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L. C. NIELSEN & P. V. F. PETERSEN.

LIQUID PASTEURIZER.

(Application filed Dec. 18, 1899.)

(No Model.)

FIG 1

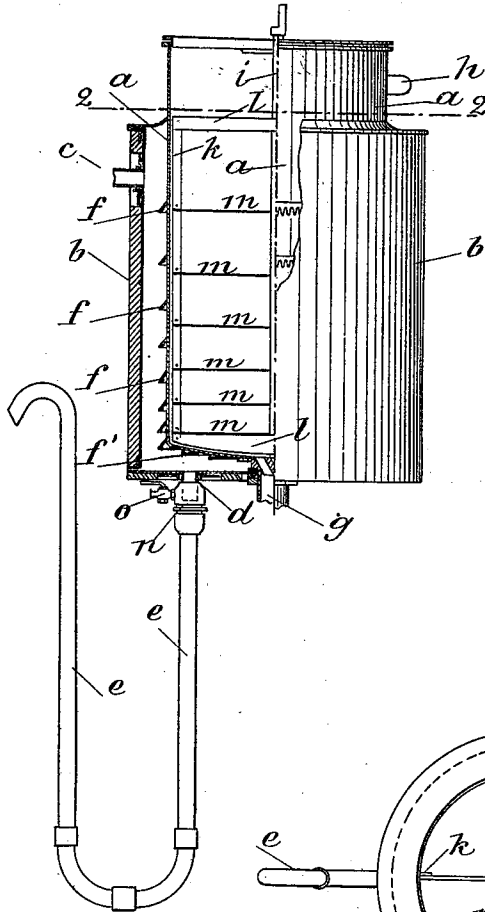
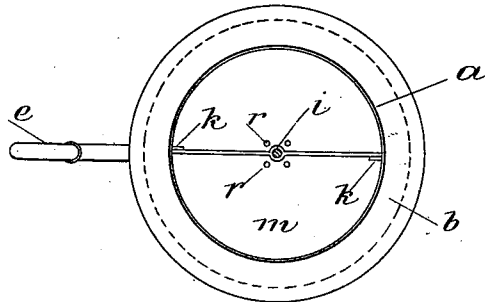


FIG 2



Witnesses

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LIQUID-PASTEURIZER.

SPECIFICATION forming part of Letters Patent No. 665,258, dated January 1, 1901.

Application filed December 18, 1899. Serial No. 740,764. (No model.)

To all whom it may concern:

Be it known that we, LARS CHRISTIAN NIELSEN, constructor, residing at Kong Georgsvej 12, and PETER VALDEMAR FREDERIK PETERSEN, computator, residing at Talkonerallé 41, in the city of Copenhagen, in the Kingdom of Denmark, subjects of the King of Denmark, have invented an Improvement in Liquid-Pasteurizers, of which the following is a specification.

Our invention relates to improvements in heating or sterilizing apparatus wherein the fluid, milk, and cream especially are passed through a chamber or heater, preferably steam or heat jacketed. The water of condensation escapes through a waste-water or drain pipe with a suitable drain-trap or water seal therein to exclude the external or outside air from the steam jacket or mantle. During the heating or sterilizing process the fluid is subjected to the agitating action of a stirrer or agitator arranged in the heater or chamber aforesaid in a relatively thin vertical layer on the wall of the chamber, leaving an empty space in the middle of the apparatus. The fluid to be heated will gradually leave the apparatus through a suitable outlet-spout. Such apparatus, however, have proved inefficient in several respects, resulting in decreasing the working capacity thereof and rendering it incapable to meet the continually-growing demands thereon. A thorough investigation of the matter has disclosed the following circumstances as causes therefor: The thermal conductivity of the heating-surface, and consequently the working capacity of the apparatus, is lowered to a marked degree by the water produced by the condensation of the steam developing in a layer outside the heating-surface. This layer increases in volume toward the bottom, and as water is a bad conductor of heat the consequence is obvious. It would appear that when the stirrer or agitator is, as hitherto, only a frame taken around on the inside of the heating-surface it will mix the fluid particles not only in horizontal direction, by which the renewal of the fluid to touch the inner side of the heating-surface is effected, but it will mix it in vertical direction, too, the consequence of which is that the

temperature on the inner side of the heating-surface is about the same all over and about the same as the outlet temperature. Thus the difference in temperature on the inner side and the outer side of the heating-surface is too small and the heating capacity of the apparatus insufficient. It will also be observed that air is accumulating in the steam-chamber, the air being carried along by the action of the steam and disengaged by the condensation thereof. The air accumulates especially near the heating-surface, thus preventing the steam from coming in so direct contact with said surface as would otherwise be the case, thus partly reducing the working capacity of the apparatus and rendering it measurably inconstant. Our invention overcomes these drawbacks or difficulties and in addition augments several times the working capacity of the apparatus.

