No. 842,257. PATENTED JAN. 29, 1907.

D. T. SHARPLES.

CENTRIFUGAL SEPARATOR.

APPLICATION FILED OCT. 17, 1905.

Fig. 3.

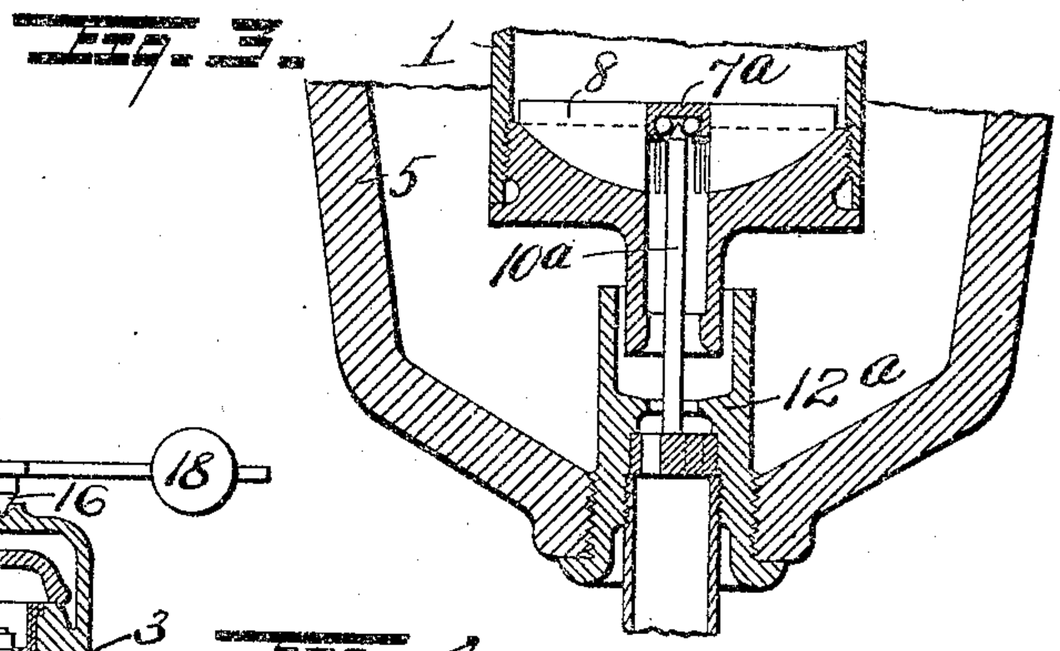


Fig. 1.

