July 31, 1928. 1,679,205

F. O. CONILL

REFRIGERATION

Filed Jan. 16, 1923

Fig. 1.

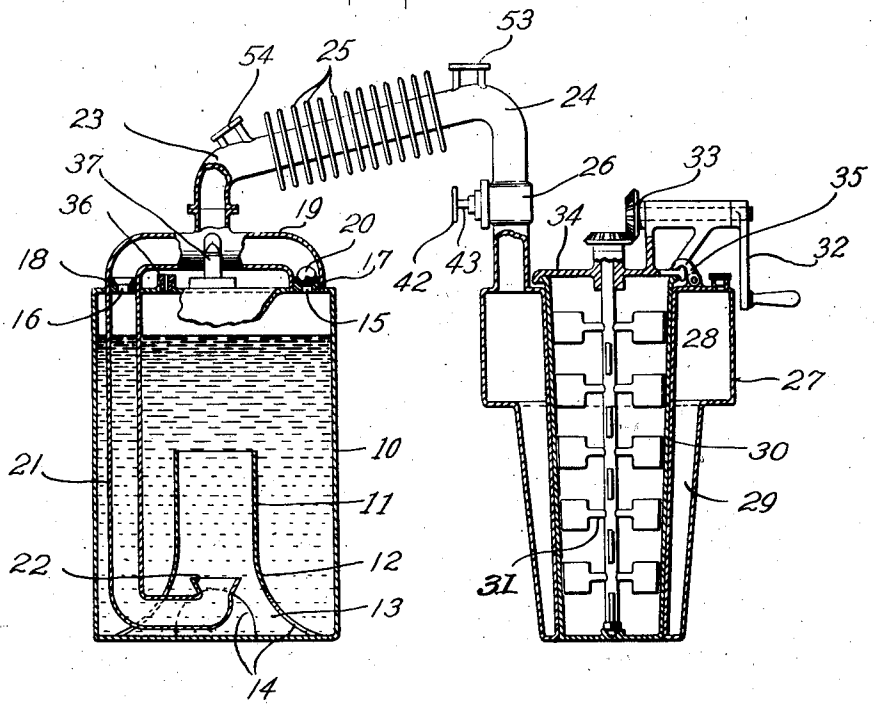


Fig. 2.

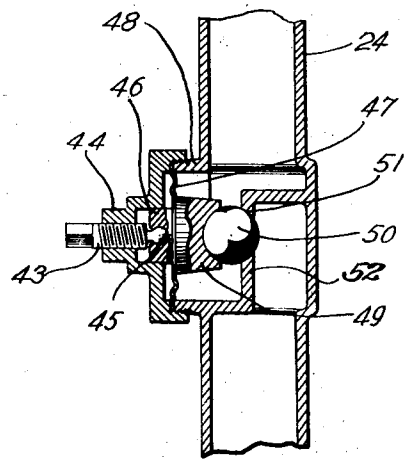
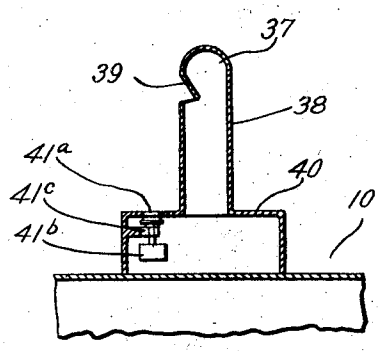


Fig. 3.



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UNITED STATES PATENT OFFICE.

FERNAN O. CONILL, OF MARSEILLE, FRANCE.

REFRIGERATION.

Application filed January 16, 1923. Serial No. 612,885.

