L. S. PFOUTS.

HEATING OR COOLING APPARATUS.

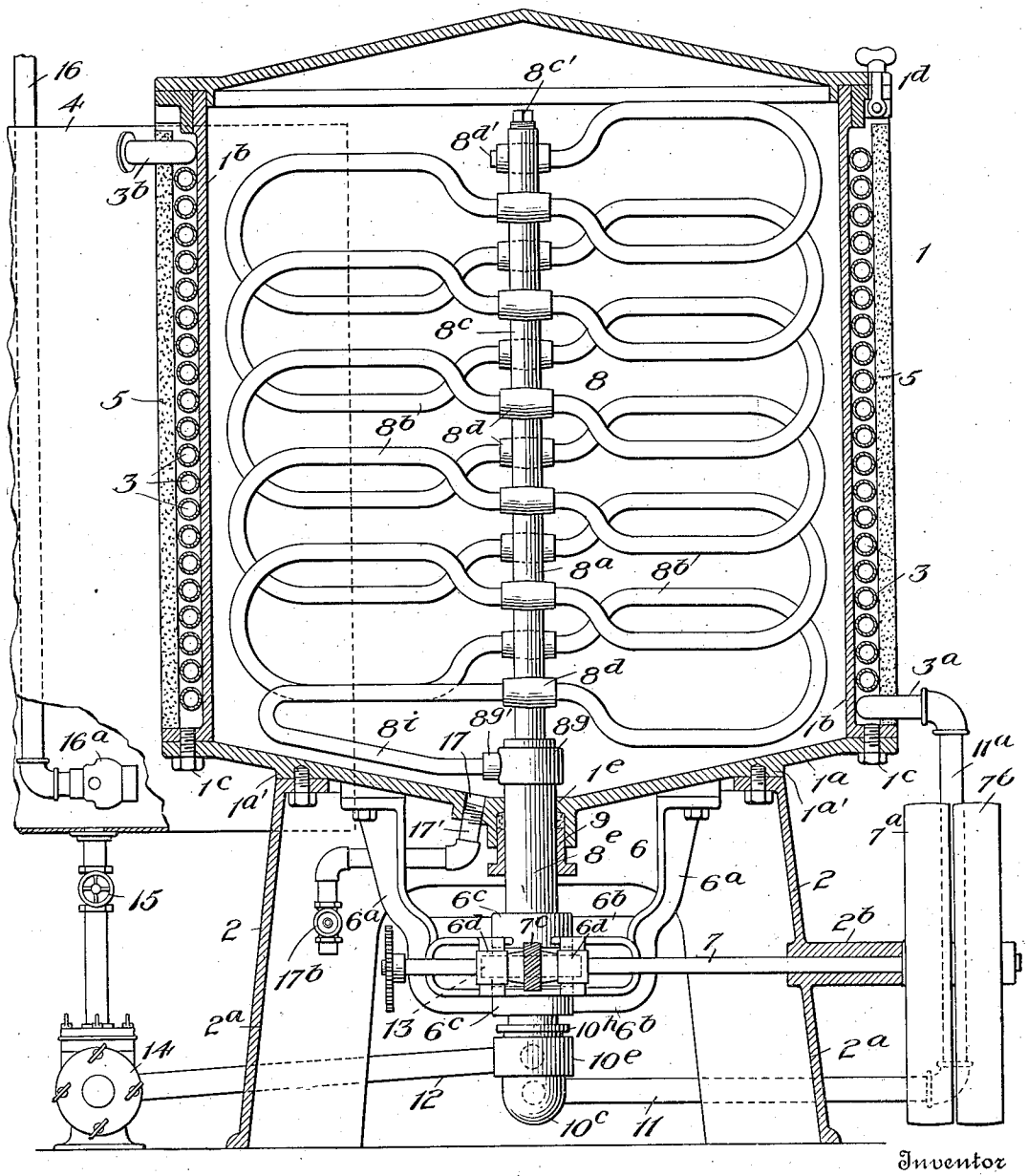
APPLICATION FILED JAN. 24, 1912.

