

March 23, 1937.

R. E. STARK

2,074,597

AERATING APPARATUS

Filed July 24, 1935

3 Sheets-Sheet 1

Fig. 1.

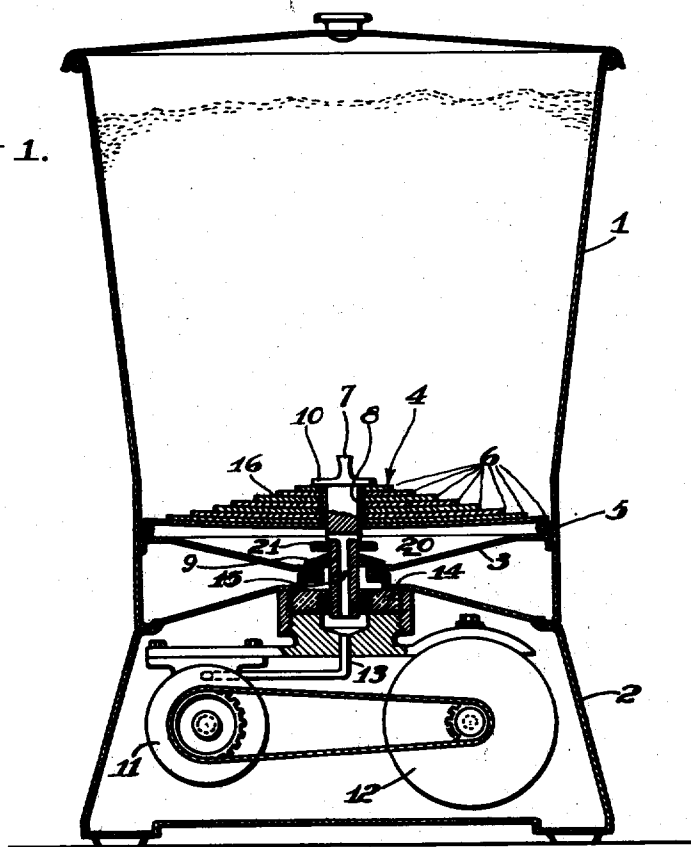
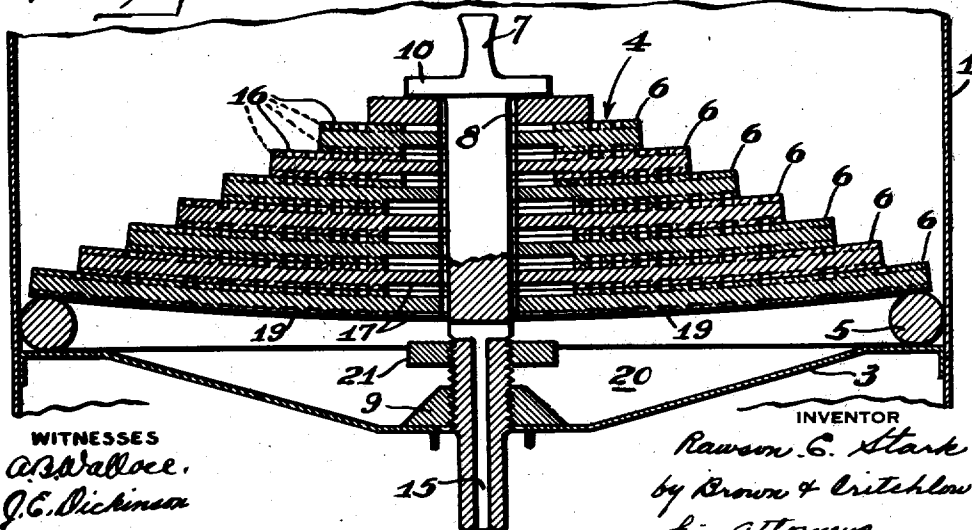


Fig. 2.



WITNESSES
C. Wallace,
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Rawson C. Stark
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3 Sheets-Sheet 2

Fig. 3.