This invention relates to cooling or refrigeration. One of the objects thereof is to provide practical apparatus of the above nature of simple and rugged construction. Another object is to provide apparatus of the above nature of highly efficient and dependable action. Another object is to provide apparatus of the above nature in which the action shall be under complete control and readily regulated. Other objects are to provide a simple and practical art characterized by efficiency and convenience and by dependability in achieving the desired results. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangement of parts, steps and combinations of steps, all as will be hereinafter illustratively described and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings in which is shown one of various possible embodiments of the mechanical features of this invention,

Figure 1 is an elevation showing the apparatus in part in central vertical section;

Figure 2 is an enlarged sectional view of a valve and related parts; and

Figure 3 is an enlarged sectional view of an alarm signal.

Similar reference characters refer to similar parts throughout the several views of the drawings.

Referring now to Figure 1 of the drawings, there is shown a receptacle 10 having mounted therein a tube 11, the lower end of which is outwardly flared at 12 and supported on the bottom of the receptacle by legs 13 spaced to provide openings 14 therebetween. At the upper end of this receptacle are formed ports 15 and 16 provided with valve seats 17 and 18 respectively. These valve seats are connected by a transverse conduit 19 curved at its respective ends downwardly toward the seats. Coacting with these seats alternatively is a valve 20 preferably of the ball form which may by suitable inclination of the device be brought into operative relation with either valve seat 17 or valve seat 18 exclusively and act to seal the corresponding port.

Extending downwardly from the conduit 19 is a conduit 21 curved laterally and thence upwardly to provide the flared upwardly-directed open end 22 which is concentrically disposed within the tube 11.

Leading from conduit 19 is a conduit 23 which passes first upwardly and thence in a laterally upwardly inclined direction to a bend 24. This conduit is provided with cooling flanges 25 for a purpose hereinafter described. From the bend 24 the conduit leads downwardly past a sealing valve 26, the details of which are shown in Figure 2 of the drawings. The conduit opens downwardly at the lower side of this valve into a receptacle 27 preferably of the shape indicated to form an upper annular chamber 28 and a lower annular chamber 29 of less thickness. The inner walls 30 of the chambers 28 and 29 are adapted to receive the substance to be frozen and in the present case are slightly divergent in an upward direction. Near these walls shaped substantially to fit the same is a dasher 31 rotatable about a vertical axis as by means of the crank 32 and beveled gearing 33. This dasher with the gearing and crank are mounted upon a cover plate 34 which is removable with respect to the receptacle 27 in an upward direction, thus carrying with it the dasher. A suitable locking device 35 is provided to lock the dasher in position if desired or to be released to permit its removal.

Recurring to the receptacle 10 and associated parts, there is provided a filling device 36 hermetically sealed in any suitable manner and at 37 is a safety signal device better shown in Figure 3 of the drawings. In this enlarged sectional view of Figure 3 which is taken at right-angles with the plane of the paper through the center of the device as shown in Figure 1, it is seen that there is provided a tube 38 closed at its upper end and having a vent at 39 adapted to form a whistle. This whistle is mounted upon and is in communication with a small container 40 mounted in thermal contact with the receptacle 10. The container is provided with a vent 41 in turn guarded by a check valve 41^a controlled by a float 41^b, the valve stem being guided by a bracket 41^c. Upon immersion of receptacle 10 in water, for example, as herein described, the check valve 41^a permits the container 40 to be filled to an extent determined by the float 41^b. Upon the pressure within the receptacle 10 becoming excessive, due to heating, the water in the container 40 begins to boil

and the steam issuing through the whistle produces an alarm signal, or warning of the excessive pressure, whence the heating may be reduced or terminated.

