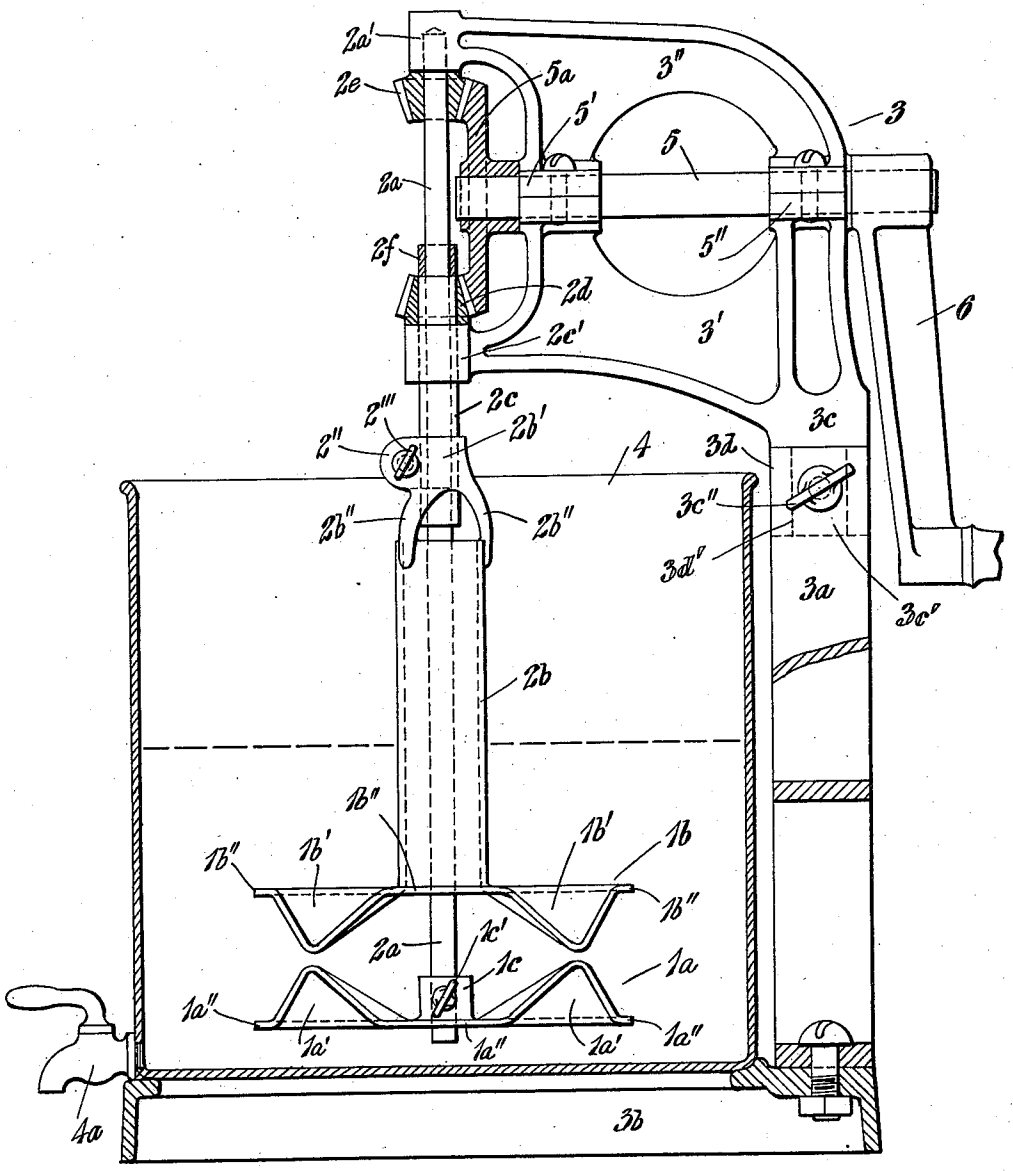
A. FAY.

AERATING BUTTER SEPARATOR.

APPLICATION FILED FEB. 19, 1912.

1,028,869.

Patented June 11, 1912.



Witnesses:
Clarence Perdew
Chas. O. Davis

Inventor
Alphers Fay

UNITED STATES PATENT OFFICE.

ALPHEUS FAY, OF LOUISVILLE, KENTUCKY.

AERATING BUTTER-SEPARATOR.

1,028,869. Specification of Letters Patent. Patented June 11, 1912.

Application filed February 19, 1912. Serial No. 678,575.

To all whom it may concern:

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

The object of my invention is to provide improved means for the performance of such processes in connection with the treatment of cream, milk or butter as requires either mechanical agitation or aeration or both.

The processes to which my invention is most applicable will hereinafter be more fully described.

My object also is to simplify the construction of apparatus of this character, and to add to its efficiency and durability.

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

The drawing is a sectional elevation of a device embodying my invention.