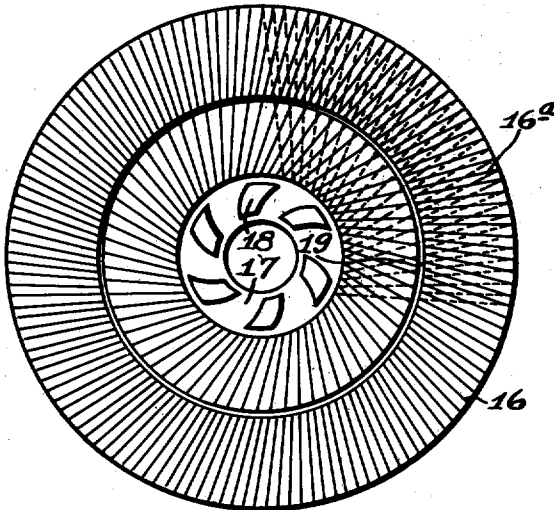


Fig. 4.

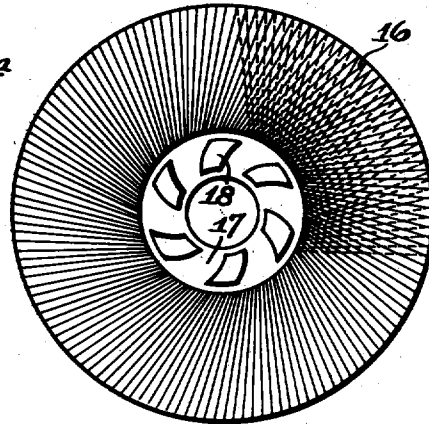


Fig. 5.

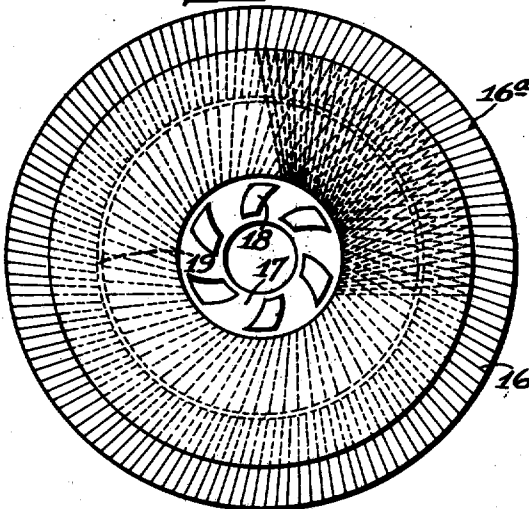


Fig. 6.

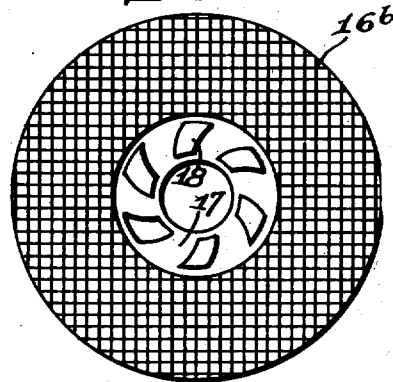
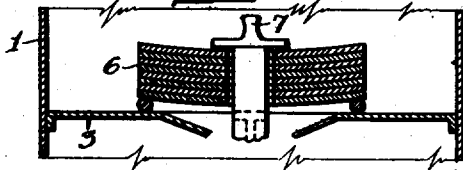
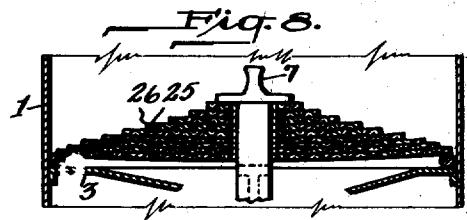


Fig. 7.



WITNESSES
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March 23, 1937.