The valve 26 hereinbefore referred to is controlled by a hand wheel or grip 42 on a spindle 43 shown on a larger scale in the sectional view forming Figure 2 of the drawings. This spindle is threaded within the cap 44 so as to move inwardly and outwardly as the handle 42 is turned in one or the other direction. At the inner end of the spindle is a ball member 45 fitting within and interlocking with a plate 46 secured to the outer surface of a flexible diaphragm 47. This diaphragm is hermetically sealed at its edges to the annular flange 48 formed in the conduit 24. On the inner surface of the diaphragm 47 is secured a plate 49 having a suitable recess within which rests a ball valve 50. This valve co-acts with a valve seat 51 and upon being forced against its seat tightly closes the passage through the conduit 24 by reason of the partition 52 in which the valve seat is formed. If however it is desired to open this valve, the hand wheel or grip 42 is turned in a suitable direction to draw back the diaphragm 47 whereupon the valve 50 will be permitted to fall away from its seat to the desired extent. It will be seen however that under all conditions the passage through the conduit 24 is hermetically sealed and does not depend for tightness on the packing of any joint.

Considering now the method of using this apparatus, there is inserted within the receptacle 10 a suitable solvent in which is dissolved the desired amount of liquefiable gas, all as is described for example in my copending application Serial No. 612,886 filed January 16, 1923. With the parts in this condition and assuming that all air has been removed from the interior of the entire apparatus, the receptacle 10 or boiler is tilted as by means of lifting the apparatus by the handle 53. This causes the ball 20 due to the inclined position which the conduit 19 will assume by gravity to roll out of operative relation with the port 15 and into operative relation with the port 16. Heat is thereupon applied to the receptacle 10 in any suitable manner and the liquefiable gas is driven from the solution and passes outwardly into the conduit 24. As it passes through the upwardly inclined portion of this conduit the walls cooled by the flanges or vanes 25 condense any water vapor which may be carried up with the gas, the latter having a higher boiling point than the vapor. The gas thus free from water vapor passes into the chamber 29 assuming the valve 50 to be open, and is cooled and liquefied. Assuming that it be desired to immediately utilize the refrigerating action, the apparatus is lifted by the handle 54 to so tilt it by gravity as to bring the ball valve 20 back into operative relation to the port 15, it being understood that the heating agency is withdrawn from the receptacle 10 when the gas has been entirely driven off. The evaporation of the gas which has been liquefied in the chamber 29 now takes place and the gas passing through the conduit and thence through the port 18 travels downwardly until it is discharged upwardly at the open end 22. Thus placed in contact with the solution it is reabsorbed with a slight generation of heat which sets up convection currents in the water, these currents being accelerated by the force of the jet of gas entering the water and by the buoyancy of any bubbles which may me formed thereby. The upward current through the tube 11 draws inwardly the solution through the openings 14 and thus the returning gas is strictly, intimately and uniformly mixed with the solvent and the time required for its entering into the solution greatly reduced. This is a highly important factor in the efficiency of the apparatus. As the gas evaporates in the chamber 29 it necessarily absorbs its latent heat of evaporization from its surroundings, notably from the inner container in which the ice cream or other substance is being cooled. Simultaneously with this action the dasher may be operated and when the action has been completed the dasher may be removed in the usual way.

If desired when the gas has become liquefied within the device comprising the chamber 29, the valve 50 may be tightly closed. With the parts in this condition the freezing or cooling element maintains indefinitely its potential cooling action. This is totally different from any form of vacuum jacketed container which must gradually leak heat. Here the passage of heat to and from the liquefied gas during the period of storage is immaterial. All that is necessary is that the pressure be retained by the tight sealing action of the valve 50. Later at any desired time when the cooling action is wanted, this valve 50 is simply opened to a greater or less extent, depending on the rapidity of cooling which is desired. In this manner not only the time of action but the rate of action are under exact control for the refrigerating effect obviously varies with the rate of evaporation of the liquefied gas, which may in turn be varied by the valve 50.

It will thus be seen that I have provided apparatus and an art in which the several objects of this invention are achieved and that these are well suited to meet the conditions of hard practical use.