1,156,851.

Patented Oct. 12, 1915.

2 SHEETS—SHEET 1.

Fig. 1.



Inventor

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Witnesses

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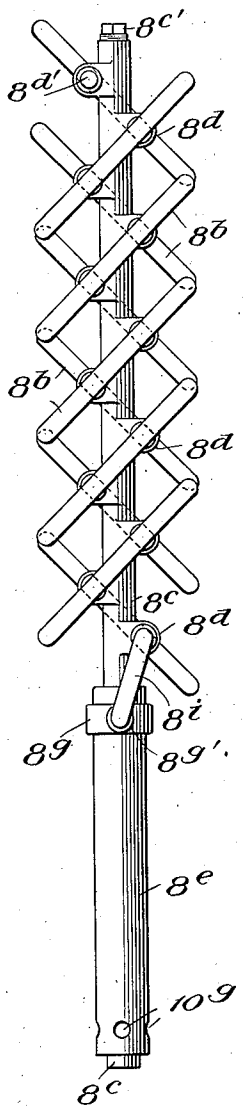
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2 SHEETS—SHEET 2.

Fig. 3.



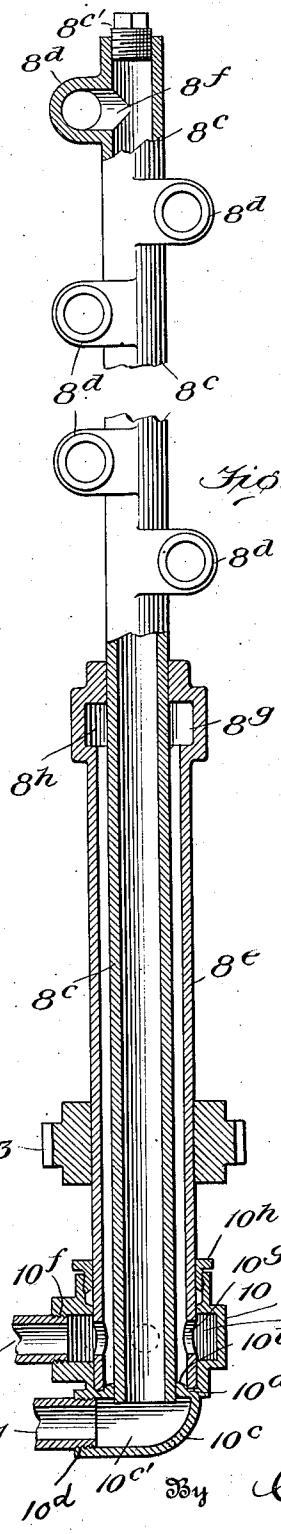


Fig. 2.

Fig. 4.

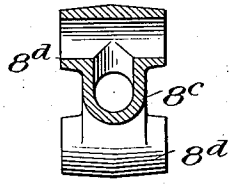


Fig. 5.

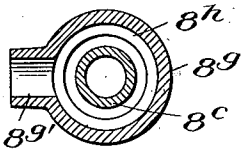
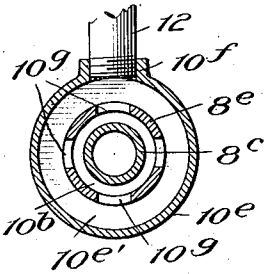


Fig. 6.



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UNITED STATES PATENT OFFICE.

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HEATING OR COOLING APPARATUS.

1,156,851. Specification of Letters Patent. Patented Oct. 12, 1915.

Application filed January 24, 1912. Serial No. 673,138.

To all whom it may concern:

Be it known that I, LEROY S. PFOUTS, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in and Relating to Heating or Cooling Apparatus, of which the following is a specification.

My invention relates to apparatus for heating or cooling a liquid, such as milk, cream or buttermilk, to any desired or predetermined temperature. In fact, with my improved apparatus, the liquid may be heated, held for a period of time at a predetermined temperature, and then cooled in the same receptacle, if desired.

