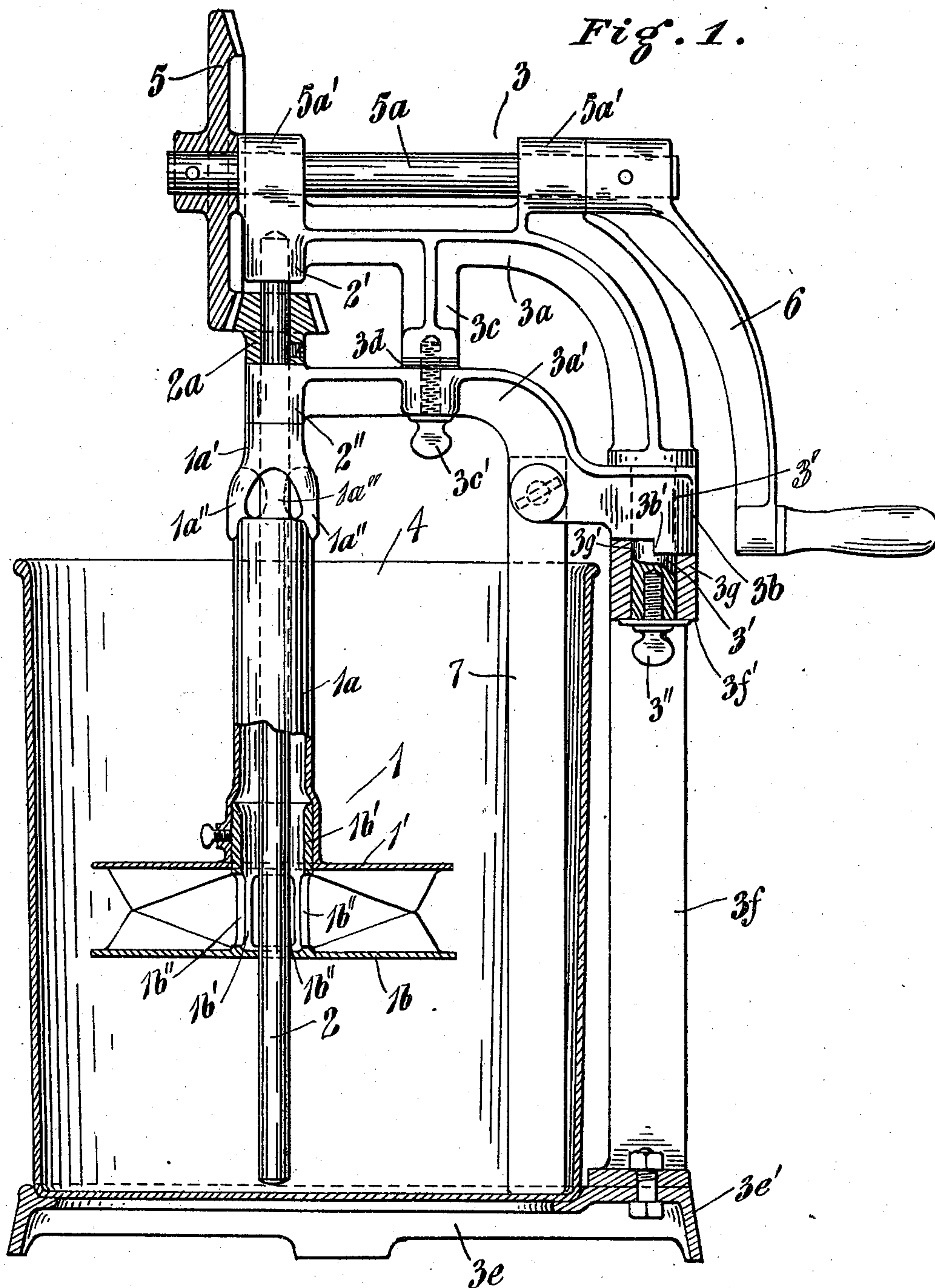


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A. FAY.
CREAM SEPARATOR AND CHURN.
APPLICATION FILED APR. 22, 1911.

Patented July 4, 1911.
2 SHEETS—SHEET 1.