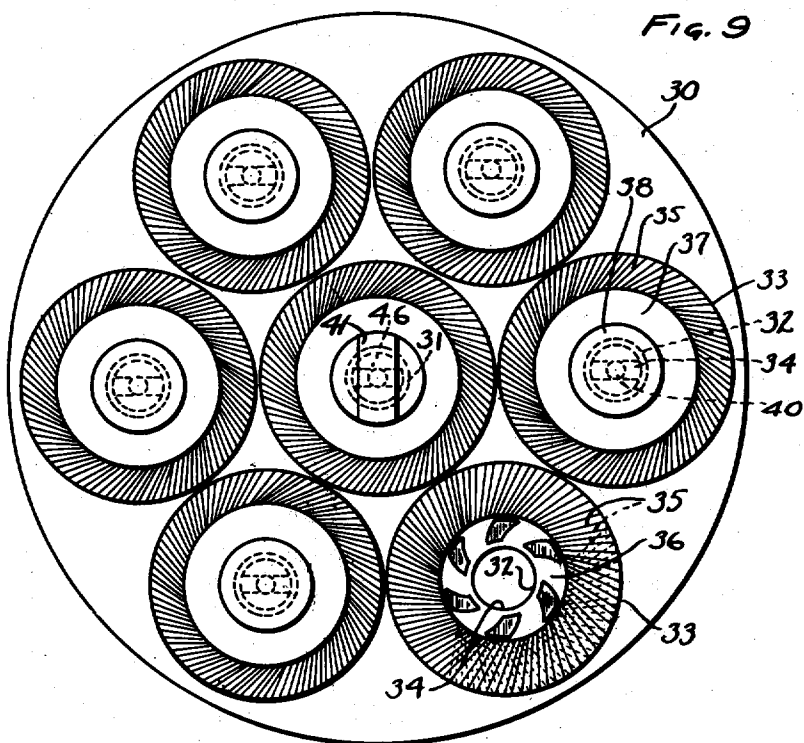
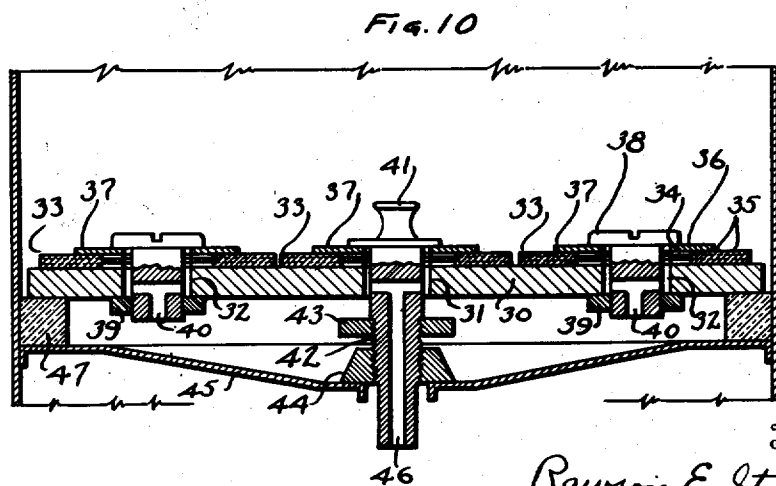
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AERATING APPARATUS

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3 Sheets-Sheet 3



Inventor

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UNITED STATES PATENT OFFICE

2,074,597

AERATING APPARATUS

Rawson E. Stark, Pittsburgh, Pa., assignor to The
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a corporation of Ohio

Application July 24, 1933, Serial No. 681,972
In Germany December 9, 1932

23 Claims. (Cl. 261—121)

This invention relates generally to a porous wall structure and more particularly to a structure of the type commonly used in the bottoms of aerating devices, although, as will be obvious from the following description, it may be employed for numerous and various other purposes.

The primary object of the invention, generally stated, is to provide a wall structure of the nature referred to which is exceedingly simple and sturdy of construction and in which the cross sectional area and number of pores are accurately determined.

Another object is to provide a composite wall structure of the above-noted character which is so constructed as to permit its being easily and effectively cleaned whereby it may be readily maintained in an operative and sanitary condition.

A further object is to provide a structure having the above-noted characteristics which may be manufactured with relatively little difficulty and expense and placed on the market at a comparatively low cost.