The leading features of our invention are as follows:

First. Drip-rings or deflectors arranged at intervals apart upon the outside of the heating-surface—i. e., in the steam-chamber. These rings or deflectors conduct the water of condensation from narrow "zones" or arms, as it were, of the heating-surface, while otherwise said water would run down said heating-surface in a layer increasing in volume toward the bottom.

Second. Baffle-plates carried by the stirrer or agitator, whereby the fluid is caused to pass through the apparatus in such manner that the mixing of the parts of the fluid in a direction parallel with the stirrer-axis is virtually prevented. By means thereof the fluid to be heated will keep a relatively low temperature in the space beneath the lowest plate; but being heated to some degree here it will enter the space between the two lowest plates with a somewhat higher temperature, and so on, the outlet temperature not being reached until the fluid has reached the outlet-spout. Thus the average temperature on the inner side of the heating-surface is considerably lowered, causing a greater difference between the temperature on the outside and on the inside of the heating chamber or surface, thus promoting the current of heat,

and consequently aiding or increasing the working capacity of the apparatus.

Third. A vent-cock applied to the waste-pipe of the steam-chamber for the escape of
5 air disengaged from the steam in the steam-chamber.

Fourth. Numerous experiments have proved that the working capacity of the apparatus based upon our invention has been
10 increased from three to nine hundred per cent., according to the heating process taking place at temperatures lying between 85° and 95° centigrade—185° and 203° Fahrenheit.

In the accompanying drawings, illustrating the preferred embodiment of our invention,
15 Figure 1 is a view partly in side elevation and partly in section, parts also being omitted to more fully disclose the drip-rings or deflectors. Fig. 2 is a horizontal section taken on
20 the line 2 2 of Fig. 1.

In carrying out our invention we employ, preferably, a cylindric (parabolic or conical) chamber or heater *a*, made of copper or other
25 suitable metal, having a surrounding steam mantle or jacket *b*. The steam is introduced into said jacket or mantle by a suitable pipe connection *c*, and the water of condensation passes off through the outlet *d* and the bent waste-pipe *e*, adapted to form a drain-trap,
30 thus excluding the outside or external air from the steam-chamber.

Upon the outside of the chamber or heater *a*, within the steam jacket or mantle *b*, are arranged a number or multiplicity of upper-
35 surface-inclined drip-rings or deflectors *f*, preferably of sheet metal, dividing up the outer surface of said heater or chamber into a series or multiplicity of zones or circumscribed spaces, as it were. These drip-rings
40 or deflectors, it will be seen, thus take the water of condensation from said outer surface of the heater or chamber *a* at numerous divided-up points upon said surface, thereby preventing said water of condensation from
45 accumulating thereon, in which event it would run down upon the outsides of said heater or chamber and increase in volume toward the bottom thereof, therefore interfering with the thermal conductivity of said
50 sides of said chamber or heater. The water thus taken or shed from the heating-surface or heater *a* passes down the upper inclined surfaces of the rings or deflectors *f*, it finally dripping from the lower edges of said rings
55 or deflectors to the bottom of the steam-jacket. The drip-rings or deflectors, instead of being toothed or serrated at their lower edges, as principally shown, may be plain or unserrated at said edges, as is the case with
60 those shown at the bottom of the heater, as *f'*.

The fluid to be heated is supplied to the heater or chamber *a* through a supply or feed pipe *g*, making connection therewith and passing through the steam-jacket centrally
65 at the bottom, said fluid after being treated in said heater or chamber passing out therefrom through the spout *h*.

Arranged within the chamber or heater *a* is an agitator or stirrer comprising a central shaft *i*, suitably supported in operative position, lateral vertical bars *k*, a top horizontal
70 bar *l*, secured at the upper ends of said vertical bars *k* and centrally to said shaft, and a series of horizontal disks or plates *m*, also centrally secured to said shaft and vertical
75 bars and arranged at short, preferably varying, intervals apart, the same lessening toward the bottom. In each of these plates or disks are a number or plurality of air passages or perforations *r* around its center, upward through which the air is forced from
80 the fluid by the centrifugal action or motion of the agitator or stirrer, said air thus leaving the heater or chamber by said route.

