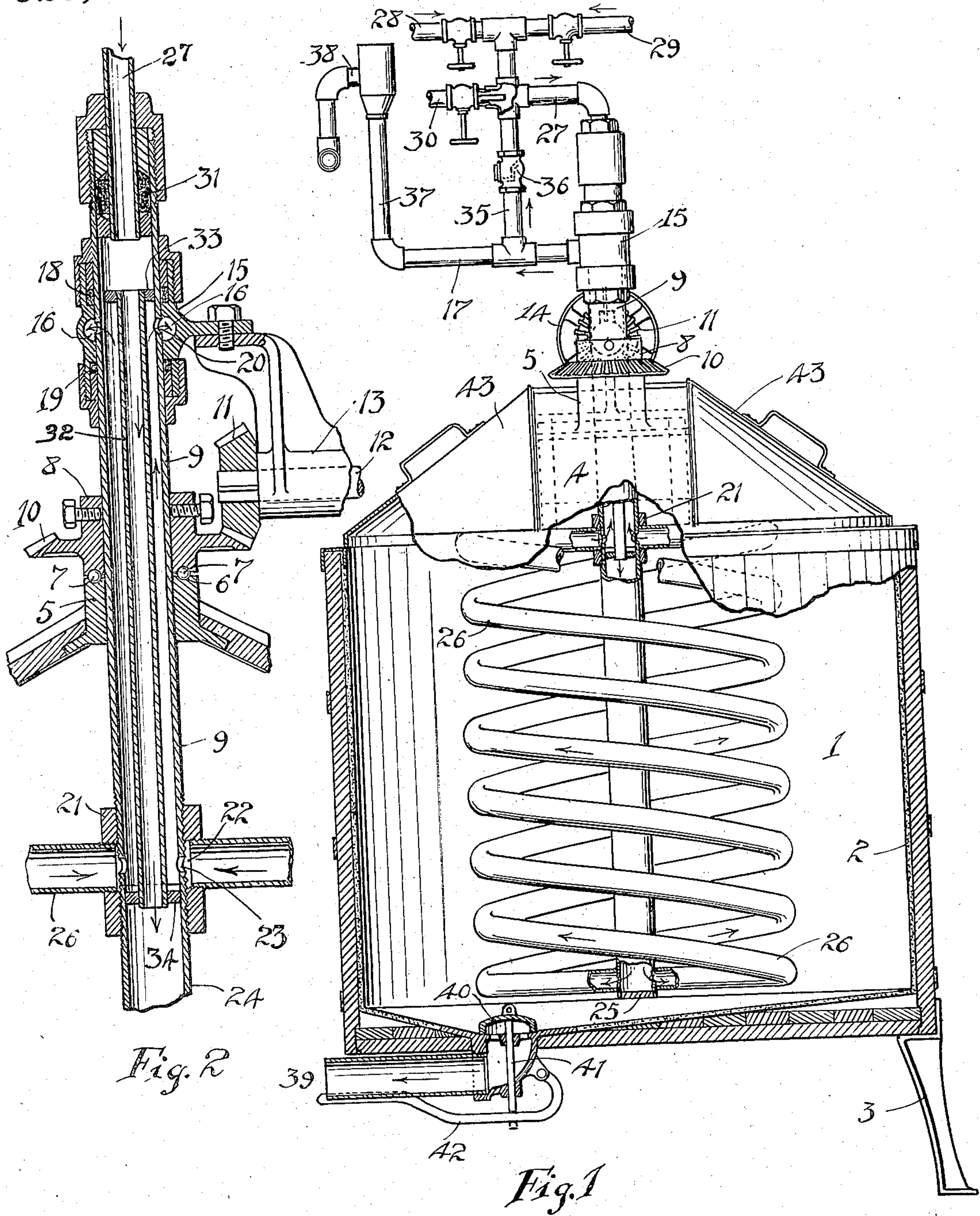


A. JENSEN.
 APPARATUS FOR HEATING AND COOLING LIQUIDS.
 APPLICATION FILED JUNE 16, 1908.

Patented June 8, 1909.