These and various other objects as well as the numerous other novel features and advantages of the invention, will be apparent when the following detailed description is read in conjunction with the accompanying drawings, of which,—

Fig. 1 is a vertical sectional view of an aerating device employed for producing whipped cream and the like, in which an embodiment of the invention is illustrated as comprising a porous filter or air dispersing wall in the bottom of the cream container;

Fig. 2 is a view to enlarged scale of the invention as shown in Fig. 1;

Fig. 3 is a plan view of one of the larger discs comprising the composite structure shown in Fig. 2;

Fig. 4 is a view similar to Fig. 3 of one of the smaller discs;

Fig. 5 is a plan view of the disc shown in Fig. 4 assembled upon the one shown in Fig. 3;

Fig. 6 is a plan view of a modified form of disc;

Fig. 7 is a view similar to Fig. 2 of another form of the invention;

Fig. 8 is a sectional view of a still further modification of the invention;

Fig. 9 is a view of a modified aerating device; and

Fig. 10 is a section thereof.

This application is a continuation-in-part of my copending application Serial No. 583,129 filed December 24, 1931 and assigned to the same assignee as this application.

The invention to date has been developed more particularly in conjunction with the development of a new type of cream whipping machine which has recently been placed on the market. For that reason to illustrate one of its more special uses, it is illustrated and described here in connection with its use in such a machine.

Referring to Fig. 1 an aerating machine of the character referred to is illustrated as comprising a tank 1 which is detachably mounted upon a base 2. In tank 1 adjacent its bottom 3 there is provided a porous wall 4 through which air is forced into the cream which is placed in the tank for whipping. To provide a seal about the edges of the wall, and a pressure chamber 20 below it, a rubber gasket 5 is mounted between it and the bottom 3 of the tank.

In the particular machine shown, wall 4 is constructed in accordance with this invention, and is made up of a plurality of flat discs 6, the details of which will be presently described. These discs are all held in place by a plug 7 which is passed through holes 8 formed in their centers and threaded into an opening 9 formed in bottom 3 of tank 1, the plug being provided with a shoulder 10 at its upper end which is adapted to cover holes 8 and bear against the top of the upper disc, thereby forcing the wall tightly in place when the plug is screwed down.

The air pressure for the machine is supplied by a compressor 11 which is mounted in base 2 together with a motor 12 by which it is operated. The outlet of this compressor is connected by a tube 13 to communicate with a hollow gasket 14 mounted in the top of base 2 in which the end of plug 7 is adapted to fit when tank 1 with disc 4 in it is in place. To conduct the air from gasket 14 to pressure chamber 20 a bore 15 is provided in plug 7 and to prevent plug 7 obstructing the flow from holes 8 through the discs 6 these holes are made larger than the diameter of the plug, the discs themselves having pore-forming channels 16 provided in their surfaces for conducting the air to their outer edges as defined more in detail hereinafter. To also insure the discs being in surface-to-surface contact so that the pores will more definitely determine the flow of the air, they are preferably made sufficiently flexible so that they may be flexed together as shown more particularly in Fig. 2 when plug 7 is screwed to place in such a way as to minimize the effect of distortions on them which may otherwise throw them apart.

To best understand the nature of the invention,

reference may be had to the requirements placed upon wall 4 referred to above. To begin with, it must have a porosity which will permit the air to be passed through it in only very minute streams 5 and in such a way that it will enter the cream only as very small bubbles, the force back of them being insufficient to carry them through the cream, as it is essential that the air be entrapped in the body of the cream in minute quantities 10 rather than be permitted to pass completely through it. This necessitates the pores of the wall being of a very fine cross sectional area. It is also necessary or desirable that the pores offer a sufficient resistance to the back flow of the cream contained in the tank as to prevent or substantially 15 prevent it, either in its natural or whipped state, from flowing downwardly into the bottom of the tank when the air pressure supplied by the compressor is turned off. This necessitates that they be sufficiently long as well as small to offer a 20 sufficient resistance to a flow through them to meet such requirement. In addition it is highly desirable that the wall be susceptible of being easily and effectively cleaned so that the accumulation of filth and undesirable odors may be easily avoided, as well as the pores prevented from becoming clogged so as to impair or interfere with the functioning of the wall. Furthermore, it must 30 have sufficient strength to stand up in service under the treatment to which it is subjected.

