to guide the flow of liquid and being disposed as walls against which the liquid is impacted through the centrifugal force exerted by the spinning of the shell. However, due to the fact that the perforated disk 24 covers over and closes the notches of the uppermost disk, the milk is directed to flow through the central opening of this disk. It will be understood that the parts as described are all readily removed from the shell by first removing the top 19 and then loosening the spindle H from its mounting upon the threaded nipple 25, thus all of the parts may be readily washed and scalded and may be interchangeably reassembled. To allow for fitting of the shell in place and for ready removal of the same, the bowl pot E is preferably made up of the two members 40 and 41, as shown in Fig. 5, which members are hinged together at 42. As the members 40 and 41 are closed around the separating bowl, the latch member 43 is fitted over the extension 44, and these members are held against separating. If desired, packing might be introduced at the edges of the members 40 and 41, or these parts might be ribbed and grooved to provide an interfitting joint, the main purpose being to guard against splashing of the liquid from the pans 34 and 35 and against ingress of dirt or foreign matter thereto.

The operation of the apparatus and the carrying out of the method are as follows:

Assuming that the parts are assembled as shown in Figs. 1 and 2, milk or other liquid to be separated is supplied to the tank K. The faucet L is adjusted to secure proper flow of liquid to the feed cup M, and it will of course be understood that excessive flow will be stopped through action of the float valve 31. The operating handle B is now turned, and as the liquid flows through the tube 29 into the chamber formed within the upper part of the shell 18, this liquid will be spread over the perforated plate 24 and will be supplied in an even flow through the body of the shell. Within the shell, the flow of liquid will be substantially as indicated by the full and dotted line arrows of Fig. 3, it of course being understood that the main volume of liquid as supplied to the separating bowl includes cream, as indicated by the dotted line arrows, and milk as represented by the full line arrows, and that in the flow of the liquid toward the bot-

tom of the shell, which flow is induced in gravity, the separation of the mixture into the lighter and heavier liquids will be carried out, until the discharge outlets are reached, where a more or less perfect separation will have been attained. Provision of the spindles extending above and below the separating bowl and of the bearing mountings by which the spindles are held guards against wearing of the parts through lateral or twisting strain placed upon the separating bowl due to improper leveling of the machine or to any other cause, and as one of these bearings is adjustable, the machine can be at all times maintained in condition for operation at its highest efficiency.

The process depends for its novelty upon the passing of liquid, as a mechanical mixture of two or more ingredients of different weights, between disks of substantially truncated cone-shape disposed with their walls inclined upwardly, and this method of treatment is successful due to the fact that the exertion of centrifugal settling force is parallel with the settling forces inherent within the mixture through the difference in the weight of the ingredients, rather than counter to the natural settling.

While I have herein shown and described the parts of my invention as incorporated with a particular power and drive mechanism, it is to be understood that any standard form of such mechanism might be employed or that special forms could be used where desired, and further that the liquid supply and control might be varied from that here specifically mentioned.

Changes in other details may be made without departing from the spirit or scope of my invention; but,

I claim:

1. In a centrifugal machine for separating liquids, a separating bowl having spindles extending above and below the same to be disposed in substantially vertical relation when the bowl is mounted for use, a supporting structure, a bearing formed in conjunction with the supporting structure by which the lowest spindle is mounted, a movable bearing member carried by the supporting structure adjacent the upper spindle, means by which said movable bearing member is held in fixed position, a pivot screw mounted in conjunction with the movable bearing member to engage with the upper spindle of said bowl when the movable member is fixed, and means to lock the pivot screw in adjusted positions.

2. In a separating bowl for liquid separating apparatus, a shell including a substantially cylindrical side wall, a plurality of disks of truncated cone-shape made of a size to be received within the shell fitted thereto with their walls sloping downwardly from the wall of the shell, a perforated plate mounted upon the topmost disk as the same are placed within the shell, and means to secure said perforated plate in a position to retain the disks in proper fitted positions.

3. A centrifugally-operating bowl having a perforated tube arranged centrally therein, and a plurality of disks of substantially truncated cone-form mounted within said bowl with their central openings clearing said perforated tube, and their walls sloping up from said central openings.

