

Oct. 30, 1923.

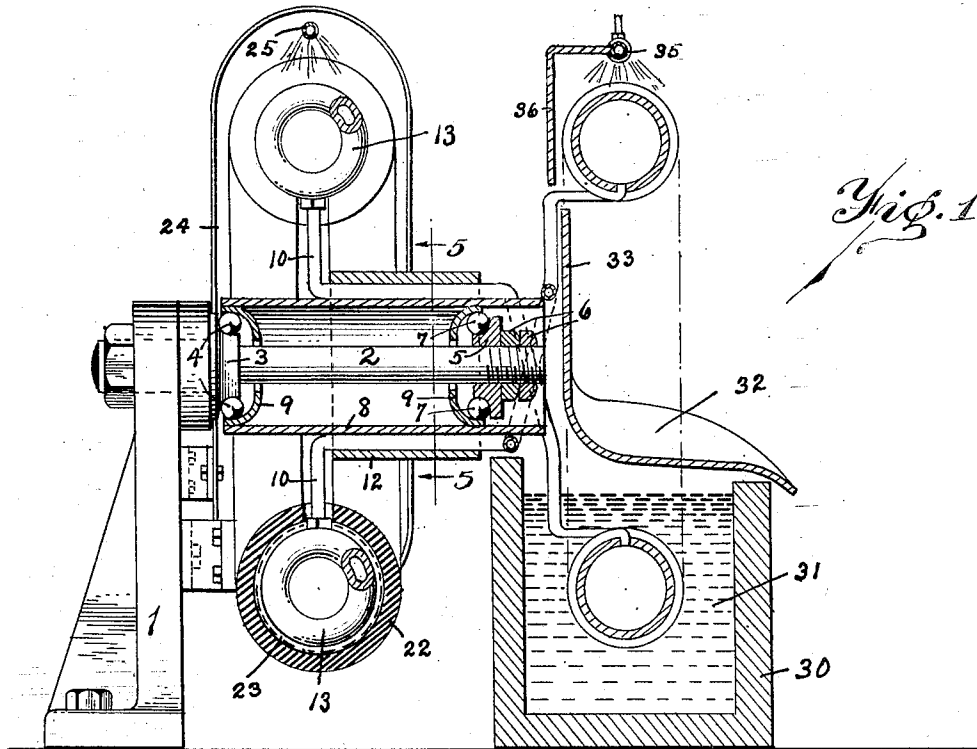
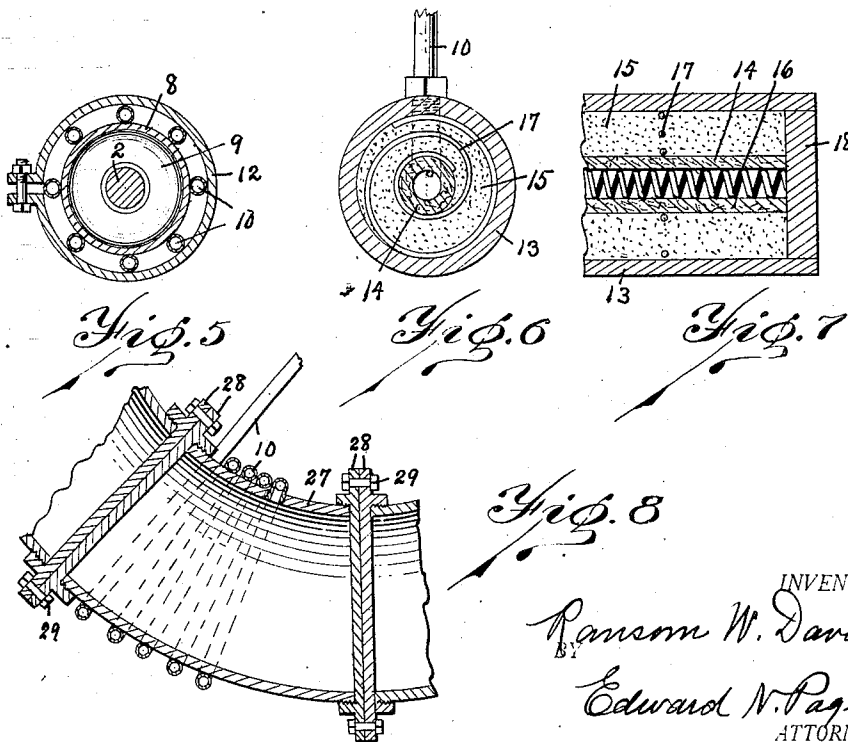
1,472,432