Witnesses:
Clarence F. Fildes
Chas. L. Hess

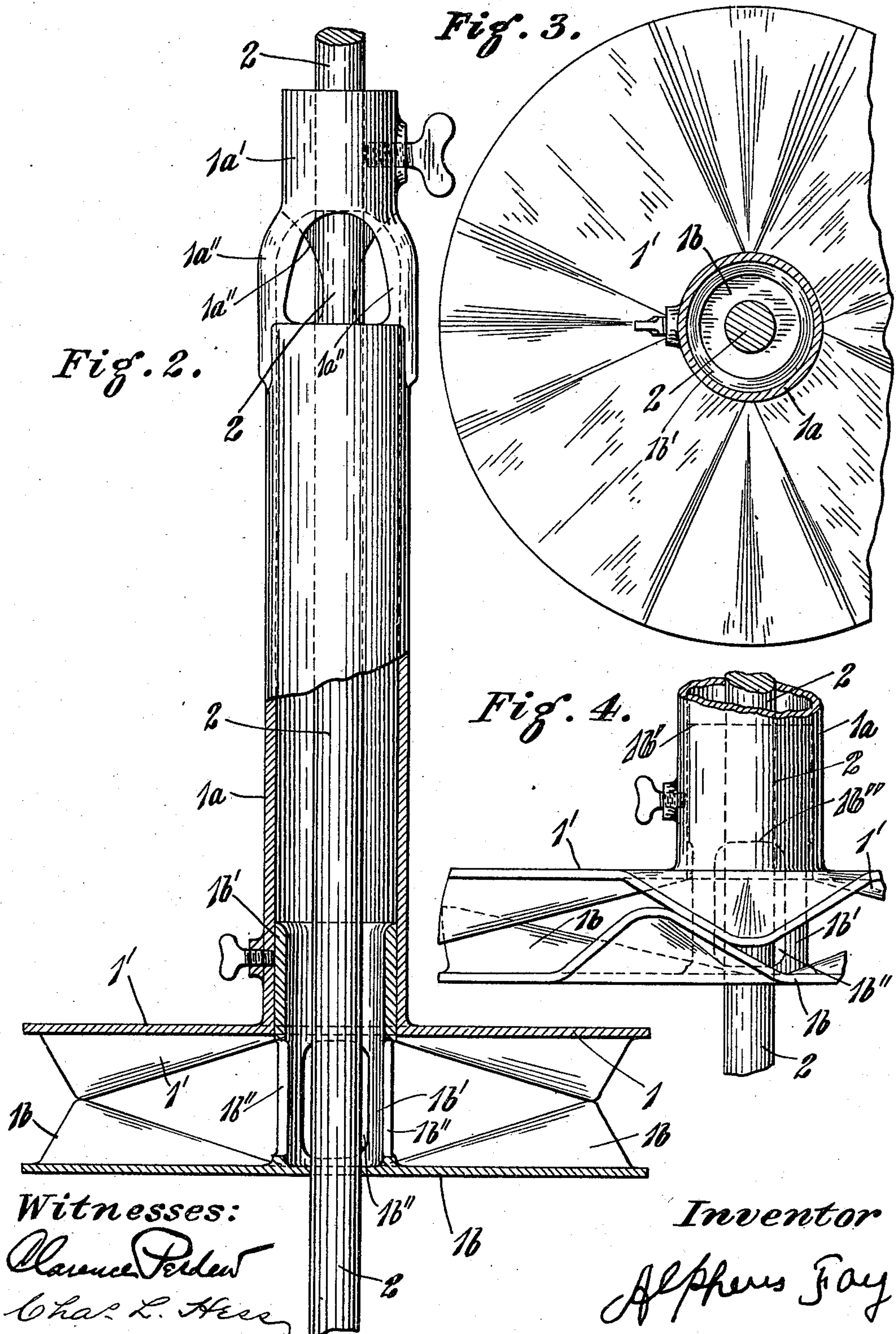
Inventor
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Inventor
Alphus Fay

UNITED STATES PATENT OFFICE.

