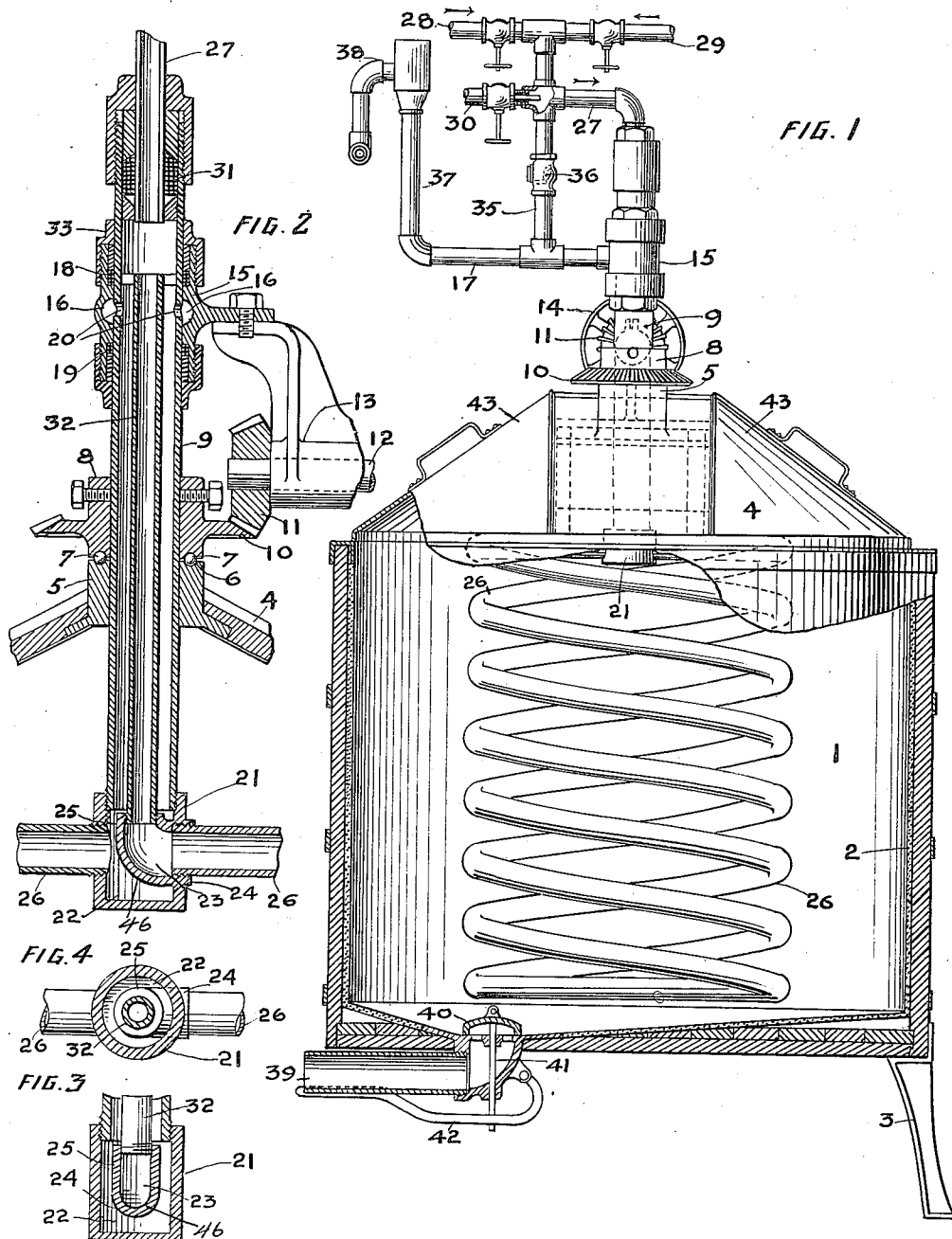


A. JENSEN.
 APPARATUS FOR HEATING OR COOLING LIQUIDS.
 APPLICATION FILED MAY 8, 1909.

949,769.

Patented Feb. 22, 1910.



WITNESSES:

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UNITED STATES PATENT OFFICE.

AAGE JENSEN, OF EUREKA, CALIFORNIA.

APPARATUS FOR HEATING OR COOLING LIQUIDS.

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Specification of Letters Patent.

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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 or Cooling Liquids, of which the following is a specification.

The object of the present invention is to provide an apparatus for heating or cooling liquids, which shall be simple and inexpensive in construction and which will produce a substantially uniform heating or cooling effect at the different levels of the receptacle for containing the said liquid.

In the accompanying drawing, Figure 1 is a vertical section of my improved apparatus, certain parts being shown in side elevation; Fig. 2 is an enlarged vertical section of the upper portion of the apparatus; Fig. 3 is a vertical section through the connection box, at right angles to that shown in Fig. 2; Fig. 4 is a horizontal section through said box and through the ends of the coil.