To satisfy the aforementioned requirements, in accordance with this invention, a porous wall is provided which, as illustrated in its preferred form for this special use more particularly in Figs. 3, 4 and 5, comprises a plurality of flat metal or 35 other suitable discs 8 mounted one upon the top of the other. To permit a flow between these discs from their bottoms upward, an opening 9 is provided at the center of each which is sufficiently larger than the plug 7 by which they are held together to form a pressure chamber at their inner edges, and grooves or channels 16 running from 40 the opening 9 to the outer edge of the plates are provided on at least one surface of each disc. Hence, when the discs are assembled one on top of the other, these channels form pores extending between the inner and outer edges of the discs, the size of the pores being determined by the cross sectional area of the grooves or channels 16, the 45 capacity of the wall by their number.

In a cream whipping device such as that referred to hereinbefore it is desirable that the whipping air be admitted to the cream as uniformly as possible over the entire bottom of the body of 50 cream. For this reason the various discs comprising the wall structure are made in diminishing diameters to form a wall in the shape of a cone whereby, as the respective pores terminate at the edge of each disc, the passing of air through the walls is distributed substantially uniform over the entire upper area of the composite wall surface.

In order to facilitate the assembly of the discs or in other words to make them reversible so that 65 it will not make any difference which side of them is up or down when the wall is assembled, they may be provided with pore forming grooves 16 on both of their faces. To prevent the pores on adjacent discs coinciding over their length the 70 grooves 16 may be cut on an angle to a line extended through the center of each disc, as shown. Hence, when two of the discs are placed on top of each other as illustrated in Figs. 2 and 5, the 75 grooves on the face of one disc adjacent those on

the face of the next adjacent disc will cross each other rather than extend in the same direction.

A further feature of the invention is the provision at the center of each disc on its upper and lower surfaces of a cut away portion 17 which 5 forms a sort of manifold that tends to equalize and aid the distribution of flow through the structure. This also increases the area of the metal at the inner edge of the disc where the grooves 16 terminate and permits the provision of a greater 10 number of such grooves without their overlapping each other. To increase the strength of this manifold, sections 18 of the disc body may be retained in this area. In the larger discs the number of grooves 16 is further increased by providing 15 a secondary or auxiliary circular manifold groove 19 which is arranged midway between the edge of manifold 17 and the edge of the disc and in which the outer end of the radial grooves terminate as well as the inner ends of a greater number of outer grooves 16a, as shown in Figs. 3 and 5. 20

To facilitate the cleaning of the discs when used in the manner referred to a nut 21 is provided on plug 7 sufficiently below the lowermost disc so that when the plug is removed from the 25 bottom of the tank the plates may all be swished about at the same time in a cleaning fluid by using the plug as a handle, the play between the plates and the nut permitting them to flop about sufficiently to let the cleaning fluid flow between them 30 to thoroughly clean them.

It is appreciated that various other pore forming arrangements may be employed on the surfaces of the wall-forming plates. For example, as is shown in Fig. 6, a system of pore forming 35 grooves 16b may be cross-hatched on the opposite surfaces of the plates 16.

Referring to Fig. 8 the invention may also be practiced by providing a structure consisting of a plurality of plates 25 between which there are 40 arranged sheets of woven mesh 26 to provide the air passages. In such a structure, as will be understood, the pore capacity will vary with the size of the mesh.

Nor is it essential that the plates have any particular shape or form, for example, they may be made and assembled in the manner shown in Fig. 7 in which they form a porous cylinder, or they may be assembled in any other desirable 45 fashion. It will also be obvious that the assembly of the unit may be effected in various other ways than that illustrated and shown here which constitutes only a teaching of the invention in its broader aspect.

