

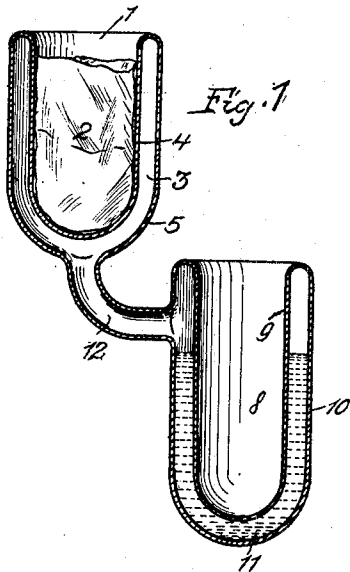
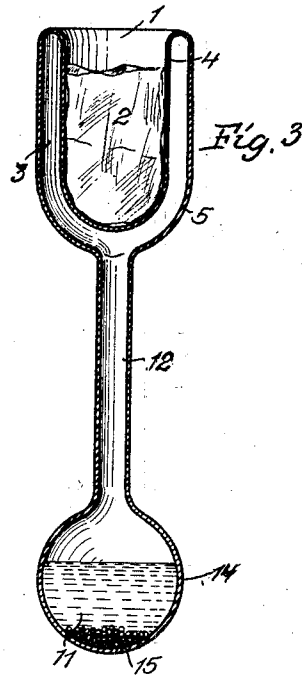
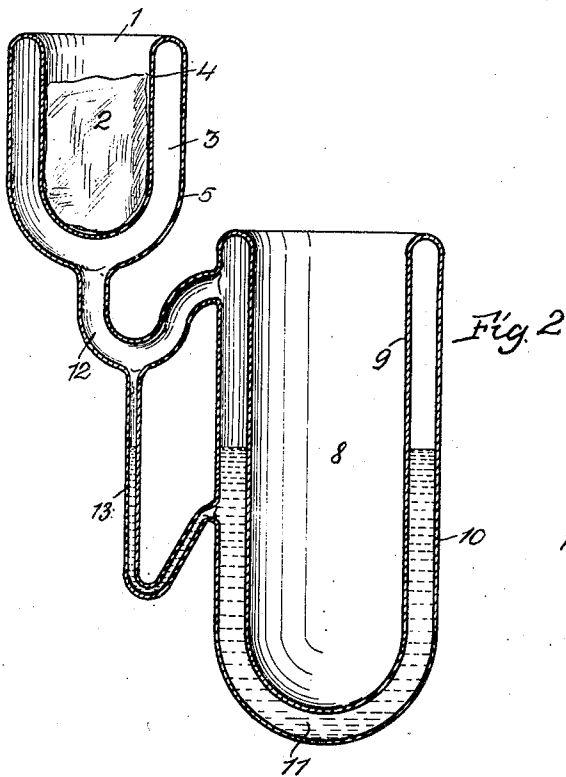
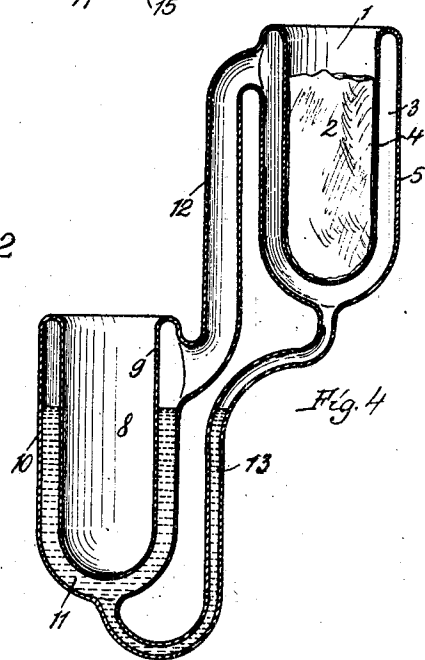
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COOLING APPARATUS

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UNITED STATES PATENT OFFICE

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COOLING APPARATUS

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My invention relates to cooling devices or apparatus and more particularly to an improved refrigerator of the type wherein a primary cooling agent, such as carbon dioxide ice, known on the market as "dry-ice" and a volatile secondary refrigerating agent are employed to co-operate for the cooling purpose.