For the purpose of illustration, I have, in the accompanying drawings, shown and herein described one form of apparatus embodying my invention.

Figure 1 is an elevation, partly in section, of an apparatus embodying my invention. Fig. 2 is a view of the shaft member of the rotary device, partly in section. Fig. 3 is an elevation of the rotary device as seen from either side in Fig. 1. Figs. 4, 5 and 6 are detail views.

In the drawings, 1 indicates a tank or casing. As an entirety it may be of any desired size and constructed in any ordinary or preferred manner. It preferably comprises a bottom wall 1^a, a cylinder 1^b fixed to said bottom by bolts 1^c, and a top or cover arranged to be removably fixed to the cylinder by devices, such as indicated at 1^d. The joints between the cylinder and the bottom and top are of a character to make the tank liquid tight. The under side of the bottom 1^a is provided with an annular bearing surface $1^{a'}$ which rests upon a supporting frame 2, the latter being provided with suitable legs 2^a, to support the tank at the desired elevation.

1^e indicates an axial opening formed in said bottom, and serving as a bearing, as will be later described.

3 indicates a pipe coil surrounding the cylinder 1^b and having an inlet connection 3^a at its lower end, and an outlet connection 3^b at its upper end communicating with a reservoir 4. The reservoir 4 may be supported at one side of the casing 1, or in any suitable manner, its function being that of holding a quantity of the heating or cooling medium to be used in the operation of the apparatus. The pipe coil may be supported adjacent to and in direct contact with the inner cylinder 1^b in any well known manner.

5 indicates a covering of material inclosing the pipe coil 3. This material is of a character, such as asbestos, or cork, to provide against undue losses by radiation as well as to assist in maintaining the temperature of the liquid within the tank or casing 1 as nearly as possible constant at the desired degree.

6 indicates a hanger depending centrally from the bottom 1^a of the tank 1, and comprising arms 6^a and cross members 6^b, 6^c indicates upper and lower bearings carried by said cross members and arranged in axial alinement with the bearing 1^e in the bottom 1^a.

6^d indicates horizontally arranged bearings, carried by the cross members 6^b and arranged to support one end of a horizontally disposed drive shaft 7. The opposite end of said shaft is mounted in a bearing 2^b preferably formed integral with the adjacent leg 2^a. 7^a, 7^b indicate fast and loose pulleys mounted on the shaft 7 for a drive belt (not shown).

7^c indicates a gear fixed on the shaft 7, the purpose of which will presently be described.

8 indicates a rotatable agitating, heating or cooling medium carrying device mounted in the tank 1. This device comprises a hollow shaft member 8^a and a plurality of pipe loops 8^b extending laterally from opposite sides of and carried by said shaft member 8^a. The loops 8^b are preferably enlarged so that sections of each loop are disposed in planes above and below sections of the adjoining loops. The shaft member 8^a consists of a hollow shaft 8^c provided with a series of loop connectors 8^d, and a concentrically arranged pipe 8^e surrounding its lower portion. The hollow shaft 8^c and concentric pipe 8^e extend through the bearings 1^e and 6^c, and are adapted for rotation therein, the pipe 8^e being journaled in said bearings. The shaft 8^c may be closed at its upper end in any suitable way, as by a screw plug $8^{c'}$. The connectors 8^d are preferably formed integral with the shaft 8^c, (see Fig. 4) being arranged on diametrically opposite

sides thereof and staggered, one relative to the other, from bottom to top at uniform distances apart. Between the uppermost connector 8^d and the shaft 8^c an opening 8^f is formed to permit the heating or cooling medium to flow from the end of the uppermost loop 8^b into the conduit extending through the shaft 8^c. Each loop 8^b is connected at its opposite ends in any well known manner to the corresponding ends of adjoining loop connectors 8^d. The loops 8^b are preferably arranged so that the lowermost arm of each loop on one side of the shaft is connected to the connector 8^d to which the uppermost arm of each loop on the opposite side of the shaft is connected. By this arrangement the loops 8^b and connectors 8^d form a long conduit or pipe of circuitous form for the flow of the heating or cooling medium. The end of the uppermost connector 8^d opposite to that end to which the uppermost loop is connected may be closed by an integrally formed cap or wall, or by a screw plug, as shown at $8^{d'}$.