The diameter or cross-section of each plate
85 or disk *m* is such that only a very narrow space is left between its outer edge and the inside wall of the heater or chamber *a*, whereby the fluid is caused to pass under the centrifugal action of the stirrer or agitator upward
90 therebetween in a thin stream or film, thus providing for bringing each liquid molecule in direct touch or contact with the heating-surface of the chamber or heater, fully sterilizing or pasteurizing the liquid or fluid.
95

The air carried along by the steam is disengaged in the steam-chamber and passes down through the pipe *d* and into the vent-chamber *n*, having a vent-cock *o* arranged
100 between said pipe and the pipe *e*. In order to insure this air a free passage down along the heating-surface, if cylindrical, the drip-rings or deflectors should have toothed or notched lower edges, as above referred to, the passage of the air thus being provided
105 for through said notches or incisions while the water of condensation is passing off or dripping from the points formed by such notches. This form of drip-rings or deflectors is preferred where the heating-surface
110 is perpendicular. Above the air thus disengaged and carried with the water of condensation into the chamber *n* is now a low pressure of steam and below thereof is a pressure of water. Consequently the air will
115 gradually be forced out of the vent-cock *o*, the opening therein being only of such size that the resistance to the outflow of air is sufficient to keep the steam and water in the chamber *n* separated. The extent of the
120 opening of the cock *o* can readily be ascertained by tests.

Our apparatus or invention, while adapted for heating or pasteurizing skim-milk or cream, also serves as a foam-remover or foam-
125 preventer. The fact is that the foam formed in the separator follows the milk or cream into the heating apparatus. When the foaming milk or cream passes between the plates or disks *m* and the inner side of the heater
130 the foam-bubbles are broken and dissolve into fluid and air. The centrifugal action of the agitator or stirrer forcing the air to the center and said air passing through the pas-

sages *r* and finally out of the apparatus, as before stated, the milk or cream leaves the apparatus practically free of foam.

5 Having thus fully described our invention, we declare that what we claim, and desire to secure by Letters Patent, is—

1. In heating or pasteurizing apparatus, having a chamber or heater through which the fluid to be heated is passed, a rotary stirrer
10 or agitator arranged in said chamber or heater, a steam mantle or jacket surrounding said chamber, and pipes for introducing steam into said mantle or jacket and for removing the water of condensation, the combination,
15 with said chamber or heater, of drip-rings or deflectors arranged upon the outside of said heater, within said steam-jacket adapted to conduct the water of condensation away from narrow "zones" of the heating-surface of said
20 heater, to allow said water to drip freely into the bottom of the steam-chamber, whereby a more rapid passage of heat through the surface of the heater is obtained than would otherwise be the case, substantially as de-
25 scribed.

2. In heating or pasteurizing apparatus having a heater or chamber through which the fluid to be heated is passed, a rotary stirrer or agitator in said heater, a steam mantle or
30 jacket surrounding said heater, and pipes for introducing steam into the mantle and for conducting therefrom the water of condensation, the combination with said stirrer, of plates carried thereby and arranged trans-
35 versely to its axis and having their outer or distant edges arranged at a short interval from the sides of said heater for the purpose of separating the fluid in layers, so that the mixing of the fluid molecules in the direction
40 of the stirrer-axis is essentially prevented and by which a lower average temperature on the inner side or surface of said heater or cham-

ber, and thereby a more rapid passage of heat through it, is obtained, than could be otherwise, substantially as set forth.

3. In heating or pasteurizing apparatus, having a heater through which the fluid to be heated flows, a rotary stirrer or agitator in said heater, a steam mantle or jacket surrounding said heater, and pipes for introduc-
50 ing steam into said mantle or jacket and for conducting away from it the water of condensation, the combination with said stirrer, of plates carried by said stirrer and arranged transversely to its axis and having their outer
55 or distant edges arranged at a short interval from the sides of said heater, said plates having air passages or perforations therethrough near the center, these passages or perforations serving as outlets for the air disengaged dur-
60 ing the centrifugal foam-removing operation, substantially as set forth.

4. In heating or pasteurizing apparatus, having a heater through which the fluid to be heated flows, a rotary stirrer in said heater,
65 a steam mantle or jacket surrounding said heater, and pipes for introducing steam into said mantle and for conducting therefrom the water of condensation, the combination, with said steam mantle or jacket and a pipe
70 for leading water from the bottom of said steam mantle or jacket, of a vent-cock arranged in said latter pipe, and through which the air, carried along with the steam and disengaged by its condensation, is continually
75 forced, substantially as set forth.

In witness whereof we have hereunto set our hands in presence of two witnesses.

LARS CHRISTIAN NIELSEN.

PETER VALDEMAR FREDERIK PETERSEN.

Witnesses:

MAGNUS JENSEN,

JULES BLAU.