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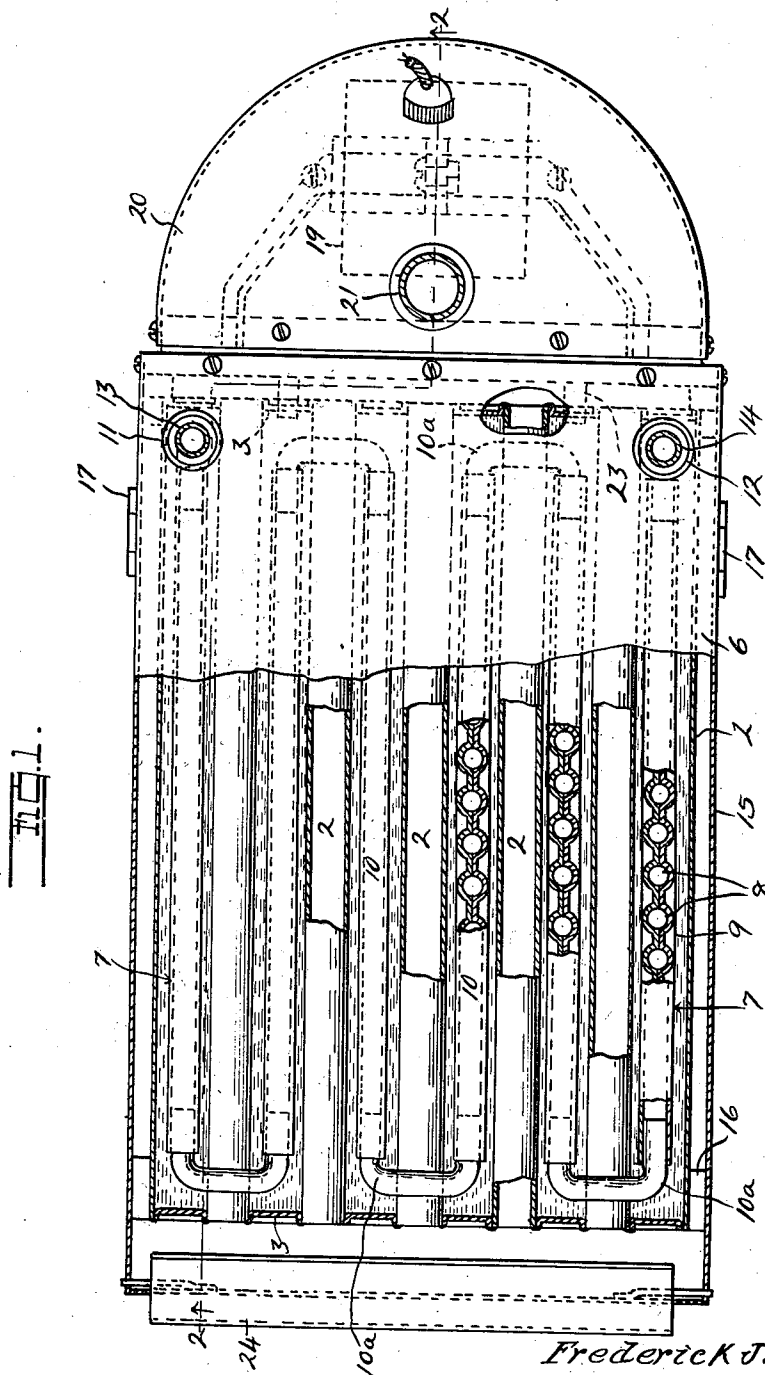
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AIR COOLING AND CONDITIONING UNIT