A modified form of the invention is illustrated 55 in Figures 9 and 10. In this arrangement a base plate or supporting disc 30 is provided which carries a compound porous wall structure. The plate or disc 30 is adapted to be mounted at the bottom of the tank on a gasket 47, and is provided 60 with a central hole 31 and a plurality of radially spaced holes 32 through which air from the pressure chamber beneath the disc 30 can pass. The porous wall structure for dispersing the air comprises a plurality of discs 33. These discs 33 are 65 mounted adjacent the holes 31 and 32, being equipped at their two sides with grooves 35 and a manifold portion 36 adjacent their centers. To hold the discs 33 in position adjacent the holes 32, washers 37 are placed on top of them and perforated pins 38 are projected through them and 70 through the holes 32 which pins 38 are held in place by nuts 39, the pins having ducts 40 in them which extend into and communicate with the holes 32. In the central hole 31 the assembly is 75

similar to that at the outer holes 32 except that a plug 41 is provided which is used for securing the whole assembly to the base 45 of the tank. This plug is provided with threads 42 which engage in a boss 44 and is equipped with a stop 43 similar to the stop 21 shown in Figures 1 and 2. The disks 33 can be cleaned by loosening pins 38 and central plug 41. Instead of a single disk 33 adjacent each hole as shown in Figures 9 and 10, a plurality of superimposed discs may be used, similar to those shown in Figures 1 and 2. Also the discs themselves may be constructed in accordance with any of the forms illustrated in Figures 3 to 8.

To sum up the advantage of the invention, it provides a porous wall structure which is extremely simple and sturdy of construction and in which the size and number of the pores, or in other words the capacity of the structure is accurately determinable. Furthermore, it provides a structure of a composite nature which is easy to clean and maintain in an operative and sanitary condition.

According to the provisions of the patent statutes, I have explained the principle and mode of operation of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

What is claimed is:—

1. A perforate structure comprising a plurality of plates arranged in surface-to-surface contact, each plate having an opening in its interior communicating with that of the next adjacent plate, and a portion of its surface adjacent said opening cut away to form a manifold chamber with the next adjacent plate, and a series of angularly spaced grooves extending in radial relation from said manifold chamber to an annular groove radially spaced from said opening and a second series of grooves extending in radial fashion from said annular groove to the outer edge of the plate.

2. A perforate structure built up of a plurality of substantially circular discs of diminishing diameters mounted one on top of the other in the form of a cone, said discs each having a hole in the center thereof and a portion of its surface surrounding said hole cut away to form a manifold chamber with the next adjacent disc and a system of pore-forming channels in its surface extending from said cut away portion to its outer edge, and means for detachably holding said disks in surface-to-surface contact and providing for the ready separation thereof for purposes of cleaning said pore-forming channels.

3. A perforate structure comprising a plurality of substantially circular discs of diminishing diameters mounted one on top of the other in the form of a cone, said discs each having a hole in its center, a portion of their surface adjacent said hole cut away to form a manifold chamber with the next adjacent disc, and a series of radial grooves on the opposite surfaces of each disc extending from the outer edge of said cutaway portions to the edge of the disc, said grooves being formed in the discs at an angle to a line passed through their centers and in opposite directions on opposite sides of the discs, whereby the grooves of adjacent discs will not coincide with each other.

4. A perforate structure comprising a plurality of flexible plates arranged one on top of the other into surface-to-surface relation and having registering holes in their interiors and finely divided

grooves on their surfaces extending from said holes to the outer edges of the plates, said grooves forming pores between the plates for conducting air or gas from said holes to their outer edges, means engaging the lower of said plates at the periphery thereof and means applying pressure to the center of the upper plates whereby said plates are flexed together in surface-to-surface relation.

5. A cream whipper comprising a hollow base member, a separable vessel mounted thereon, means within said base member for creating a forced draft of air, means within said vessel for receiving said air, and means having formed perforations of predetermined controlled size within said vessel for dividing the air thus received into a plurality of streams of finely divided bubbles, said perforations being of a size to prevent the cream within said vessel from flowing there-through.