Referring to the drawing, 1 indicates a suitable receptacle for 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. 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 a 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 the tube 9 is screwed

into a connection box 21, divided into two compartments 22, 23, by a partition in the form of an elbow 46, formed integral with said box 21, having a horizontal threaded aperture 24 and a vertical threaded aperture 25. The cylindrical wall of the box 21 is also formed with a threaded aperture opposite to the aperture 24, and, by means of said threaded apertures, having right and left threads respectively, the box is adapted to be screwed on to the ends of a tube 26. Said tube is in the form of a double helix, extending from one end downward in a helical coil and then from the bottom extending in a helical coil upward to the other end, the second helical coil alternating with or intermediate between the first coil. After said box has been screwed upon the ends of said coil, so that said ends are connected with the respective compartments 22, 23, of the box, the box with the coil attached thereto is then screwed on to the lower end of 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 the connection box, the lower end of said pipe being screwed into the threaded aperture 25 in the elbow 46 in said connection box 21. The upper end of the pipe 32 is separated from the space between said inner and outer tubes 9 and 32 by a head 33. Thus the inlet pipe 27 communicates, by means of the inlet tube 32, only with the compartment 23, and with one end of said tube 26.

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

The operation of the apparatus is as fol-

lows: The liquid to be treated having been supplied to the casing, and power having been supplied to the shaft 12, the inner and outer tubes and the double helical coil connected thereto are thereby set in rotation, a very small amount of power being needed therefor 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 inlet pipe 27, which causes the water to flow, as shown by the arrows, down the inner tube 32, into the chamber 23 of the connecting box 21, thence down one-half of the helical tube 26, then up the other half of the same, thence into the chamber 22 in the connecting box 21, thence into the space between the inner and outer tubes 32, 9, 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 16, thence to the outlet pipe 17, thence by the connecting pipe 35 through the check valve 36 to the inlet pipe 27, thus flowing in a continuous circuit. Any excess of water condensed from the steam will flow off by the overflow pipe. The heated coil thus revolving within the receptacle heats the liquid therein, and owing to the fact that the pressure on the central tube due to the weight of the vertical and helical tubes and 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.

A novel feature of this invention consists in the use of the double helical coil both the inlet and outlet ends of which are at the top of the coil. In prior apparatus of this character, in which there is used a coil or coils having a vertical axis, the outlet end of said coil is at the opposite end of the receptacle, vertically to its inlet end, one of these ends having been connected to a straight tube through the center of the coil. Since this straight tube produces practically no heating or cooling effect, and since, in pasteurizing, for instance, the coil gives off its heat continually from the inlet to the outlet end, so that, while the inlet end of the coil is very hot, its outlet end is substantially of the same temperature as the liquid to be treated, and the heating or pasteurizing effect upon the liquid is very unequal, the liquid being unduly heated at the inlet end while at the outlet end it is not sufficiently heated. This defect in the operation of the

apparatus is not entirely remedied by the fact that the liquid to be treated circulates in the receptacle, and thus assumes a uniform temperature throughout, for the reason that it is undesirable to heat certain liquids, such as milk or cream, above the temperature, necessary for pasteurization, for to do so changes the character of the milk or cream. But if the heating liquid at the outlet end of the coil is brought to substantially the same temperature as the liquid to be treated its temperature at the inlet end must be very much higher than the pasteurizing temperature in order to produce an average temperature proper for pasteurization. This excessive heat at the inlet end of the coil, being for a comparatively long time transmitted to the adjacent liquid to be treated, tends to injuriously affect the character of said liquid. In the present improvement this objection is avoided, by reason of the fact that the inlet and outlet ends of the coil are at the same level, and consequently, in the rotation of the coil, an excessive heating effect by the inlet end of the coil is neutralized by the much lower temperature at the outlet end thereof. In fact, it will readily be seen that the heating effect of the coil is substantially uniform for all heights of the coil. The result is a great increase in rapidity of operation, certainty of pasteurization, and uniformity in the character of the milk or cream so treated.

I claim:—

In an apparatus of the character described, the combination, with a suitable receptacle having an aperture, of means for changing the temperature of a liquid in said receptacle, comprising supply and discharge pipes, one within the other, passing through, and rotatable in, said aperture, a tube in said receptacle in the form of two helical coils, of which the ends remote from said aperture are connected with each other, and the ends adjacent thereto are connected respectively to said inlet and outlet pipes, the turns of said coils alternating with and being spaced midway from each other, and means for rotating said pipes and tube about the central axis of said pipes, substantially as described.

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

AAGE JENSEN.

Witnesses:

FRANK NAZRO,
J. M. NISSON.