Filed Nov. 3, 1933

3 Sheets-Sheet 1



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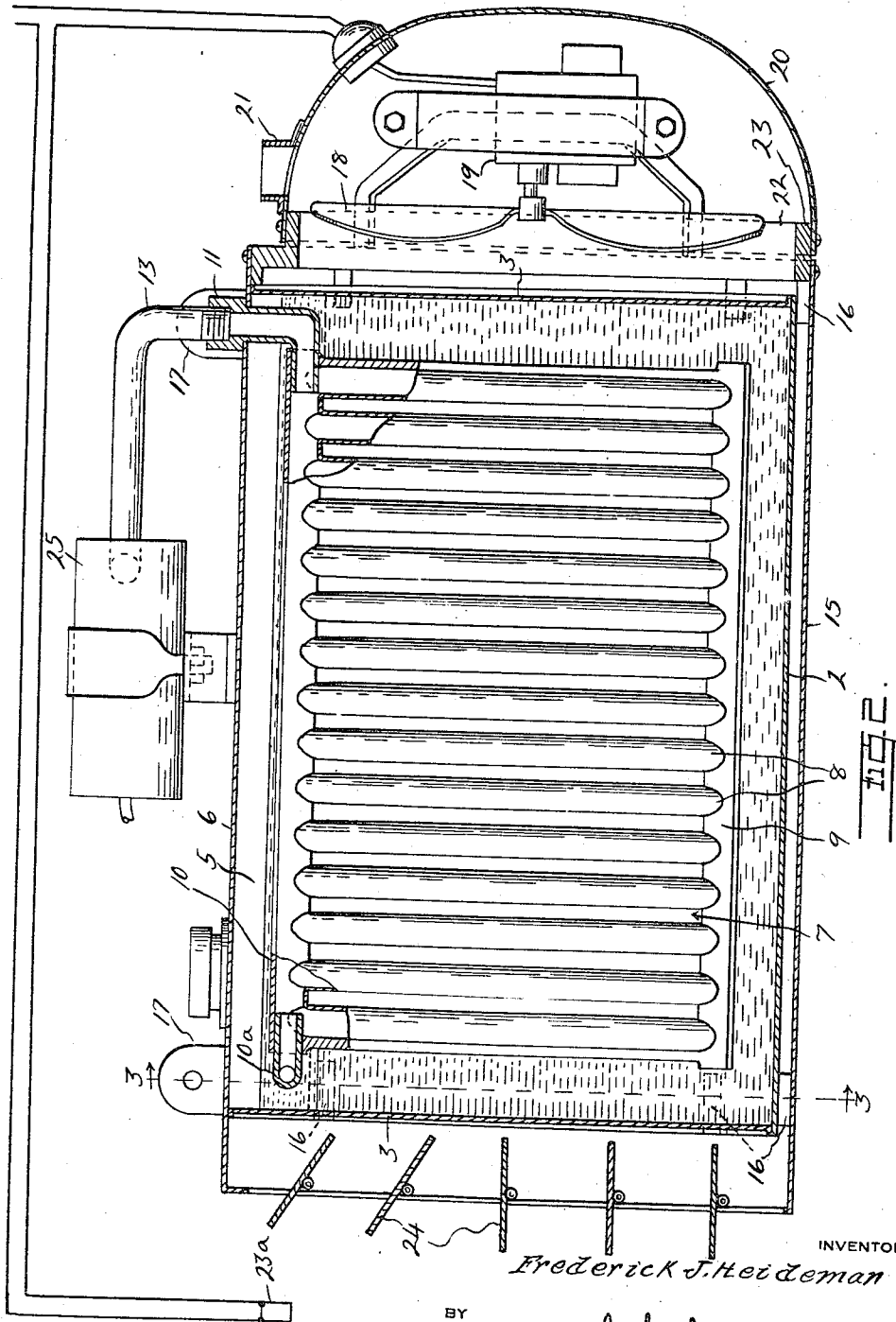
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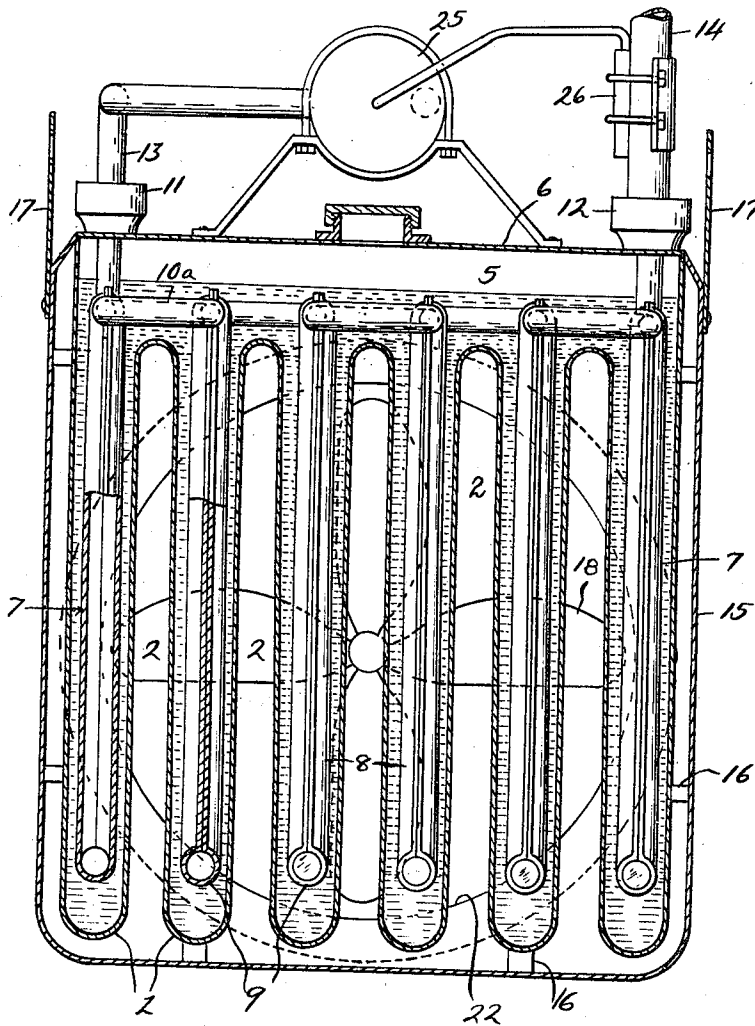