924,233.



WITNESSES:

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AAGE JENSEN, OF EUREKA, CALIFORNIA.

APPARATUS FOR HEATING AND COOLING LIQUIDS.

No. 924,233.

Specification of Letters Patent.

Patented June 8, 1909.

Application filed June 16, 1908. Serial No. 438,813.

To all whom it may concern:

Be it known that I, AAGE JENSEN, a citizen of the United States, residing at Eureka, in the county of Humboldt and State of California, have invented new and useful Improvements in Apparatus for Heating and Cooling Liquids, of which the following is a specification.

The present invention relates to an apparatus for heating or cooling liquids, being especially adapted for cooling milk, or cream, or for heating the same for the purpose of pasteurization or the like, the objects of the invention being to provide an apparatus of this character which will produce a regular and uniform circulation in the liquid, which can be operated with a minimum expenditure of power, and which can be very readily maintained clean and in a sanitary condition.

An especial object of the invention is to provide an apparatus of this character which will be entirely free from bearings or supports for moving parts which could be in contact with the liquid to be treated.

In the accompanying drawing, Figure 1 is a vertical section of my improved apparatus, certain parts being shown in side elevation; and Fig. 2 is an enlarged vertical section of the upper portion of the apparatus.

Referring to the drawing, 1 indicates a suitable receptacle for the milk, cream, or other liquid to be treated, which may be either cylindrical in form, where only a single heating or cooling appliance is used, or elongated, when there are used a number of such appliances, preferably in line with each other. Inasmuch as the principle of operation is precisely the same whether one or more of such appliances are used, and the receptacle is correspondingly formed, it will be sufficient to describe the apparatus when used with a single heating or cooling appliance, in which case the receptacle is preferably made cylindrical. Said receptacle has a suitable metallic lining 2, and stands upon legs 3. It is closed by a cover 4, in the center of which is secured a vertical tubular guide 5, upon the upper edge of which is a runway 6 for balls 7, upon which rotates a sleeve 8 secured to a tube 9 extending downward through said guide 5. Said sleeve is formed with a bevel gear 10 which meshes with a bevel gear 11 on a horizontal shaft 12 supported in a bearing 13 upon the cover 4

of the receptacle and driven by a pulley 14 from any suitable source of power, thereby imparting rotation to the bevel gear 10 and to the tube 9.

Secured upon the bearing 13 for the horizontal shaft is an upper bearing 15 for the tube 9, said bearing being formed with an annular channel 16 with which connects an outlet pipe 17, said bearing being provided with stuffing boxes 18, 19, above and below said channel 16. Said outlet pipe 17 communicates with the tube 9 through holes 20 formed in the latter opposite to the channel 16. The lower end of said tube 9 is screwed into a sleeve 21, having an annular channel 22 in its inner surface, said tube 9 connecting with said channel 22 by holes 23 formed in said tube. Into said sleeve 21 is also screwed the upper end of the lower tube 24, closed at the bottom by a head 25. With the bottom of said lower tube communicate the ends of helical tubes 26, two being here shown, although three, four, or any other number may be used. Said helical tubes 26 connect with said lower tube at points diametrically opposite to each other, and said helical tubes connect in like manner at their upper ends with said sleeve 21, whereby said helical tubes are balanced on the central tube. The upper ends of the helical tubes 26 open into the channel 22 and thus connect with the tube 9.

27 indicates the inlet pipe, with which connect a pipe 28 for admitting cold water, a pipe 29 for admitting brine, and a pipe 30 for admitting steam. One or more of these can be used selectively for the purpose of cooling or heating. The pipe 27 makes a tight connection with the upper end of the tube 9 by means of a stuffing box 31. Within said tube 9 a smaller tube 32, open at each end, extends from a point above the outlet pipe 17 to a point below the openings 23 into the sleeve 21, said open ends being separated from the space between said inner and outer tubes by means of upper and lower heads 33, 34. Thus the inlet pipe 27, communicates, by means of the inner tube 32, only with the lower tube 24.