ALPHEUS FAY, OF LOUISVILLE, KENTUCKY.

CREAM-SEPARATOR AND CHURN.

996,916.

Specification of Letters Patent.

Patented July 4, 1911.

Application filed April 22, 1911. Serial No. 622,781.

To all whom it may concern:

Be it known that I, ALPHEUS FAY, a citizen of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented a certain new and useful Cream-Separator and Churn, of which the following is a specification.

The object of my invention is to provide improved means for mechanically agitating and aerating milk and kindred products.

The processes to which my invention are most applicable will hereinafter be more fully set forth.

My invention consists in the parts and in the details of construction and arrangement of parts, as will hereinafter be more fully described and claimed.

In the drawings: Figure 1 is a vertical sectional side elevation of a device embodying my invention. Fig. 2 is an enlarged vertical sectional side elevation of the agitator and its shaft. Fig. 3 is a cross sectional view of the same. Fig. 4 is a partial vertical section of the same, indicating the members of the agitator in a different adjusted position.

The agitator 1 is of such design as to produce a centrifugal impelling effect on the liquid, and is mounted on a vertical shaft 2, journaled in a bracket 3, with upper and lower bearings 2' and 2'', respectively, therein. Between the bearings 2' and 2'' the shaft 2 has a bevel pinion 2^a rigidly mounted on it and supported on the lower bearing 2'', and in turn, supporting the shaft 2 with the agitator 1 thereon. The shaft 2 is continued nearly to the bottom of the vessel 4, which receives the substances to be operated upon. The bevel gear 2^a meshes with a bevel gear 5, rigid on a horizontal shaft 5^a having bearings 5^{a'} in the bracket 3, and extending out to one side and receiving a handle 6 for turning the driving shaft.

The bracket 3 comprises the two upwardly curved transverse members 3^a and 3^{a'}, converging to a hub 3^b and lying in vertical alinement, the upper one carrying the bearing 2' and the lower one having the bearing 2'', for the agitator shaft 2. The two members 3^a and 3^{a'}, are connected by a supplemental support 3^c, integral with the upper member 3^a and extending down therefrom near the bearings 2' and 2'', and having a clamping screw 3^{c'} that extends up into it through an opening in the lower member 3^{a'} and bears against the lower side

of said lower member. Washers 3^d are placed between the lower end of the supplemental support and the lower member, around the screw 3^{c'}, which may be removed as the bearings of the shaft 2 and its pinion 2^a wear, allowing the members 3^a and 3^{a'} to be drawn closer together, and thus compensate for the wear. Where the upper member 3^a and the lower member 3^{a'} converge together at the hub 3^b, the upper member 3^a has a stud 3' passing down through the hub 3^b, said hub being integral with the lower member.

The vessel 4 is supported upon a base 3^e, which has a circular sunken interior to receive the bottom of the vessel. At one side, this base has an extension 3^{e'}, upon which is mounted a standard 3^f, which extends up and has a horizontal part 3^{f'} with a hub 3^g. The upper side of this hub 3^g has an offset 3^{g'}, and the lower side of the hub 3^b of the member 3^{a'} has an offset 3^{b'} to correspond with said offset 3^{g'}, engaging therewith to prevent turning of the bracket 3 on the standard 3^f when the stud 3' passes down into the opening which the hub 3^g of the standard has, to receive said stud, and said stud being extended down past the lower side of the hub 3^b for this purpose. A clamping screw 3'' passes up into the stud 3' and engages with the lower side of the horizontal part 3^{f'} of the standard 3^f, to clamp the bracket firmly on the standard. By this means, the bracket, with the operative mechanism of the apparatus, is firmly supported, independently of the vessel, relieving the vessel of all strain and allowing it to be readily handled as required in the use of the apparatus.