FIG. 3.

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AIR COOLING AND CONDITIONING UNIT

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14 Claims. (Cl. 62—95)

This invention relates to air cooling and conditioning units, and particularly to units for mechanically cooling and conditioning air.

5 An object of the invention is to provide a unit which in a given size, presents a maximum cooled surface area to a current of air.

Another object is to form a refrigerant evaporator in sections, which may be combined in a suitable number to establish a desired air cooling and conditioning capacity.

10 A further object is to arrange for installation as a single unit an apparatus for cooling and conditioning air, a fan for maintaining a delivery of air to said apparatus, and an arrangement of louvers for regulating the air velocity and its direction of discharge.

15 These and various other objects the invention attains by the construction hereinafter described and illustrated in the accompanying drawings, wherein:

Fig. 1 is a top plan view of the unit with portions broken away.

Fig. 2 is a longitudinal sectional elevation of the same, taken upon the line 2—2 of Fig. 1.

25 Fig. 3 is a cross sectional view taken upon the line 3—3 of Fig. 2.

In these views, the reference character 1 designates a row of troughs, spaced apart to provide air passages 2, and formed preferably from a single sheet of metal, as best appears in Fig. 3. At each end, said troughs are closed by a metal plate 3, having slots upwardly extended from its lower edge and registered with said air passages. The end walls 3 and the outside walls of the two outermost troughs extend upward sufficiently to form a chamber 5 overlying and freely communicating with all of the troughs, and a plate 6 connects the upper margins of said walls to cover said chamber.

40 Positioned in each trough 1, and spaced from the bottom, side, and end walls thereof is an evaporator 7 for effecting heat absorption by vaporization of a refrigerant delivered to said evaporator in liquid form. The evaporators 7 may have any suitable construction, but as shown are each formed of a single sheet of metal bent upon itself to form mating halves, which are corrugated to jointly form a series of vertically tubular chambers 8, their lower ends being connected by a tubular header 9, rolled at the juncture of the mating halves, and their upper ends communicating with a tubular header 10 formed by complementary indentations in the upper margins of said halves.