As I prefer to construct my improved device, the agitators 1^a and 1^b each comprise a series of radial channels $1^{a'}$ or $1^{b'}$, of outwardly increasing triangular cross-section, joined by plane web parts $1^{a''}$ or $1^{b''}$, the whole structure being of general circular contour. The agitator 1^a is mounted on a shaft 2^a, which may be solid, and the agitator 1^b is mounted on a tubular shaft 2^b that surrounds the shaft 2^a, leaving an annular space therearound to conduct air along said shaft 2^a. This tubular shaft 2^b is open at its upper end and near its lower end. It has a hub $2^{b'}$ that is secured to its upper end by arms $2^{b''}$, and at its lower end it is attached to the plane web part $1^{b''}$, being preferably integral therewith. By having the hub $2^{b'}$ secured to the open upper end of the tubular shaft by the arms, the shaft is thus unobstructed at either end. The hub $2^{b'}$ is secured to a hollow shaft 2^c that surrounds the solid shaft 2^a above the tubular shaft 2^b, this hollow shaft 2^c having a close, journal bearing on said solid shaft. One side of the hub is split, and has an ear $2''$ at each side of the opening, through which a screw $2'''$ passes, which, when tightened, contracts the hub on the hollow shaft 2^c, without crushing it or binding it on the solid shaft 2^a. Thus, the hub may be tightened on said tubular shaft 2^c at any desired point, affording adjustment of the agitator 1^b up or down in the apparatus. The agitator 1^a has a hub 1^c, on the shaft 2^a, with a set screw $1^{c'}$ to clamp it to the shaft, thus allowing this agitator to be adjusted up or down on this shaft. The hub 1^c is confined to the upper side of the plane web part $1^{a''}$, allowing the agitator to be adjusted low on the shaft 2^a and yet make stable contact with the shaft. A bracket 3 forms the bearings for the solid shaft 2^a and for the hollow shaft 2^c surrounding it. This bracket 3 is mounted on a standard 3^a, which extends up from a base 3^b. The base 3^b supports a vessel 4, which receives the substance to be operated upon. The tubular shaft 2^c extends only far enough above its bearings $2^{c'}$ to receive a bevel pinion 2^d, but the solid shaft 2^a extends up to a bearing $2^{a'}$, and has, just below the bearing, a bevel pinion 2^e. These pinions 2^d and 2^e bear against the bearings to which they are adjacent, and thus limit endwise movement of their respective shafts down and up, respectively. A collar 2^f on the solid shaft 2^a, above and bearing down against the upper end of the tubular shaft 2^c and the pinion thereon, prevents endwise movement of said shafts 2^c and 2^a up and down, respectively. A horizontal shaft 5 is journaled in the bracket 3 in bearings 5′ and 5″, midway between the pinions 2^d and 2^e, and a bevel gear 5^a is rigidly mounted on this shaft 5, and is in mesh with said pinions. On the other end of said shaft 5, a handle 6 is rigidly mounted, for manual operation of the device. Said gear 5^a and said handle 6 bear against said bearings 5′ and 5″, respectively, and limit the end play of the shaft 5.

It is highly desirable that the gear 5^a, and the pinions 2^d and 2^e, be pressed onto their respective shafts. Accordingly, the bracket 3 is made in two parts 3′ and 3″, divided in the bearings 5′ and 5″ of the shaft 5, and suitably secured together as illustrated, so that they are practically equivalent to an integral bracket. The upper, or lesser part 3″ of the bracket carries the bearing $2^{a'}$ for the upper end of the solid shaft 2^a. This allows insertion of the hollow shaft 2^c, with the pinion 2^d on it, into the bearing $2^{c'}$, and allows the insertion of the solid shaft 2^a, with the pinion 2^e and collar 2^f on it, into this hollow shaft, after which the upper part 3″ is placed in position, the shaft 5, with the members pressed on it, having been placed in the halves of its bearings 5′ and 5″ in the lower part 3′ of the bracket. The

lower, larger part 3′ of the bracket has a main supporting hub 3^c, with a downwardly extending stud $3^{c'}$, and this stud fits snugly in a head 3^b that is formed in the upper end of the standard 3^b, with a socket $3^{d'}$ to receive said stud. A set screw $3^{c''}$ clamps the stud in the socket, thus holding the bracket firmly on the standard, but allowing it to be removed, carrying the shafts and agitators with it out of the vessel 4. The vessel 4 has a faucet or cock 4^a at its bottom, on one side, for withdrawal of liquid from the vessel.

It is readily seen that rotation of the shaft 5 by the handle 6 will result in the agitators being rotated in opposite directions. Also, it will be understood that each agitator will have its centrifugal action on the substance, so that there will be a partial vacuum created between the inversely juxtaposed agitators, due to the displacement of the liquid therefrom by said centrifugal action. This displacement from each agitator will be in substantially tangential directions, in substantially horizontal planes, and will result in a tendency to gyrate the upper and lower zones of liquid in opposite directions. Thus, there will be approximately a plane of attrition between the two oppositely impelled parts of the body of liquid, substantially coincident with the region of separation of the two agitators. The vacuum created in the space between the agitators will induce a current of atmospheric air down through the tubular shaft, which will also pass out, along with the centrifugally impelled liquid, into the main body of liquid.