8^g indicates a coupling arranged at the upper end of the concentric pipe 8^e, it being preferably formed integral therewith. This coupling is enlarged, as shown at 8^h to form a chamber. It is also reduced to form a collar which tightly fits the shaft 8^c and forms an end wall for the pipe 8^e. Leading from the coupling 8^g is an integrally formed nipple $8^{g'}$ to which one end of a pipe loop 8^i is connected, the opposite end of which is connected to the lowermost connector 8^d. Thus it will be seen, the tank 1 being filled with the liquid to be treated, that when the device 8 is rotated, the heat or cold to be transferred from the medium flowing through the pipe loops will be quickly transmitted to the liquid to be treated within the receptacle. It will also be seen that the pipe loops 8^b extend laterally to opposite sides of the shaft 8^a and are arranged on each side thereof in inclined planes parallel to each other and that the loops are, by preference, enlarged so that sections of each loop are disposed in planes above and below sections of adjoining loops. It follows from this arrangement that when the loops are revolved, the liquid will be thoroughly agitated and every particle or portion thereof brought into intimate contact with the loops. The effect of this operation will be to heat or cool the entire volume of the liquid rapidly and substantially uniformly.

9 indicates a packing gland of suitable form surrounding the outer pipe 8^e to make the bearing 1^e liquid tight.

10 indicates a combined coupling and thrust bearing member arranged at the lower end of the shaft member 8^a. It is formed with an in-turned annular closing wall and seat 10^a, the inner peripheral edge of which is provided with a flange 10^b that forms a bearing for the lower open end of the hollow shaft 8^c. At 10^c the coupling is provided with an integral, substantially semi-spherical wall forming an outlet chamber $10^{c'}$ for the heating or cooling medium flowing from the inner hollow shaft 8^c. The wall 10^c is formed with a port 10^d in which one end of an outlet pipe 11 is connected.

As will be seen in the drawings, the walls of the coupling 10 and flange 10^b form an annular recess to receive the lower end of the outer pipe 8^e, while the wall 10^a forms a seat or end bearing therefor. At 10^e the walls of the coupling are enlarged to form an annular chamber $10^{e'}$, and an inlet opening 10^f is formed at one side of said enlarged walls to receive one end of an inlet pipe 12, by means of which connection may be made with the reservoir 4. Opposite the annular chamber in the coupling 10, the outer pipe 8^e is formed with one or more openings 10^g to permit the flow of the medium from the chamber $10^{e'}$ into pipe 8^e.

10^h indicates a suitable packing gland which forms a liquid tight joint between the outer pipe 8^e and coupling 10.

13 indicates a suitable gear secured to the outer pipe 8^e. It meshes with the gear 7^c, by means of which the rotary motion is transmitted to the device 8. The pipe 11 is connected at its outer end with an uptake 11^a, which latter is connected to the pipe coil 3 by means of the connection 3^a.

14 indicates any suitable device for causing a circulation of the heating or cooling medium. This device is shown as a steam pump, which may be interposed in the supply pipe 12 between the reservoir 4 and the coupling 10. As will be clearly understood from the drawings, the heating or cooling medium is a liquid, preferably water, which is drawn from the reservoir 4 and delivered to the annular chamber $10^{e'}$. From this chamber the medium flows through the pipe 8^e, and enters the pipe 8^i, through which and each of the loops 8^b it flows to the upper end of the shaft 8^c. Entering the shaft 8^c through the opening 8^f, the medium flows downward to the chamber $10^{c'}$. From this chamber, the medium is conveyed by the pipe 11 to the pipe coil 3 and after passing therethrough, it is discharged through the connection 3^b into the reservoir 4.

15 indicates a valve which may be arranged in the pipe 12.