4. A centrifugally-operating bowl having a perforated tube arranged centrally therein, and a plurality of disks of substantially truncated cone form mounted within said bowl with their central openings clearing said perforated tube, their walls sloping up from said central openings, said disks being notched at their edges, a liquid discharge tube extending into said shell opening within the perforated tube for discharge of the lighter liquid as separated out, said bowl having discharge openings for the heavier liquid arranged concentrically around the central tube to receive the liquid flowing through the notch in the disks, and means to regulate the flow of liquid from the discharge tube.

5. A centrifugally-operating bowl for liquid separation including a side wall of substantially cylindrical form and a bottom for said side wall which bottom has discharge openings therethrough for heavier and lighter liquids as separated, a perforated tube mounted centrally within said bowl to embrace the discharge openings for the lighter liquid, a spindle connected with the bottom of said bowl extending within the same and terminating within a threaded nipple, a plurality of separating disks mounted within the bowl, said disks being separated and notched at their peripheral edges, a perforated plate mounted on the topmost of said disks, an upper bearing spindle for said bowl provided with a screw-threaded socket at its lower end to receive the threaded nipple of the lower spindle and having a collar thereon to bear upon the perforated plate to clamp the same against the disks and retain said disks in proper position within the bowl.

6. In a separating bowl for liquid separating apparatus, a shell including a substantially cylindrical side wall, a plurality of disks of truncated cone-shape bent down at their edges and notched in the flanged peripheries thus formed, said disks being of a size to be received within the shell and being interchangeably fitted thereto with their walls sloping downwardly from the wall of the shell, a disk perforated in its middle portion mounted upon the topmost disk as the same are placed within the shell and having an imperforate portion closing

over the notches of said topmost disk, and means to secure said perforated disk in a position to retain the remaining disks in proper fitted positions.

7. A centrifugally-operating bowl for liquid separation having a perforated tube arranged centrally therein, a plurality of disks of substantially truncated cone form bent down and flanged at their outer edges, said disks being shaped to fit within the bowl around the perforated tube with their walls sloping upwardly therefrom and having the flanged edges notched to provide recesses adjacent the wall of the bowl, and a perforated plate fitted within the bowl to rest upon the topmost disk and made imperforate at its edge to close the edge recesses of said disk.

8. A centrifugally-operating bowl including a shell, a perforated tube arranged centrally therein, a plurality of disks of substantially truncated cone-form mounted within said bowl with their central openings clearing said perforated tube and their walls sloping upwardly from said central openings, and a perforated plate mounted upon the topmost disk in the shell.

9. A centrifugally-operating bowl for liquid separation having a perforated tube arranged centrally therein, a plurality of disks shaped to fit within the bowl around the perforated tube with their walls sloping upwardly therefrom, and a perforated plate fitted within the bowl to rest upon the topmost disk and made imperforate at its edges.

10. A centrifugally-operating bowl for liquid separation having a perforated tube arranged centrally therein, the lower end of said tube being closed, a discharge tube extending through the bottom of said tube, and means carried by said discharge tube to regulate the flow of cream therethrough.

11. A centrifugally-operating bowl for liquid separation having a perforated tube arranged centrally therein, the lower end of said tube being closed, a discharge tube extending through the bottom of said tube, means carried by said discharge tube to regulate the flow of cream therethrough, and a plurality of disks of substantially truncated cone-form mounted within said bowl with their central openings clearing said perforated tube and their walls sloping upwardly from said central openings.

12. A centrifugally-operating bowl for liquid separation having a perforated tube arranged centrally therein, the lower end of said tube being closed, a discharge tube extending through the bottom of said tube, means carried by said discharge tube to regulate the flow of cream therethrough, a plurality of disks of substantially truncated cone-form mounted within said bowl with their central openings clearing said perforated tube and their walls sloping upwardly from said central openings, said disks having their edges notched to provide recesses adjacent the wall of the bowl, and a perforated plate fitted within the bowl to rest upon the topmost disk and made imperforate at its edges to close the edge recesses of said disk.

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