R. W. DAVENPORT

REFRIGERATING MACHINE

Filed June 10, 1921

2 Sheets-Sheet 1



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Fig. 2

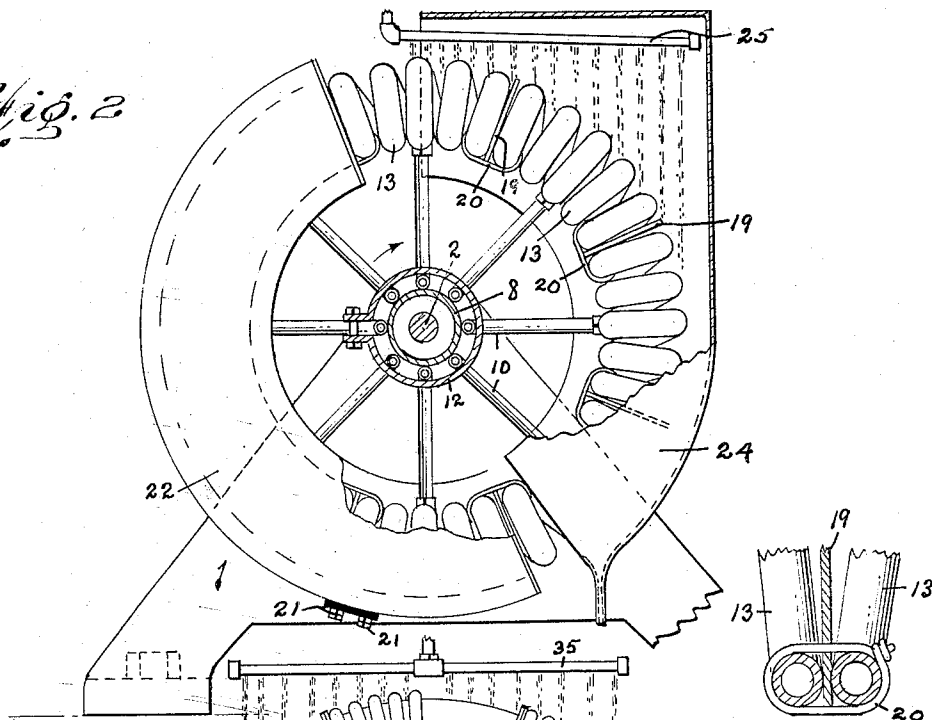


Fig. 3

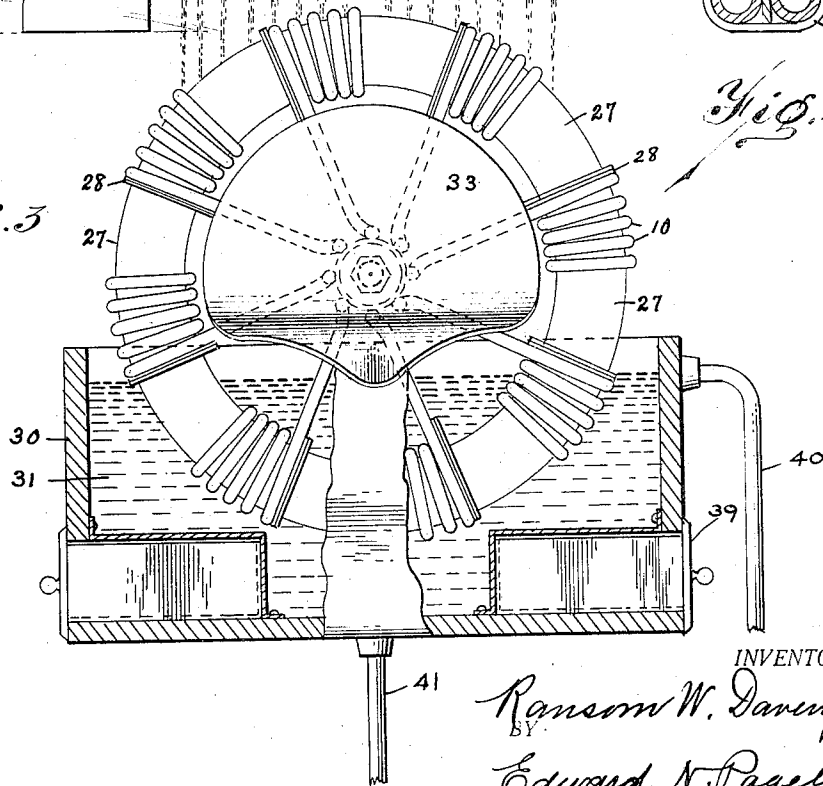


Fig. 4

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RANSOM W. DAVENPORT, OF DETROIT, MICHIGAN.

REFRIGERATING MACHINE.

Application filed June 10, 1921. Serial No. 476,391.

To all whom it may concern:

Be it known that I, RANSOM W. DAVENPORT, a citizen of the United States, and residing at Detroit, in the county of Wayne and State of Michigan, have invented a new and Improved Refrigerating Machine, of which the following is a specification.

This invention relates to means for artificially reducing the temperature of a liquid having a low freezing point in a tank by permitting a volatile liquid to evaporate in a closed receptacle which is immersed in the tank, and it is embodied in a device of this character in which a series of such receptacles are united to produce an annulus which rotates continually to submerge one of these receptacles after the other in the tank.

This invention further consists in a heating device and a series of containers of a gas absorbent material which freely takes up the evaporated contents of the receptacles in the tank, these containers being preferably so formed that they also may be united to constitute an annulus connected to the first mentioned annulus so that the two will rotate together, the connection being preferably made by tubes through which the volatilized cooling agent may pass between the receptacles and the containers.

It also consists in the details of construction illustrated in the accompanying drawings and particularly pointed out in the claims.