The agitator 1 comprises two superposed impelling members 1' and 1^b, supported on a tubular shaft 1^a, open at its upper and its lower end, and having a hub 1^{a'} which is secured to the shaft 2 by a set screw, so that the agitator 1 thus comprised may be adjusted up and down on the shaft 2. This hub 1^{a'} joins its tubular shaft by arms 1^{a''}, so as not to close the upper end of the tubular shaft. This open upper end of the tubular shaft is preferably above the rim of the vessel 4, so that the liquid may not overflow and close the end of the shaft. The hub 1^{a'}, as well as the upper impeller member 1', may be integral with the tubular shaft 1^a, as shown, and, preferably, are made of cast aluminum, which will not corrode so much as some other metals under the action of the

fluids introduced into the apparatus. It is generally desirable to have the agitator 1 at about the middle of the body of liquid in the vessel, vertically.

5 Each of the impeller members 1' and 1^b consists of a series of radial channels of outwardly increasing triangular cross section joined by plane web parts. The lower member 1', and it has an upwardly extending
10 ing tubular hub 1^{b'}, integral with it, which telescopes in the lower region of the tubular shaft 1^a, and a set screw is passed through the wall of said tubular shaft to clamp the hub 1^{b'} and hold the lower member in various
15 adjusted positions axially and circumferentially of the agitator. With this provision, the lower member may be turned with respect to the upper one as it is adjusted upward, the inclined peripheries of the
20 members at the terminations of their channels sliding together and forming the peripheral support of the two members, each against the other, which, in coöperation with the set screw clamping the hub 1^{b'}, renders
25 the agitator rigid throughout, in its various adjustments. Such adjustment regulates the agitating capacity of the agitator, and also regulates the inflow of air to the central vacuum thus created. The hub 1^{b'} has a
30 series of openings 1^{b''} through which the air passes from the tubular shaft 1^a and the inside of the hub 1^{b'}, out into the vessel, under the influence of the agitation. As shown in
35 Fig. 1, the lower region of the tubular shaft 1^a is enlarged to receive the hub 1^{b'}, leaving the interior of said hub and of the tubular shaft uniform in caliber. In any case, the lower impeller member 1^b has its central
40 opening, inside the hub 1^{b'}, of diameter to snugly admit the shaft 2, and to slide thereon, thus steadying the lower end of the agitator on its shaft. This arrangement, with the hub 1^{b'} attached to the lower member 1^b, and sliding in the tubular shaft, allows most
45 ready removal of the lower member from the upper one, and gives most convenient access to the interior of the tubular shaft at the lower end, and also to the tubular hub 1^{b'} of said lower member 1^b, for cleansing
50 these parts by inserting a brush, after the operation of the apparatus is finished. This arrangement also confines the irregularities and crevices to the interior of the tubular shaft, where, under the influence of the centrifugal action of the agitators, there is least
55 contact with the substances, and consequently less lodgment thereof, and less of interference with the operation of the device, or of contamination of the products.

60 The brake to coact with the agitator 1 comprises a vertical strip 7 at one side of the vessel, with its upper end clamped to the lower member 3^{a'} of the bracket 3, and having its lower end bearing firmly against the
65 bottom of the vessel. It may be of sufficient

relative length to be flexed slightly against the direction of action of the agitator 1 when it is thus secured in position. The agitator and its shaft and other operative mechanism is displaced somewhat from the
70 center of the vessel to admit the brake 7 in its position therein.

For separating and churning, fresh, sweet milk is placed in the vessel, nearly filling it, the agitator 1 being in its uppermost position, as shown in the drawing, in which position the impellers of the agitator will be about midway of the depth of the liquid. The milk is then agitated by the operation of the mechanism, the agitator exerting a
80 centrifugal impelling effect on the milk and setting up air currents that cause an ebullition in the liquid, due to the partial vacuum in the central region of the agitator; the downward circulation of the air, under atmospheric pressure, through the tubular
85 shaft is readily distributed along with the circulating currents of liquid, under the centrifugal action, to produce this ebullition, and to thoroughly aerate the milk. The
90 milk is preferably introduced at a temperature of from 40 to 50 degrees Fahrenheit, while the air entering the liquid is of atmospheric temperature, or about 60 to 70 degrees
95 Fahrenheit. After the milk has been agitated and aerated in the above manner for about five or ten minutes, the agitation is discontinued and the liquid allowed to rest for a few minutes, during which the separation of the
100 cream from the milk will become complete, and the cream will have risen to the top of the vessel. Then the skimmed milk is drawn off, leaving the separated cream. By varying the volume of skimmed milk drawn off, the cream may be left with any desired
105 proportion of butter fat. When the desired proportion of skimmed milk has been drawn off, the agitation is resumed to churn the cream, the agitator 1 being lowered to properly operate on the reduced quantity of
110 liquid. The temperature of the cream will by this time have risen to approximately that of the atmosphere, or to from 60 to 65 degrees Fahrenheit, and the churning agitation and aeration at this temperature is continued until the butter is separated from the
115 cream, which will ordinarily require from three to five minutes. The butter may then be removed and worked in the usual manner, and for conveniently removing the butter
120 the bracket may be removed from the apparatus, along with the agitators and their shafts, leaving free access to the vessel, or allowing the vessel to be removed also from the apparatus. The entire interior of the
125 vessel will be left smooth, facilitating a thorough removal of the butter and permitting a thorough cleansing of the interior after the residue from the churning has been withdrawn. This smoothness of the interior
130