On account of the triangular cross-section of the channels, which define the outlet spaces from the space between the agitators, there is a tendency to congest the outflow of liquid, and of the air, in the region of above described plane of attrition between the oppositely impelled parts of the body of liquid. This increases the intimacy of contact of the air particles and of the particles of liquid in this region, from which the intermingled particles then circulate throughout the upper and lower parts of the body, manifesting their action by a boiling appearance in the liquid, or, as properly defined, ebullition. This attainment of the mechanical effects of boiling, without the thermal effects, in large measure contributes to the success of the processes for which my improvement is adapted.

For separating and churning, fresh, sweet milk is placed in the vessel, nearly filling it, the agitators being adjusted to their higher positions. The milk is then agitated by the centrifugal actions before described, producing ebullition therein. The milk is preferably introduced at a temperature of from 40 to 50 degrees Fahrenheit, while the air entering the milk is of atmospheric temperature, or about 60 to 70 degrees Fahrenheit. After the milk has been treated for from five to ten minutes, the agitation is discontinued and the liquid allowed to rest for a few minutes, during which the separation of the cream from the milk will become complete, and the cream will rise to the top of the vessel. Then the skimmed milk is drawn off, leaving the separated cream. By varying the volume of milk drawn off, the cream may be left with any desired proportion of butter fat. When the desired proportion of skimmed milk has been drawn off, the agitation is resumed to churn the cream, the agitators being lowered to properly operate on the reduced quantity of liquid. The temperature of the cream will by this time have risen to approximately that of the atmosphere, or from 60 to 65 degrees Fahrenheit, and the churning agitation and aeration at this temperature is continued until the butter is separated from the cream, which will ordinarily require from three to five minutes. The butter will now be ready for washing, after the residue has been drawn off, and will be in small particles, distinct from the residue. After withdrawing the residue as completely as is practicable, pure water at from 50 to 55 degrees Fahrenheit is repeatedly applied to the butter in the vessel, while the ebullition is kept up by the agitators, it being preferable to run the water through the vessel and out of its faucet 4^a continuously, as supplied from a hydrant or other suitable source of supply. This washing is kept up till no traces of residue are apparent in the water. Then, with the last of the washing water withdrawn, the butter is in a granular mass in the vessel, the granules resembling the granules of sugar in size. It is now ready for salting. For salting, a solution of a pint of salt to a gallon of water is applied to the butter granules in the vessel, at a temperature of from 50 to 55 degrees Fahrenheit, or about the same as that of the washing water that was used. The granules are now agitated and aerated in this solution, preferably at reduced speed, to insure thorough intermingling of butter and of solution particles, for from 30 to 60 seconds. On completion of the agitation of the granules and solution, the solution may be withdrawn, leaving that which is incorporated with the granular mass, which, now thoroughly salted with great homegeneity, is taken from the vessel and drained and worked to the proper useful consistency in any suitable and well known manner. A low temperature having been maintained throughout the washing and salting operations, the completed butter will now have a fine texture, after final working or pressing. All parts of the apparatus being readily accessible on disassemblage, it may

be cleaned with thoroughness, after the operation is completed.

It will be understood that whole milk may be used, from which the separator will churn the butter in about the same time as above described. The temperature of the whole milk, on introduction, should be higher than that of cream, or from 65 to 70 degrees. Otherwise, the process is the same. Where cream is used, the skimmed milk may be saved and mixed with the residue from churning, by ebullition. This produces a serviceable sweet milk, with all the solids except the butter fats, and with all the sweet milk flavors. If they are mixed and soured before the ebullition, a high grade of buttermilk is produced, being superior by virtue of the aeration which it receives in the process. Skimmed milk alone, if clabbered, may be used for this purpose, and aerated. In operating on a heavy liquid such as clabber, the agitators should be separated a considerable distance, to reduce their resistance. This apparatus, producing ebullition in substances treated in it, is also useful for improving the condition of inferior grades of butter, by granulation and aerating processes. It is also applicable to the production of homogeneized products, to be used as butter substitutes, made by mixture of milk and a fatty substance. Thus, homogeneized butter, oleo-margerin, and butterin may be made, for domestic use, or, when properly labeled, for the market.

I have set forth the above processes to illustrate the use of my improved 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 limiting myself to the precise details herein illustrated and described, but

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

1. In a device of the character described, inversely juxtaposed agitators, means for supplying air between them, and means for rotating them oppositely.

2. In a device of the character described, inversely juxtaposed agitators, each with radial channels of outwardly increasing triangular cross-section, means for supplying air between them, and means for rotating them oppositely.

3. In a device of the character described, inversely juxtaposed agitators, each with a continuously closed plane web part and a part at an angle thereto presented peripherally, means for supplying air between them, and means for rotating them oppositely.

4. In a device of the character described, inversely juxtaposed agitators, each with parts closed throughout a horizontal region but with parts at an angle thereto presented peripherally, a shaft with which one agitator turns, a tubular shaft surrounding the aforesaid shaft and attached to the other agitator with open ends for admission of air between the agitators, and means for rotating them oppositely.

ALPHEUS FAY.

Witnesses:
CLARENCE PERDEW,
CHAS. C. DAVIS.