As a means for heating the circulating medium, when my apparatus is to be used as a heater, I provide a steam pipe 16 that is connected with a suitable source of supply. This pipe extends into the reservoir 4 and carries at its free end an injector or nozzle 16^a which operates in the well known manner to quickly heat and maintain at any desired temperature the liquid contents of the reservoir. When the apparatus is used

as a cooler, the steam pipe 16 can be omitted or a pipe connected with a cold water source of supply may be substituted therefor.

17 is an outlet opening in the bottom wall 1ª and 17′ an outlet duct leading therefrom and controlled by a valve 17ᵇ. In this manner provision is made for withdrawing the liquid treated in the receptacle when desired.

To those skilled in the art of making apparatus of the class described, many alterations in construction and widely differing embodiments and applications of my invention will suggest themselves, without departing from the spirit and scope thereof. My disclosures and the description herein are purely illustrative, and are not intended to be in any sense limiting.

What I claim is—

1. In an apparatus of the class described, the combination of a tank having a bottom formed with an opening, a two-way medium carrying member rotatably mounted in the opening in said bottom and forming liquid tight inlet and outlet connections to and from the interior of said tank, the said member including a hollow shaft extending longitudinally of the tank and forming one way through said medium carrying member, a plurality of pipe loops connected together in series to form a conduit which is connected at its opposite ends to said member and the free end of said shaft, the said loops being supported by and extending laterally from said shaft to opposite sides thereof and the loops on each side of said shaft being disposed in inclined planes parallel to each other, means for supplying a medium to the other way of said medium carrying member, and means for rotating said member.

2. In an apparatus of the class described, the combination of a tank having a bottom formed with an opening, a two-way medium carrying member rotatably mounted in the opening in said bottom and forming liquid tight inlet and outlet connections to and from the interior of said tank, the said member including a hollow shaft extending longitudinally of the tank and forming one way through said medium carrying member, a plurality of pipe loops connected together in series to form a conduit which is connected at its opposite ends to said member and the free end of said shaft, the said loops being supported by and extending laterally from said shaft to opposite sides thereof and the loops on each side of said shaft being disposed in inclined planes parallel to each other, and each loop being enlarged to extend above and below sections of adjoining loops, means for supplying a medium to the other way of said medium carrying member, and means for rotating said member.

3. In an apparatus of the class described, the combination of a tank having a bottom formed with an opening, a medium carrying member rotatably mounted in the opening in the bottom of the tank, the said member comprising a hollow shaft, a sleeve fixed to and surrounding the lower portion of said shaft, a plurality of connected loops carried by the shaft for circulating a medium, a connection between the upper loop and the upper end of the shaft, a connection between the lower loop and said sleeve, and a coupling formed with openings communicating with said shaft and sleeve, the coupling being provided with a flanged annulus forming a thrust bearing and end wall for said sleeve.

4. In an apparatus of the class described, the combination of a tank having a bottom formed with an opening, a medium carrying member rotatably mounted in the opening in the bottom of said tank, the said member comprising a hollow shaft provided with a plurality of hollow connectors spaced from each other from end to end thereof, the uppermost connector communicating with the upper end of said shaft, a series of loops arranged on opposite sides of the shaft and each having its opposite ends connected to adjoining connectors and each connector forming a conduit between one end of each loop on one side of the shaft and the adjacent end of a loop on the opposite side of the shaft and means for supplying a medium to the lowermost loop, and means for rotating said member.

5. In apparatus of the class described, the combination of a tank having a bottom formed with a bearing opening, a medium carrying member extending through and rotatably mounted in the opening, the said member comprising a hollow shaft, a sleeve surrounding the lower portion of the shaft, a series of connected loops carried by the shaft and having connection at one end therewith, and a connection between the other end of the loops and said sleeve, a hanger depending from the bottom of said tank and provided with a pair of spaced cross bars formed with alined bearings to receive the shaft and sleeve, means including a gear fixed to said sleeve between the cross bars of said hanger for rotating said medium carrying member, and connections below said hanger with said shaft and sleeve.