55 Said evaporators project sufficiently into the

chamber 5 to permit location in said chamber of U pipe connections 10a between the top headers of adjacent evaporators. Said connections are established alternately at opposite ends of the evaporators, so as to place the latter in series connection and the two outermost evaporators have an inlet fitting 11 and an outlet fitting 12 connected to the top headers thereof. Said fittings project upwardly through the plate, 6, in fluid-sealed connection with the latter, and are engaged by pipes 13 and 14 for respectively delivering a liquid refrigerant and withdrawing the same, in a gaseous form. The troughs 1 and chamber 5 are approximately filled with a freezable liquid preferably a eutectic solution of high latent heat value, said liquid having a freezing point at least several degrees lower than the temperature to be imposed on air flowing through the passages 2.

The parts so far described are located within a U-shaped sheet metal casing 15, open at its ends and spaced from the bottoms of the troughs and their outermost walls by spacer blocks 16. Lugs 17 rising from said casing serve for the suspension of the entire unit.

To impel air through the passages 2 a fan 18 driven by a motor 19 is located within a hemispherical chamber 20 carried by the unit at one end thereof, said chamber having a duct 21 opening thereto for air delivery. The fan is located substantially within a circular opening 22 in a plate 23, secured to said end of the unit, said opening communicating with the passages 2.

At the other end of the unit the casing 15 projects beyond the corresponding end wall 3 to provide a mounting for a vertical series of horizontally pivoted louvers 24, which may be individually adjusted to regulably restrict the discharge of air from the passages 2, and deflect such air at a desired upward or downward inclination.

A thermostat 23a, suitably exposed to the conditioned air discharged past said louvers, controls the motor 19 so as to cut off the fan, when a desired temperature reduction has been effected.

In use of the described unit, liquid refrigerant is delivered to the evaporator from a suitable expansion valve 25 through the pipe 13, said valve being automatically controlled, as is well known, by a thermal bulb 26 or the like. When the withdrawal of heat from the liquid contents of the troughs 1 and chamber 5 has substantially frozen such contents, the refrigerant cycle is automatically interrupted through the action of the usual

cut out (not shown) effective on the usual compressor or the like (not shown). The frozen body of liquid, because of its high latent heat value, will continue over an extended period of time to exercise its air-cooling and conditioning function, thus minimizing the frequency of starting and stopping the compressor, with resultant reduction of wear and economy of power.

It has been established that the conditions most favorable to preservation of meat are maintenance of a temperature approximating 35 degrees F., together with an air circulation approximating fourteen feet per minute, with a relative humidity of 80 to 85 per cent. The described apparatus is particularly suited for maintaining such conditions. During active periods of the refrigerant cycle, the eutectic solution in the troughs 1 is gradually frozen to solid form. When active periods of the fan 18 and of the refrigerant cycle coincide, the air delivered through the passages 2 deposits moisture on the passage walls, which is transformed to frost and thereby retained and accumulated on said walls.

When active periods of the fan and idle periods of the refrigerant cycle coincide, the air delivered through the passages 2, gradually melts such frost, taking into suspension the resulting moisture, and thus suitably humidifying the in-flowing air.

The described unit may be used for cooling and conditioning the air of butcher's refrigerators, food display cases, trucks, railway passenger and freight cars, air-craft, boats, and theaters and other buildings.

The expression "hold-over liquid", as employed in the claims, designates any liquid which may be reduced to a quite low temperature during active periods of a refrigerant apparatus, and may consequently furnish refrigeration during idle periods of the apparatus.

The invention is presented as including all such modifications and changes as come within the scope of the appended claims.

What I claim is:

1. An air cooling and conditioning unit comprising a container having a liquid inlet in its top and formed with a plurality of air passages extending between and opening in its ends, a freezable liquid of high latent heat value in said container, and spaced from the top of the receiver to provide for expansion of said liquid in freezing, means immersed in said liquid for cooling and freezing such liquid, and means for impelling air to be conditioned through said passages.