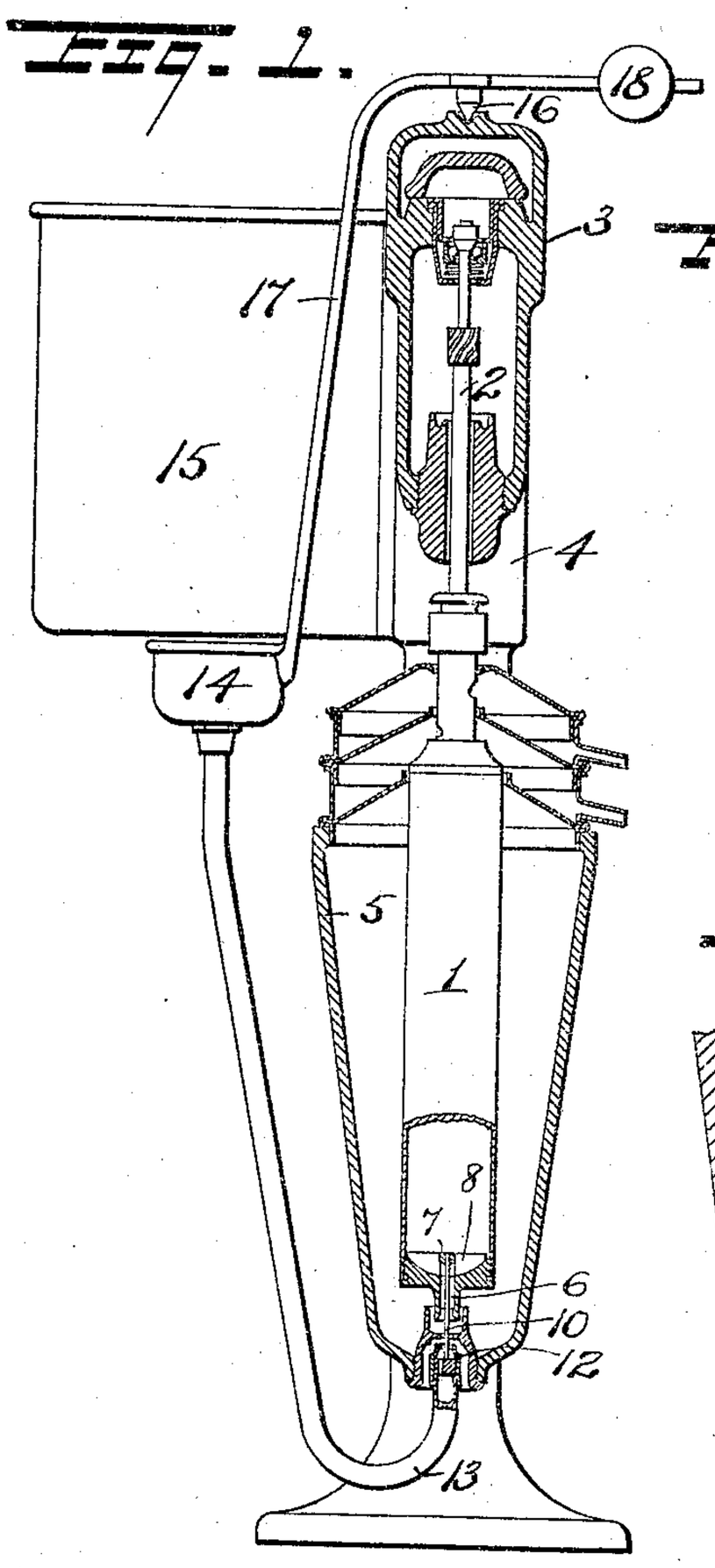


Fig. 4.

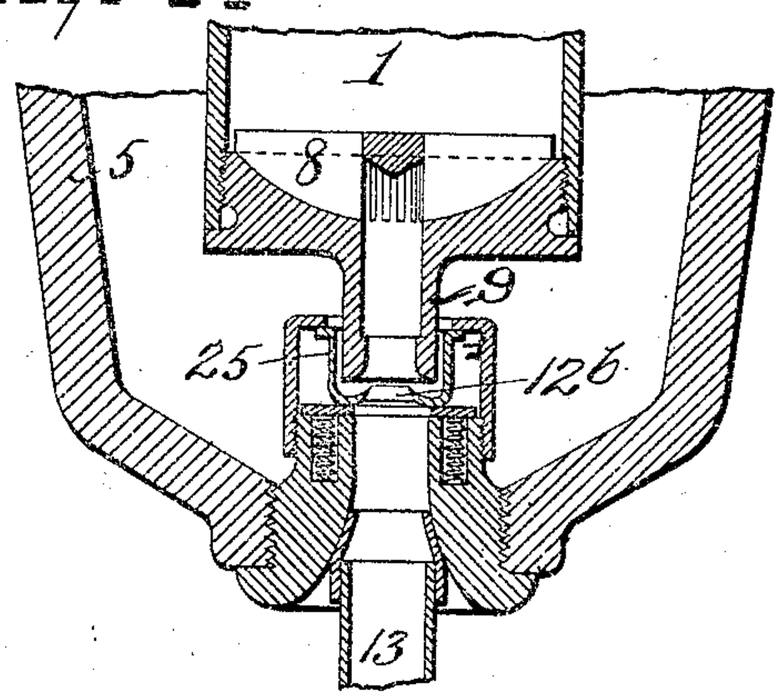
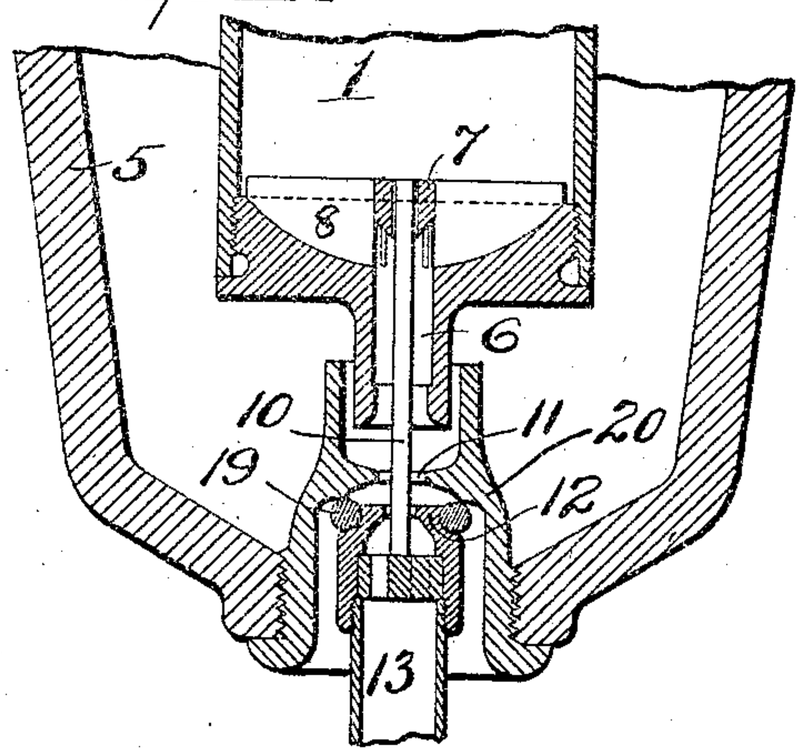