I am aware of the fact that it is known to utilize the cold of a primary cooling agent for the purpose of condensing the vapors of a secondary volatile refrigerant act for cooling purposes at a place spaced a distance apart from the location of the primary cooling agent. This old method has been suggested or practised hitherto for transferring cold from one place or room into another room and the means hitherto employed for the transfer of cold in connection therewith comprise an extended system of conduits.

The chief object of my invention is to provide a cooling apparatus embodying a similar method but comprising, as a novel improvement in the art, a condenser and an evaporator which are both shaped to form hollow bodies or vessels for the reception of the cooling agent and the material to be cooled, respectively, and which are interconnected for operation to form a unit.

Another object of my invention is to provide means preferably for using dry-ice as a cooling agent, economically and without any risk of endangering the material to be cooled, so that the apparatus may be used for various purposes, particularly for the production of ice-cream, for refrigerating chamber or screens, for cooling drinks and the like, and will just as well be adapted for technical uses such as in laboratories and the like.

The apparatus is, as a unit, very handy, rugged and compact both when of smaller dimensions for household purposes and when of larger form for laboratory and similar uses. The construction, of the apparatus is of particular advantage if the condenser is shaped to form a double-wall vessel of such dimensions as will conform to the size or dimensions of a standard ice-block so that the latter will be well accommodated and snugly fit therein, the evaporator preferably being

likewise constructed and shaped to form a double-wall vessel or to form a tube adapted to dive into the liquid to be cooled.

With the above recited objects in view, the invention resides in the novel construction set forth in the following specification, particularly pointed out in the appended claims and illustrated in the accompanying drawing, it being understood that the right is reserved to embodiments other than those actually illustrated herein, to the full extent indicated by the general meaning of the terms in which the claims are expressed.

In the accompanying drawing forming a part of this specification and showing diagrammatically for purposes of exemplification, preferred forms and manners in which the invention may be embodied and practised, but without limiting the claimed invention to such illustrative instances:

Figure 1 is a view in vertical section of the apparatus;

Figure 2 is a similar view of a modification thereof, and

Figures 3 and 4 are similar views of further modifications.

Referring to Figure 1, the apparatus comprises in general two double-wall containers or vessels 1 and 8 and a tubular conduit 12 connecting the two vessels for communication. The inner cavity of the upper vessel 1 serves for the reception of the dry-ice 2 and the annular room 3 formed by the jacket 5 or the two walls serves for the condensation of the vapors of the secondary refrigerant. The lower vessel 8 is adapted to receive, in its inner room or cavity, the material to be cooled, while the annular space between the two walls or the inner wall and the jacket 10 is adapted to receive the liquid secondary refrigerant. The vapors evolved from the latter flow through the conduit 12 to the condenser 1 and the liquefied condensate will be returned to the evaporator likewise through the conduit 12.

The modification shown in Figure 3 is constructed to form a diving refrigerator adapted to float in the liquid to be cooled. The tubular evaporator 12, 14 must be of such a weight as to maintain the apparatus

in the liquid to be cooled, in approximately vertical position and to this end a few grains of shot 15 or any other suitable weights may be dropped into the evaporator in order to regulate the weight thereof and ensure the said vertical position.

In the embodiment of the invention shown in Figure 2 the two vessels 1 and 8 are similarly constructed and interconnected by a tubular conduit 12 as in Figure 1, but in the former a branch conduit 13 is provided to connect the lowermost point of the conduit 12 with a point of the vessel 8 intermediate between the bottom and the top of the latter and at a level below the level of the secondary refrigerant contained in the jacket 10.

It will be seen that the liquid condensate will return and flow from the annular condensation chamber 3 through the branch conduit 13 so as to enter into the evaporator at a point below the level of the secondary refrigerant. In this way the uppermost layer of the liquid in the evaporator will be prevented from being detrimentally cooled by the returning condensate.

Figure 4 illustrates a modification wherein the means for establishing circulation of the secondary refrigerant are provided and constructed in a different manner and with a view to securing a further improvement. The upper ends of the two vessels 1 and 8, that is to say, the annular jackets thereof, properly speaking, are interconnected by a twice-bent tube 12 for communication and the bottoms of the vessels or jackets are likewise interconnected by a tubular conduit 13 for communication, so that the vapors of the refrigerant, evolved in the jacket 10 will flow and enter into the jacket 5 of the upper vessel at a point near the top of the latter and cannot be partially condensed by returning condensate. The condensed refrigerant in turn will separately flow off through the conduit 13 into the jacket 10 of the evaporator so that also in this modification the uppermost layer of the refrigerant in the evaporator or jacket 10 will be prevented from being cooled by returning condensate.