6. An aerating device comprising a base member, a separable vessel mounted thereon, means supported by said base member for creating a forced draft of air, means within said vessel for receiving said air, and means having formed perforations of predetermined controlled size within said vessel for dividing the air thus received into a plurality of streams of finely divided bubbles, said perforations being of a size to prevent the liquid within said vessel from flowing there-through.

7. A cream whipper comprising a hollow base member, an electrical motor and air pump connected thereto and housed within said base member, a vessel removably supported upon said base member, an air chamber within the bottom of said vessel, removable air distributing plates upon the top of said air chamber, said plates having slots and grooves for distributing the air into minute jets.

8. A cream whipper comprising a hollow base member, means within said base member for creating a forced draft of air, a vessel removably mounted upon said base member, means within said vessel for dividing said air into minute streams of finely divided bubbles, said means comprising a plurality of separable members with passages formed therebetween breaking the draft of air into fine jets, said second-named means being removably mounted in said vessel, and means connecting said first-mentioned means and said vessel for ready separation, said second-named means being of a nature to prevent the liquid within said vessel from flowing therethrough.

9. A cream whipper comprising a hollow base member, means within said base member for creating a forced draft of air, a vessel removably mounted upon said base member, an air chamber within said vessel, said air chamber having closed bottom and side walls and having a top wall formed of perforate plates to divide the air into fine jets, means connecting said plates to said air chamber and connecting said air chamber to said first-mentioned means.

10. A cream whipper comprising a hollow base member, means within said base member for creating a forced draft of air, a vessel removably mounted upon said base member, an air chamber within said vessel, said air chamber having closed bottom and side walls and having a top wall formed of perforate plates to divide the air into fine jets, means removably connecting said plates to said air chamber and serving as a con-

duit between said air chamber and said first-mentioned means.

11. A cream whipper comprising a hollow base member, means within said base member for creating a forced air draft, a vessel removably mounted upon said base member, said air chamber having closed bottom and side walls and having a top wall consisting of a plurality of plates, one of said plates having slots in communication with said air chamber and the other of said plates having grooves therein communicating with said slots and communicating with the edges of said plate, and means connecting said air chamber with said first-mentioned means.

12. An aerating device comprising a container, a plate mounted above the bottom wall of the container and spaced therefrom to form a pressure chamber, said plate having a plurality of openings therein, discs overlying the several openings and having grooves formed on their surfaces for the distribution of gas from said pressure chamber in finely divided streams, means for supplying gas under pressure to said chamber, and means for attaching said discs to said plate to provide for the unitary removal of said plate and discs.

13. An aerating device for a liquid comprising a source of air or gas under pressure, a wall having a plurality of openings therein, each said opening being closed by an aerating element including a plurality of separable members with passages formed therebetween constructed and arranged to introduce said air or gas into said liquid in minute streams of finely divided bubbles and to substantially prevent free passage of said liquid therethrough.

14. A perforate structure for aerating foodstuffs, such as the whipping of cream, adapted to be connected with a gas pressure source, comprising a plurality of plates detachably arranged in surface to surface contact and provided with fine grooves etched on their surfaces forming channels of controlled limited size for permitting a flow of gas to be forced between them in predetermined finely divided streams, but adapted to substantially prevent the free flow of liquid therethrough.

15. An aerating device of the character described for the whipping of cream or the like comprising a container for holding the cream to be whipped, a source of air or gas under pressure, a perforate structure associated with a wall of said container, said perforate structure comprising a plurality of plates arranged in surface to surface contact, and provided with a system of fine grooves on adjacent contacting faces through which a flow of air or gas may be forced in predetermined finely divided streams of bubbles to produce a whipping action, said grooves being formed of such fineness as to substantially prevent the back flow of liquid therethrough under the normal pressure condition existing within said container.

16. An aerating device for a liquid comprising a source of air pressure, a plurality of plates arranged in surface to surface relation, each plate being provided with a system of finely divided grooves on the surface thereof, each groove forming with the next adjacent plate channels not substantially greater in dimension than the respective individual groove, providing for a flow of air from said air source being forced between the plates and introduced into the liquid in minute streams of finely divided bubbles, and an opening in the interior of each plate providing for

such flow from the interior of the composite structure outward.