In the accompanying drawings, Fig. 1 is a central vertical section of this improved refrigerating machine. Fig. 2 is an elevation of the annulus containing the absorbent material, taken from the inside of the machine. Fig. 3 is an end elevation of the machine, part of the brine tank being broken away. Fig. 4 is a detail showing how two sections may be connected. Fig. 5 is a section on the line 5—5 of Fig. 1. Fig. 6 is a transverse section and Fig. 7 is a longitudinal section of a portion of a coil containing the absorbent material, Fig. 8 is a radial section of a condensing and expanding chamber.

Similar reference characters refer to like parts throughout the several views.

Several gases condense to liquid form at normal temperatures under moderate pressures and are also freely absorbed by solids at such temperatures. Among these gases ammonia is most commonly used in refrigerating machines, and as an absorbent therefor calcium chloride is perhaps the most satisfactory material and may be in powdered or granular form.

In the present machine I have shown a pedestal 1 having a horizontal shaft 2 with a proper shoulder 3 to constitute a raceway for the bearing balls 4. A collar 5 may be positioned by the jamb nuts 6 and constitutes the raceway for the balls 7. A hub, consisting of the cylindrical body 8 and the cups 9 which engage the balls, is rotatable on the shaft.

Mounted on the hub and supported by the tubes 10 which are secured to the hub in any desired manner, a clamp 12 being shown in Fig. 5, are a series of absorption chambers, preferably in the form of short coils of pipe 13, five coils to each chamber being shown in Fig. 2. Eight of these are shown, but they may be of any desired number. A tube 10 extends into each coil and preferably into the tube core 14 thereof, which core may be of asbestos cloth or any other material not affected by the ammonia or the calcium chloride 15 which is packed around the core. A coil 16 may be placed within the core to keep it from collapsing and any desired number of spiral coils 17 may be employed to position the core in the pipe 13. Plugs 18 may be used to close the ends of the pipes 13. I prefer to separate the several coils by disks 19 and these may be secured in position and the several coils may be connected to constitute an annulus by means of the wires 20.