6. In apparatus of the class described, the combination of a tank having a bottom formed with a bearing opening, a medium carrying member extending through and rotatably mounted in the opening, the said member comprising a hollow shaft, a sleeve surrounding the lower portion of the shaft, a series of connected loops carried by the shaft and having connection at one end

therewith, and a connection between the other end of the loops and said sleeve, a hanger depending from the bottom of said tank and provided with a pair of spaced cross bars formed with alined bearings to receive the shaft and sleeve, means including a gear fixed to said sleeve between the cross bars of said hanger for rotating said medium carrying member, and a coupling below said hanger to receive the lower ends of the shaft and sleeve and provided with inlet and outlet openings therefor.

7. An apparatus of the class described, comprising a tank having a bottom for holding the material to be treated, a device extending through the bottom to form inlet and outlet liquid tight connections to and from the interior of the tank, the said device including a tubular member, a plurality of pipe loops supported by and extending laterally to opposite sides of said member and connected together in series to form a conduit, one end of which is connected to said device, and a connection between the opposite end of the conduit and said tubular member, means for supplying a circulating medium to said device, and an outlet pipe connected to said tubular member outside of said tank.

8. In an apparatus of the class described, the combination of a tank, a circuit through which a medium circulates, comprising a reservoir, a two-way medium-carrying device rotatably mounted in the bottom of said tank and forming liquid-tight connections to and from the interior thereof and having an inlet and an outlet, connections between said reservoir and the inlet and between the reservoir and the outlet, and a pump for circulating the medium through said circuit, and means arranged below the tank for rotating the medium-carrying device.

9. In an apparatus of the class described, the combination of a tank having a bottom arranged to hold material to be treated, a hollow shaft mounted in said tank and extending through said bottom, and provided with connectors, a plurality of laterally extending pipe loops having their opposite ends connected to said connectors so as to form a circuitous conduit, a pipe leading through the bottom of the tank and arranged concentrically on said shaft to form an inlet connection for a circulating medium, a connection between said concentric pipe and the lower end of the conduit, a connection between the upper end of the conduit and the hollow shaft, a coupling in which the lower ends of the said shaft and concentric pipe are mounted and provided with inlet and outlet openings for the circulating medium, and means arranged below the tank for rotating said shaft.

10. In an apparatus of the class described, the combination of a tank having a bottom arranged to hold material to be treated, a hollow shaft mounted in said tank and extending through said bottom and provided with connectors, a plurality of laterally extending pipe loops having their opposite ends connected to said connectors so as to form a circuitous conduit, a pipe leading through the bottom of the tank and arranged concentrically on said shaft to form an inlet connection for a circulating medium, a connection between said concentric pipe and the lower end of the conduit, a connection between the upper end of the conduit and the hollow shaft, a coupling in which the lower ends of the said shaft and concentric pipe are mounted and provided with inlet and outlet openings for the circulating medium, means arranged below the tank for rotating said shaft, a reservoir, connections between said reservoir and the inlet and outlet openings in said coupling, and a pump in one of said connections for circulating the medium.

11. In an apparatus of the class described, the combination of a tank, a hollow shaft mounted therein and extending through the bottom of said tank, the upper end of said shaft being closed and its lower end being open, a plurality of pipe sections connected together to form a circuitous conduit supported by the shaft and extending laterally therefrom, an intake pipe concentric with said hollow shaft and extending through the bottom of the tank, the lower end of the conduit being connected with said intake pipe and the upper end of the conduit being connected with the hollow shaft, a coupling formed with fluid inlet and outlet chambers and arranged to inclose the lower ends of the shaft and intake pipe, the intake pipe being formed with opening for the passage of the circulating medium, an annular wall forming a bearing or seat for the intake pipe, means for supplying the circulating medium to the inlet chamber in the coupling, means for conveying the material from the outlet chamber thereof, and means connected with said intake pipe below the tank for rotating it and said shaft.

In testimony whereof I affix my signature, in the presence of two witnesses.

LEROY S. PFOUTS.

Witnesses:
WILLIAM H. MILLER,
JOHN H. BISHOP.