2. In an air cooling and conditioning unit as set forth in claim 1, an open-ended casing receiving said liquid container and spaced from the bottom and sides of said container to form additional air passages.

3. In an air cooling and conditioning unit as set forth in claim 1, an open ended casing receiving said liquid container and spacers interposed between said casing and container, forming additional air passages extending between and opening in the ends of the unit.

4. A refrigerating unit comprising a liquid container forming a plurality of spaced troughs and formed with a chamber above and communicating with said troughs, said troughs being substantially filled with a freezable liquid of high latent heat value, an evaporator immersed in said liquid in each of said troughs, pipes within said chamber connecting the upper ends of said evaporators in series, and means for delivering a re-

frigerant to an end evaporator of the series and for withdrawing refrigerant from the other end evaporator of the series.

5. A container comprising a sheet of metal bent to form a plurality of substantially parallel troughs and establishing a spaced relation between said troughs, a pair of end plates closing the ends of said troughs and slotted to form openings between the troughs, said end plates and the outer walls of the outermost troughs projecting above the troughs and forming a chamber overlying and communicating with said troughs, and a top plate connecting the upper margins of said end plates and outer walls and covering said chamber.

6. An air cooling unit comprising a series of evaporators spaced apart in the direction of their thickness and having a length and height largely exceeding their thickness, a receiver enclosing the evaporators and formed with substantially parallel air passages between the evaporators, extending from end to end of said receiver, a freezable liquid of high latent heat value immersing the evaporators within the receiver, means for inducing a flow of air through said passages, and means for delivering a refrigerant to and from the evaporators.

7. An air cooling unit comprising a series of evaporators spaced apart in the direction of one of their dimensions and having their other dimensions largely exceeding the first mentioned dimension, a receiver enclosing the evaporators and formed with substantially parallel air passages between the evaporators, a freezable liquid of high latent heat value immersing the evaporators within the receiver, means for inducing a flow of air through said passages, and means for delivering a refrigerant to and from the evaporators.

8. An air cooling unit comprising a liquid container forming a plurality of spaced troughs and formed with a chamber above and communicating with the troughs, the troughs being substantially filled with a freezable liquid of high latent heat value, means immersed in such liquid in each trough for cooling and freezing the liquid, and means for inducing a flow of air between the troughs.

9. An air cooling unit comprising a series of evaporators spaced apart in the direction of one of their dimensions and having their other dimensions largely exceeding the first mentioned dimension, means for receiving said evaporators and for additionally receiving a freezable liquid, of high latent heat value, immersing said evaporators, and for forming air passages between the evaporators, means for inducing a flow of air through such passages, and means for delivering a refrigerant to and from the evaporators.

10. A refrigerating unit comprising a container for a hold-over liquid, said container forming a plurality of spaced troughs and a chamber above and communicating with the troughs, an evaporator in each of the troughs adapted to be substantially submerged in said liquid, means within said chamber establishing a series connection between the evaporators, and means for delivering a refrigerant to and withdrawing it from the evaporators.

11. An air cooling unit comprising a plurality of evaporators spaced apart in the direction of one of their dimensions and having their other dimensions largely exceeding the first mentioned dimension and each having at its top an elongated header into which a vaporized refrigerant

may rise, means for receiving said evaporators and for additionally receiving a hold-over liquid substantially submerging the evaporators, and for forming air passages between the evaporators, means for impelling air through said passages, means establishing a series connection between said headers of the evaporators, for the flow of a refrigerant therethrough, and means for delivering a liquid refrigerant to the evaporators, and for withdrawing the vaporized refrigerant from said headers.

12. An air cooling unit comprising a container for a hold-over liquid forming a chamber and a plurality of extensions opening from said cham-

ber, spaced apart to form air passages, an evaporator positioned in each extension and adapted to be substantially submerged in the hold-over liquid, and means within said chamber for delivering a refrigerant to and from said evaporators.

13. An air cooling unit as set forth in claim 12, said means within the chamber providing for a flow of refrigerant through the evaporators, in series.

14. In an air cooling unit as set forth in claim 12, means for impelling air through said passages.

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