Fig. 2.



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CENTRIFUGAL SEPARATOR.

No. 842,257. Specification of Letters Patent. Patented Jan. 29, 1907.

Application filed October 17, 1905. Serial No. 283,079.

To all whom it may concern:

Be it known that I, DAVID TOWNSEND SHARPLES, a citizen of the United States, residing at West Chester, Chester county, State of Pennsylvania, have invented certain new and useful Improvements in Centrifugal Separators, of which the following is a specification.

My invention relates more particularly to centrifugal liquid-separators; and my main objects are to provide, first, an improved steadying means for the rotary separator vessel, and, second, an improved feed mechanism therefor.

It is well known that steady running of the rotary vessel and a uniform central feed thereto of the material to be operated upon are matters of great importance in the practical operation of centrifugal liquid-separators, and means for securing these results have heretofore been provided in which a fixed axial-feed nozzle has been employed in connection with a steadying device adapted to limit swaying movement of the rotary vessel and to maintain it in the normal axis of rotation without disturbing action, such as is ordinarily apt to occur. My invention provides for securing these results in a novel manner; and it consists, mainly, first, in employing a non-rotating steadying-spindle mounted axially in the rotary vessel and capable of a limited lateral movement therewith, and, second, in providing a feed-nozzle in connection with said spindle, which latter forms an axial guide-stem extending therefrom through the central feed-opening in the rotary vessel and around which an annular feed-passage is formed within said opening, through which the liquid is at all times fed centrally into the vessel.

The invention is fully described in connection with the accompanying drawings, illustrating a preferred application of the same, and the novel features are particularly pointed out in the claims.

Figure 1 is a partial front elevation, partly in section, of a centrifugal liquid-separator of the type illustrated in Patent No. 795,360, issued July 25, 1905, but showing my invention applied thereto. Fig. 2 is an enlarged sectional view showing the lower portions of the rotary vessel in connection with my improved steadying-spindle and feed-nozzle. Figs. 3 and 4 indicate modifications.

The drawings show a suspended rotary vessel 1 of tubular form, carried by a shaft 2, hung upon a top bearing provided in the frame 3 and rotated by suitable gearing inclosed in the casing 4, forming part of the frame, a portion 5 of which also incloses the rotary vessel.

The general construction and operation are similar to that described in the patent above referred to, and it will be readily understood that the rapid rotation of the vessel while feeding a compound liquid, such as milk, thereto effects the separation of such liquid into its constituent parts, which are separately discharged from the vessel, as usual.

As already stated, my invention relates to the novel means provided for steadying the vessel and maintaining it in the normal axis of rotation and for feeding the liquid through the central feed-opening 6 into the rotating vessel, the main objects being to steady the vessel by means of a device operating at the axis of the vessel and to maintain at all times a central feed into the vessel. These means will now be specifically described as shown in the drawings.