I have not attempted to explain all of the minute details of the construction of the apparatus or device, for it will be understood by those to whom this specification is addressed, that the parts will necessarily be of the proper size and relationship, and will be properly mounted and supported according to the tenets of machine construction; nor have I attempted to illustrate the parts in their exact sizes and dimensions as many of the parts are conventionally shown and the figures of the drawing are diagrams only.

It seems unnecessary to reiterate the operation of the apparatus or device, for the operation of the several parts has been described in detail. Nor does it seem necessary to burden this specification with an ex-

position of the advantages which the invention possesses, for they will be apparent to those skilled in the art to which this invention relates.

What I claim is:—

1. A refrigerating apparatus consisting of an open condenser adapted to hold a primary cooling agent, a jacket forming an annular chamber around said condenser, an evaporator adapted to contain a liquid secondary refrigerant, and a conduit connecting said chamber with the evaporator and forming a hermetically sealed unit with said chamber and the evaporator, the walls of the evaporator being adapted to contact with the material to be cooled.

2. A refrigerating unit, wherein the evaporator is shaped to form a tubular member adapted to be immersed into a liquid to be cooled and to float therein, substantially as described.

3. A refrigerating unit comprising an evaporator and a condenser operatively connected, said unit being constructed to float in a liquid to be cooled, and means for maintaining the floating unit in substantially upright position.

4. Refrigerating apparatus comprising a double-walled receptacle adapted to contain a substance to be cooled, the annular chamber between the walls of said receptacle containing a liquid refrigerant adapted to evaporate, a second double-walled receptacle for holding a cooling agent and having an annular condensing chamber around said agent, and means for interconnecting said chambers so that the vapors enter said condensing chamber where they are condensed, said connecting means causing the condensate to return to said liquid refrigerant.

5. Refrigerating apparatus comprising a double-walled receptacle of glass for holding a substance to be cooled, the annular chamber between the walls of said receptacle containing a liquid refrigerant adapted to evaporate, a second double-walled receptacle of glass for holding a cooling agent and having an annular condensing chamber around said agent, and glass tubing fused to said receptacles for interconnecting said chambers, whereby the vapors entering the condensing chamber are cooled and condensed, the condensate automatically returning to the supply of liquid refrigerant through said tubing.

6. Refrigerating apparatus comprising a double-walled receptacle for holding a substance to be cooled, the annular chamber between the walls of said receptacle containing a liquid refrigerant adapted to evaporate, a second double-walled receptacle for holding a cooling agent and having an annular condensing chamber around said agent, the bottom of each receptacle being rounded, and

means for interconnecting said chambers so that vapors entering the condensing chamber are cooled and condensed, said connecting means including a pipe leading centrally from the rounded bottom of one receptacle to that of the other for the return of condensed vapors.

7. Refrigerating apparatus comprising an evaporator constructed to hold a substance to be cooled and provided with a chamber containing a liquid refrigerant adapted to evaporate, a condenser adapted to hold a cooling agent and having a condensing chamber in operative relation to the cooling agent, and means for interconnecting said chambers so that the vapors of the cooling agent are condensed in said condensing chamber and the condensate returns to the liquid refrigerant in an automatically repeated cycle, said interconnected evaporator and condenser constituting a unitary self-contained refrigerating device with substantially continuous walls forming a permanently sealed hollow interior adapted to act as an evaporating and condensing space.

8. Refrigerating apparatus comprising an evaporator constructed to hold a substance to be cooled and provided with a chamber containing a liquid refrigerant adapted to evaporate, a condenser adapted to hold a cooling agent and having a condensing chamber in operative relation to said agent, said evaporator and condenser being constructed of glass, and glass tubing for interconnecting said evaporator and condenser so that the vapors of said cooling agent are condensed in said condensing chamber and the condensate returns to the liquid refrigerant in an automatically repeated cycle, said interconnected evaporator and condenser constituting a unitary self-contained refrigerating device with a permanently sealed hollow interior adapted to act as an evaporating and condensing space.

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