17. A perforate structure comprising a plurality of separable plates arranged in surface to surface contacting relation, each plate having a system of grooves provided on the surface thereof and forming with the next adjacent plate a system of pores, an opening passing through the interior of each plate to provide for air being forced between the plates in finely divided streams from the interior outwardly, and means for detachably holding said plates firmly together in operative position, said means maintaining the plates as a unitary assembly while providing for the separation thereof for cleaning and the like when not in use.

18. An aerating device for aerating foodstuffs and the like such as whipping cream, comprising a source of air pressure, a container for holding the material to be aerated, a perforate structure positioned adjacent the bottom of said container, said perforate structure comprising a plurality of plates having holes in their centers and a system of finely divided grooves on their surfaces, the plates being arranged in surface to surface relation with said grooves arranged to permit a flow of air from said air source to be forced between the centrally located holes and the outer edges of the plates in finely divided streams of minute bubbles adapted to effectively whip the cream and having insufficient force to be carried through the cream, said grooves being adapted to substantially prevent free flow of liquid therethrough.

19. An aerating device for aerating foodstuffs and the like comprising a pressure chamber, means for supplying air under pressure to said pressure chamber, a perforate structure in communication with said pressure chamber, said perforate structure comprising a plurality of plates arranged in surface to surface contact and having holes in their centers and a system of radiating grooves on their surfaces extending in angularly spaced relation from said holes to the outer edges of said plates, said grooves forming passages with the adjacent surface adapted to divide the air from said pressure chamber into a plurality of predetermined minute streams of controlled size adapted to produce finely divided bubbles when in contact with a liquid, and adapted to substantially prevent backflow of the liquid therethrough.

20. A perforate structure comprising a plurality of plates arranged in surface to surface relation and having registering openings in their interiors and finely divided grooves on their opposite surfaces extending in non-radial direction from said openings to the outer edges of the plates, each plate having two series of such grooves, one series on each of its opposite sides, the grooves of corresponding series on all the plates being similarly arranged, and the grooves of opposite series on each of the plates being angularly related.

21. An aerating device for liquid foodstuffs, such as for whipping cream, comprising a container for holding the liquid to be aerated, said container having a wall formed of a plurality of plates arranged in surface-to-surface contact provided with fine channels or the like on adjacent faces, means for separably retaining said plates in assembled operative position and a source of air or gas under pressure associated with said wall, said wall providing for the introduction of said air into the container in predetermined minute streams of controlled size

adapted to produce finely divided bubbles, and adapted to substantially prevent backflow of the liquid therethrough.

22. A perforate structure comprising a plurality of plates arranged in surface to surface contact, each plate having an opening in the interior thereof communicating with that of the next adjacent plate, and each having a portion of its lateral surface adjacent said opening cut away to form a manifold chamber with the next adjacent plate, and a system of finely divided grooves extending on the surface thereof from the outer edge of said manifold to the outer edge of the plates, said grooves providing formed passages of predetermined controlled size adapted to substantially prevent passage of liquid therethrough.

23. A perforate structure for introducing air or gas from a pressure source into a liquid comprising a plurality of similarly shaped plates of progressively diminishing surface areas mounted one on top of the other, said plates each having a hole in the center, and a system of finely divided pore forming grooves extending upon the surface thereof from said hole to the periphery of the plate, said grooves being of predetermined controlled size to provide for the introduction of air or gas from said pressure source into the liquid in minute streams of finely divided bubbles and to substantially prevent backflow of the liquid therethrough and said structure preventing passage of said air or gas except through said grooves.

RAWSON E. STARK.

CERTIFICATE OF CORRECTION.

Patent No. 2,074,597.

March 23, 1937.

RAWSON E. STARK.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, lines 48 and 49, claim 8, strike out the words "breaking the draft of air into fine jets"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of May, A. D. 1937.

(Seal)

Henry Van Arsdale
Acting Commissioner of Patents.

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