The axial device for steadying the rotating vessel and restoring it to the normal axis of rotation when deflected therefrom in any way during its operation consists of a non-rotating spindle 10, which is passed through the feed-opening 6 of the vessel and loosely entered or passed through a centrally-fixed bearing 7 in the vessel, which bearing is arranged to serve, as heretofore, to spread the incoming jet of liquid so that it will be thrown outward between the radial wings 8, provided on the bottom of the vessel. This spindle or guide-stem 10 projects centrally through an annular opening 11 in a feed-nozzle 12, fixed to the end of a feed-pipe 13, which extends, as usual, to a feed-regulator cup 14 beneath the reservoir 15. The spindle 10, which extends axially through the feed-opening 6, is preferably of very small diameter—for instance, one-eighth of an inch—and the size of the annular opening 11 required for the passage of the liquid is so small as to produce a jet which will readily pass through a restricted annular passageway formed in the feed-opening 11 between the non-rotating spindle 10 and the rotating wall of such opening, and as this annular jet is at all times practically central in said opening, as hereinafter explained, the latter may be of such small size as to enable the inner cream-wall of the rotating liquid to be retained as near as possible to the center of ro-

tation, which is of great advantage in practical operation, because of the lower velocity at which the separated constituents may be discharged.

The feed-nozzle 12, as well as the projecting spindle or guide-stem 10, is so arranged, as shown, as to be capable of a limited movement with the rotary vessel when the latter sways from the normal axis of rotation. To provide for this movement, I preferably suspend it from a convenient point 16 in the axial line of rotation of the vessel by means of a carrier extension 17 from the feed-governor cup 14, which latter is free to move slightly, as required, beneath the reservoir, a counterweight 18 serving to balance the parts, as shown, so that the spindle 10 and nozzle 12 will naturally tend toward the normal axis of rotation of the vessel though readily swung therefrom with the vessel itself, with the axis of which latter they at all times remain practically in alinement, so as to constantly deliver the liquid centrally thereto. In practice this swaying movement of the vessel during its operation is very slight, and the movement of the nozzle 12 may be correspondingly limited, as by means of a rubber ring 19, arranged to contact with the inverted cup 20 in the frame-casing beneath the vessel, this cup, as shown, being also arranged to divert any liquid that may possibly escape into the path of the inflowing jet.

While the suspended vessel shown is running normally the spindle 10 is not acted upon by it, and the liquid is merely fed into the vessel in an annular stream hugging the spindle and clear of the rotating wall of the feed-opening. If from any cause the balance of the rotating vessel is temporarily impaired or a swaying movement in any way started, the spindle 10 comes into service as a steadying means, the central bearing 7 therefor in the vessel coming promptly into lateral contact with the spindle. Owing, in the first place, to the nearness of the contacting surface of the spindle to the center of rotation and, in the second place, to the delicate lateral yielding action thereof, no chattering or wabbling effect upon the rotary vessel is produced by such contact, while the free lubrication provided by the inflowing liquid still further eleminates friction and wear. Thus the swaying tendency is quickly and smoothly overcome and the normal action restored. Notwithstanding that the swaying movement is thus promptly and delicately restrained and limited in extent it is evidently desirable that the inflowing jet of liquid shall not be thrown into the vessel out of center therewith even to this limited degree, as such action, if permitted, not only requires that the diameter of the cream-wall be correspondingly greater than is otherwise requisite, but itself tends to produce swaying action of the vessel by unevenly distributing the inflowing liquid thereto. In my improved construction, as shown, the inflowing jet is maintained practically central to the vessel whether the axis of the latter is in the normal axis of rotation or swayed therefrom, as described.

It will be noticed that in the construction shown the vessel is free to adjust itself to its natural axis of rotation instead of having a mechanically-fixed axis, which, though it vary but slightly from the natural axis, causes considerable friction and trouble. The feed-nozzle, as well as the steadying-spindle, readily follows the vessel into the natural axis in the construction shown.

It will be readily understood that my invention may be applied in different ways from that specifically shown and described. In Fig. 3, for instance, the vessel is carried upon the spindle 10^a by means of a step-bearing 7^a, the annular feed-nozzle 12^a being in this case suitably fixed to the frame, or obviously the Fig. 2 construction may be applied to the top instead of the bottom of the vessel, as indicated. The flexibility of the spindle 10 may be relied upon to give the lateral yield required for steadying the vessel, though the lateral movement of the feed-nozzle with the spindle, as provided for, is preferable.