As various changes might be made in the above construction and as the art herein described might be varied in various particulars, all without departing from the scope of this invention, it is to be understood that

all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim as my invention:—

1. In refrigerating apparatus, in combination, a receptacle adapted to receive a liquid having dissolved therein a condensible gas which may be released from said liquid upon heating thereof in one stage of operation of the apparatus, a second receptacle connected to receive and have condensed therein the gas driven out of solution from the liquid in the first receptacle upon the heating of the latter, said first receptacle being adapted to be submerged in a cooling liquid during another stage of operation of the apparatus to cause the re-absorption of said gas within the liquid therein, a signal adapted to be operated by vapor pressure, and means associated with said first receptacle and forming a reservoir adapted to be filled with cooling liquid upon the submerging of said first receptacle, said reservoir-forming means being in thermal contact with said first receptacle and adapted upon a subsequent heating of the latter to supply vapor for operating said signal upon the attainment of a predetermined abnormal pressure of gas within said first receptacle.

2. In refrigerating apparatus, in combination, a receptacle adapted to receive a liquid having dissolved therein a condensible gas which may be released from said liquid upon heating thereof in one stage of operation of the apparatus, a second receptacle connected to receive and have condensed therein the gas driven out of solution from the liquid in the first receptacle upon the heating of the latter, said first receptacle being adapted to be submerged in a cooling liquid during another stage of operation of the apparatus to cause the re-absorption of said gas within the liquid therein, a signal adapted to be operated by vapor pressure, means associated with said first receptacle and forming a reservoir adapted to be filled with cooling liquid upon the submerging of said first receptacle, said reservoir-forming means being in thermal contact with said first receptacle and adapted upon a subsequent heating of the latter to supply vapor for operating said signal upon the attainment of a predetermined abnormal pressure of gas within said first receptacle, and means for limiting the quantity of cooling liquid that may be supplied said reservoir upon the submerging of said first receptacle.

3. In refrigerating apparatus, in combination, a receptacle adapted to receive a liquid having dissolved therein a condensible gas which may be released from said liquid upon heating thereof in one stage of operation of the apparatus, a second receptacle connected to receive and have condensed therein the gas driven out of solution from the liquid in the first receptacle upon the heating of the latter, said first receptacle being adapted to be submerged in a cooling liquid during another stage of operation of the apparatus to cause the re-absorption of said gas within the liquid therein, a vapor responsive signal device, a vessel in thermal contact with the contents of said first receptacle for holding a supply of liquid adapted to vaporize on heating and connected to supply vapor to said device, a vent through which said vessel may be supplied with liquid, and means for closing said vent upon the liquid therein reaching a predetermined level.

4. In refrigerating apparatus, in combination, a receptacle adapted to receive a liquid having dissolved therein a condensible gas which may be released from said liquid upon heating thereof in one stage of operation of the apparatus, a second receptacle connected to receive and have condensed therein the gas driven out of solution from the liquid in the first receptacle upon the heating of the latter, said first receptacle being adapted to be submerged in a cooling liquid during another stage of operation of the apparatus to cause the re-absorption of said gas within the liquid therein, a vapor responsive signal device, a vessel associated with said first receptacle and adapted to be submerged therewith to receive a charge of cooling liquid, said vessel being in thermal contact with said first receptacle, whereby the liquid in said vessel is adapted to be subsequently vaporized and to operate said device.

5. In refrigerating apparatus, in combination, a receptacle adapted to receive a liquid having dissolved therein a condensible gas which may be released from said liquid upon heating thereof in one stage of operation of the apparatus, a second receptacle connected to receive and have condensed therein the gas driven out of solution from the liquid in the first receptacle upon the heating of the latter, said first receptacle being adapted to be submerged in a cooling liquid during another stage of operation of the apparatus to cause the re-absorption of said gas within the liquid therein, a vapor responsive signal device, a vessel in thermal contact with the contents of said first receptacle for holding a supply of liquid adapted to vaporize on heating and connected to supply vapor to said device, a vent through which said vessel may be supplied with liquid, and a float-actuated valve for closing said vent.

In testimony whereof, I have signed my name to this specification this 5th day of January, 1923.

FERNAN O. CONILL.