is due to the absence of step bearings or brake attachments in the vessel, and is permitted by the rigid journal bearing afforded for the agitator shaft in the bracket with its supplemental support, as hereinbefore described. If it be desired, the residue from the churning may be left in the vessel, and the skimmed milk that had been withdrawn after the separating operation may be then added to the residue, and the agitator introduced again and operated to thoroughly mix the liquids, producing a good serviceable fresh, sweet milk, with all the natural solids of milk except the butter fats, and which has the natural flavors of fresh, sweet milk.

If it be desired to produce a high grade of buttermilk, the skimmed milk may be placed in the vessel with the churning residue, and, before agitating, the liquids allowed to become sour, reaching the condition of clabber. Then when the agitators are introduced and the agitation and aeration of the soured liquids effected, a good quality of finely aerated buttermilk will result. The souring of the liquids may be facilitated by the use of a suitable ferment. This souring may also be effected with the skimmed milk alone, allowing it to reach the condition of clabber, and then agitating and aerating it; such treatment of skimmed milk is advantageous when the cream therefrom has not been used for the production of butter, leaving no residue for mixture with the skimmed milk. In the treatment of either of the above clabbers, the adjustment of the impeller members of the agitators toward each other is advantageous, it being understood that such adjustment reduces the action of the agitators and greatly facilitates the driving of them in operating upon the clabber, which naturally is of heavy and somewhat viscous consistency.

A poor quality of butter may be operated upon, to improve it, by the use of my invention, placing such butter in a suitable amount of pure water in the vessel and agitating and aerating it in the above described manner, but at a temperature of not more than 50 or 60 degrees Fahrenheit. The butter may be granulated to permit a most efficient purifying action of the air thereon, and of the water, which may be withdrawn and fresh water supplied, as required; the entire operation results in the production of butter granules in a neutral state and with their impurities eliminated. The neutral granules may then be removed and salted and worked and otherwise treated according to good practice in the production and marketing of palatable fresh butter, with which it is identical. Furthermore, if desired, the butter granules above alluded to may be mixed with sweet milk to produce a high quality of cream of any desired percentage

of fatty constituents, thoroughly fresh, sweet and pure, and adaptable for all the purposes that good cream is used for. This combined aeration and agitation will produce a fine quality of whipped cream, from a cream of comparatively low percentage of butter fats, with an operation of only from three to five minutes. Usually, a cream to be whipped must be rich in butter fats, to attain the desired peculiar fluffy consistency, but the effective aeration caused by the ebullition set up in the liquid by my apparatus allows the same results to be had with a decided economy. For whipping cream, the agitator should have its impeller members adjusted to their positions whereby the agitator is widest open, and the agitator should be rotated at a maximum speed.