Fig. 4 indicates a modification in which my movable feed-nozzle is employed independently of the steadying-spindle shown in the preferred construction, the movable nozzle 12^a in this case forming part of a drag-ring 25, loosely inclosing the neck 9 of the vessel and movable with the swaying vessel to steady the same, as more fully described in Patent No. 706,088, issued August 5, 1902, to H. McCormack, the contact of the swaying rotating vessel with the steadying device being in this construction at a considerable distance from the center of rotation instead of closely adjacent thereto, as when my preferred steadying-spindle 10 is employed, but the novel feature of automatically shifting the non-rotating nozzle laterally with the swaying rotary vessel, so as to maintain a practically central feed notwithstanding temporary movement of the axis of the vessel from the normal axis of rotation being retained.

What I claim is—

1. In a centrifugal liquid-separator the combination with a vertically-mounted rotary vessel having an end feed-opening and an axial steadying-bearing adjacent thereto, of a non-rotating spindle extending axially through said feed-opening into said steadying-bearing.

2. In a centrifugal liquid-separator the combination with a vertically-mounted rotary vessel having an end feed-opening and an axial steadying-bearing adjacent thereto, of an annular feed-nozzle for said vessel pro-

vided with a non-rotating spindle extending axially through said feed-opening into said steadying-bearing to form an annular feed-passage between said non-rotating spindle and the rotary feed-opening wall.

3. In a centrifugal liquid-separator the combination with a vertically-mounted rotary vessel having an end feed-opening and an axial steadying-bearing adjacent thereto, of an annular feed-nozzle for said vessel provided with a non-rotating spindle extending axially through said feed-opening into said steadying-bearing to form an annular feed-passage between said non-rotating spindle and the rotary feed-opening wall, said spindle being laterally yielding to swaying movement of the vessel.

4. In a centrifugal liquid-separator the combination with a rotary separator vessel having an end feed-opening, of an annular feed-nozzle for said vessel having an axial guide-stem projected through said opening and centered in the latter to form an annular feed-passage around the stem, said nozzle being adapted to swing approximately concentrically with the swing of the free end of the vessel.

5. In a centrifugal liquid-separator the combination with a vertically-mounted rotary vessel having a carrier mechanism adjacent one end thereof and provided with an axial steadying-bearing adjacent the opposite free end, of a non-rotating movable spindle entered in said bearing and serving to restrict swaying movement of the vessel.

6. In a centrifugal liquid-separator the combination with a vertically-mounted rotary vessel having a carrier mechanism adjacent one end thereof and provided with an axial steadying-bearing adjacent the opposite free end, of a non-rotating swinging spindle entered in said bearing and serving to restrict swaying movement of the vessel.

7. In a centrifugal liquid-separator the combination with a vertically-mounted rotary vessel having a carrier mechanism adjacent one end thereof and provided with an axial steadying-bearing adjacent the opposite free end, of a non-rotating swinging spindle entered in said bearing and so hung as to tend toward the normal axis of rotation of the vessel.

8. In a centrifugal machine the combination with a vertically-mounted separator vessel of a carrier mechanism adjacent one end of said vessel and a non-rotating swinging spindle for the other end so hung as to tend toward the normal axis of rotation of the vessel.

9. In a centrifugal liquid-separator the combination with a vertically-mounted separator vessel having an end feed-opening at one end, of a laterally-movable feed-nozzle and a non-rotating steadying-spindle for said vessel, substantially as set forth.

10. In a centrifugal liquid-separator the combination with a rotary separator vessel having an end feed-opening, of a non-rotating feed-nozzle arranged to move laterally with the swaying of the vessel.

11. In a centrifugal liquid-separator the combination with a vertically-mounted separator vessel having an end feed-opening at one end, of a laterally-movable feed-nozzle carrying a non-rotating steadying-spindle for said vessel.

12. In a centrifugal liquid-separator the combination with a vertically-mounted separator vessel having an end feed-opening at one end, of a laterally-movable feed-nozzle carrying a flexible non-rotating steadying-spindle for said vessel.

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

DAVID TOWNSEND SHARPLES.

Witnesses:
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G. K. MCFARLAND.