Connecting the outlet pipe 17 with the inlet pipe 27 is a pipe 35 having therein a check valve 36, and in addition said outlet pipe 17 has a stand-pipe 37 having an overflow 38 at a higher point than the level of the steam inlet.

The liquid to be treated can be drawn off from the receptacle by a pipe 39 which is closed by a valve 40 having a stem 41 which can be raised by a lever 42. The liquid to be
5 treated can be supplied to the interior of the receptacle through suitable doors 43 in the cover.

The operation of the apparatus is as follows: The liquid to be treated having been
10 supplied to the casing, and power having been supplied to the shaft 12, the inner and outer tubes and the helical coil connected thereto are thereby set in rotation, a very small amount of power being needed there-
15 for on account of the whole weight being suspended upon the ball bearings 7. Supposing, now, that it be desired to heat said liquid, and the inner, outer and helical tubes being filled with water, steam is admitted by the
20 inlet pipe 27, which causes the water to flow, as shown by the arrows, down the inner tube 32, below the lower head to the lower tube 24, thence into the helical tubes 26, flowing up the same, thence into the circular channel
25 in the sleeve 21, thence through the opening 23 into the space between the inner and outer tubes and to the upper portion of the outer tube 9, thence through the openings 20 at the top of said outer tube into the channel
30 16, thence to the outlet pipe 17, thence by the connecting pipe 35 through the check valve 36 to the inlet pipe 27, and thus flowing in a continuous circuit. Any excess of water condensed from the steam will flow off by
35 the overflow pipe. The heated coils, thus revolving within the receptacle, heat the liquid therein, and at the same time produce a circulation and agitation, the liquid flowing upward at the center and downward at the
40 outer portions of the receptacle, so that the liquid is maintained at a uniform temperature therewithin. Owing to the fact that the pressure on the central tube due to the weight of the vertical and helical tubes and
45 to the pressure thereon of the liquid is uniform on all sides, said tube is perfectly balanced and there is no tendency whatever to deflect the same from the vertical.

It will readily be seen that all the parts of
50 the apparatus are readily accessible so that the apparatus can be easily maintained in a sanitary condition.

When the valve for the outlet pipe is located at a distance from the entrance into
55 said pipe from the receptacle, the liquid in

said pipe escapes the pasteurizing or cooling action.

By placing the outlet valve at the entrance to the outlet pipe from the interior of the casing, the liquid is entirely excluded from said
60 outlet pipe until the valve is opened, so that all of the liquid is exposed to the action of the helical tubes.

It will be observed that all of the bearings or supports for the moving parts are in such
65 positions that they do not come into contact with the liquid to be treated.

While the operation of the apparatus has been described when used for heating, it will be readily understood that, to use the appa-
70 ratus for cooling, all that is necessary is to supply cold brine or other cooling fluid in the place of steam.

I claim:—

1. The combination of a suitable recepta- 75 cle, a cover therefor, a bearing supported by said cover, an outer tube rotatable in said bearing, a stationary discharge pipe, and means for conducting liquid from said rota-
80 table outer tube to said discharge pipe, a tortuous conduit within the receptacle, an inner tube within the outer tube, said outer tube being in communication with one end of said conduit and the inner tube of the other end
85 thereof, a head around the upper end of the inner tube and within the outer tube, a stationary inlet pipe leading to the upper end of the inner tube, and a stuffing box around said
90 pipe on said outer tube, substantially as described.

2. The combination of a suitable recepta- cle, a cover therefor, a tortuous conduit in
said receptacle, a bearing supported on said cover, an outer tube rotating in said bearing,
95 an inner tube within the outer tube, said inner and outer tubes being connected only with opposite ends of the tortuous conduit, a supply tube connected only with the inner tube, a discharge pipe connected only with
100 the outer tube, and a connection between the supply and discharge pipes having a check valve therein, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

AAGE JENSEN.

Witnesses:

FRANCES M. WRIGHT,
D. B. RICHARDS.