My apparatus is well adapted for producing homogenized dairy products, as preparations to be used as butter, or as oleomargarin, or as butterin. In either case, the butter, or the oleomargarin, or, in the case of butterin, the lard, should be taken in equal quantity by weight, with the milk, and the mixture placed in the vessel with the milk at a temperature of about 50 degrees Fahrenheit, and the fatty ingredient, butter, oleomargarin, or lard, as the case may be, at any of the usual temperatures. Then heat should be applied to the vessel, as by placing it over a stove or burner, sufficient heat being provided to raise the temperature of the mixture in the vessel to about 90 degrees Fahrenheit in about three minutes. During this three minutes, the agitation and aeration, by ebullition, are kept up in the mixture, and at the end of the time, the butter, or oleomargarin, or lard, as the case may be, will be found to have merged with the milk into a single homogeneous mass, having the characteristics of the butter, or of oleomargarin, or of butterin, as the case may be, and well adapted for use as such by the user of the apparatus. When properly labeled, this homogenized article also becomes a marketable product. In any case it allows marked economy, since the cost of the resultant product is only the mean between the cost of the butter, or other fatty ingredient, and the cost of the milk. Such homogenized products are superior to their pure fatty ingredients, inasmuch as they contain milk solids not found in the pure fatty substances alone. The convenience with which these products are made by my device makes them available to the private consumer, for domestic preparation and use.

I have set forth the above processes to illustrate the use of my apparatus, and it will be understood that other advantageous uses will be suggested in the employment of my invention, and divers minor modifications may occur in such adaptation; therefore I do not wish to be understood as limit-

ing myself to the precise details herein illustrated and described, but

What I claim as new and desire to secure by Letters Patent is:

- 5 1. In a device of the character described, the combination in an agitator of a tubular shaft and an upper impeller member on its lower end, and a lower impeller member with an upwardly extended tubular hub entering the lower region of the interior of the tubular shaft, and means for securing said hub in said shaft.
- 10 2. In a device of the character described, the combination in an agitator, of a tubular shaft, an upper impeller member with downwardly projected impeller channels having inclined lower surfaces, said upper member being secured to the shaft at its lower end, and a lower impeller member with upwardly projected impeller channels having inclined surfaces presented upwardly, a hub on said lower member extending up into the lower region of the interior of the shaft, and means for securing the hub in the shaft in various positions depending upon the sliding contact of the respective inclined surfaces of the channels of the members.
- 15 3. In a device of the character described, the combination in an agitator of a tubular shaft and an impeller member on its lower end, and a lower impeller member with an upwardly extended tubular hub entering the lower region of the interior of the tubular shaft, said tubular hub having a series of openings down adjacent the lower member.
- 20 4. In a device of the character described, the combination in an agitator of a tubular shaft, a hub at its upper end, means for attaching the hub to a central shaft, a central shaft extending through the hub and through the tubular shaft, an upper impeller member on the lower end of the tubular shaft, the lower end of the tubular shaft being open around said central shaft, a lower impeller member fitting closely around the central shaft and having a hub extending up around said central shaft into the open lower end of the tubular shaft, and means for clamping

said hub in said tubular shaft, the hub having openings communicating between its interior and the space between the impeller members, substantially as and for the purposes specified. 50

5. In a device of the character described, the combination of a vertical agitator shaft, a vessel into which the shaft extends to rotate and support an agitator therein, a bracket above the vessel having vertically alined bearings for the vertical shaft and having means for rotating the shaft, a base supporting the vessel in operative position relative to the shaft, a standard located at one side of the vessel on the base and extending up near the upper part of the vessel, a hub on the standard having an opening, a stud on the bracket extending down into the opening, an offset on the upper side of the hub on the standard, and a hub on the lower side of the bracket to cooperate and engage with the offset on the hub when the stud enters the opening, whereby the bracket is supported independently of the vessel, substantially as and for the purposes specified. 60 65 70

6. In a device of the character described, the combination of a vertical agitator shaft, a vessel into which the shaft extends to rotate and support an agitator therein, a bracket above the vessel having vertically alined bearings for the shaft and having means for rotating the shaft, means for supporting the bracket independently of the vessel, so that the operative positions of the bracket and shaft and said vessel are maintained, relative to each other, said bracket comprising upper and a lower vertically alined members converging to the supporting means, and having a supplemental support adjacent the bearing of said vertical shaft, said shaft terminating short of the bottom of said vessel, substantially as and for the purposes specified. 75 80 85 90

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."