Figs. 1 and 2 show a shell 22 of heat-insulating material in the form of a split tubular ring of about 180 degrees in length, about one third of which is provided with an electric heating element 23 connecting to the posts 21 shown in Fig. 2. Nearly all the remainder of the annulus is enclosed in a shell 24 at the upper end of which is a sprinkling pipe 25 by means of which a portion of the sections may be showered with water. It will be understood that any other desired forms of heater and cooler may be employed.

A series of receptacles 27, one for each coil 13, are mounted on the hub, and I prefer them to be short sections of pipe having flanged ends 28 which may be connected together by bolts 29 to constitute a second annulus. Each tube 10 extends radially from its coil 13 to the hub, along the hub,

then substantially radially and then around its receptacle 27 to which it connects as shown in Fig. 8. A tank 30 for brine 31 or similar material receives the receptacles 5 as the united coils and receptacles rotate on the shaft. An apron 32 and upright deflector 33 substantially prevent the water which flows down onto these receptacles 27 from the sprinkling pipe 35 from mixing 10 with the brine. A shield 36 of any desired construction deflects part of the water from the pipe 35 from passing to the brine tank and this is also done by the flanged ends 28 of the sections.

15 The operation of this device is as follows. The calcium chloride and dry ammonia having been introduced into the coils 13, the ammonia being sufficient to saturate the chloride, and the parts being hermetically 20 sealed, the units are united on the hub 8 and preferably balanced. Under normal temperatures, all the ammonia will be in the coils 13. As soon as current is conducted to the heating element 23, the two 25 coils adjacent thereto will become heated and a portion of the ammonia will be driven off into the receptacles approximately opposite. This will disturb the balance of the machine and the hub 8 will slowly rotate.

30 While the ammonia is passing through the tubes 10 to the receptacles 27, the coils of these tubes and the receptacles are sprinkled by the pipe 35 which materially aids in the condensing of the ammonia in 35 these receptacles. I have found that time is a factor in driving off the ammonia from the calcium chloride and therefore have extended the shell 22 of insulating material so that practically four sections are en- 40 closed thereby. The gas continues to pass from the coils 13 to the receptacles 27 until these receptacles are respectively entering the brine 31.

45 As soon as the coils 13 emerge from the shell 22, they are sprinkled by the pipe 25 which reduces their temperature to such an extent that the calcium chloride immediately becomes absorbent. The liquid ammonia in the receptacles 27, now submerged 50 in the brine, immediately commences to evaporate and to pass to the cooled coils 13, again serving to overbalance the two rings and serving to increase the tendency of the hub to turn. As the liquid ammonia in the 55 receptacles 27 expands or evaporates, it becomes very cold and absorbs heat from the brine. The action of the two rings is therefore much alike in that both are heated and both are cooled by outside influences.

60 The action of this device is practically continuous and uniform and wholly automatic. There are no packed joints and after the parts are assembled, all joints may be sealed by soldering or welding, thus 65 absolutely preventing leakage. There are

no valves or orifices requiring adjustment. If desired, I may form the brine tank 30 with outwardly opening chambers 38 to receive the small containers 39 in which water 70 may be frozen. The two pipes 40 and 41 connect the brine tank to cooling coils or chambers wherever desired. While I prefer to have the chambers 27 diametrically opposite the paired receptacles 13, this is 75 not absolutely necessary, as they may be positioned in any desired manner, depending upon their number and upon the position of the heater.

The details and proportions of this machine may all be changed by those skilled 80 in the art without departing from the spirit of my invention as set forth in the following claims.

I claim:

1. In a refrigerating machine, the combination of two rings connected to rotate on a 85 common axis, one of the rings consisting of a series of containers of gas absorbent material and the other of a series of receptacles in which the gas may condense, a tank of liquid of low freezing point, a heater for the 90 containers of the gas absorbent material, and means to sprinkle water on the two rings.

2. In a refrigerating machine, the combination of a series of containers and gas 95 absorbent material therein, said containers being in the form of a ring, a series of receptacles united to form a second ring, tubes connecting the containers of one ring 100 to the substantially diametrically opposite receptacles of the other ring, means to respectively heat and cool substantially opposite containers of absorbent material, and means 105 to cool and heat substantially opposite receptacles of the other ring.

3. In a refrigerator, the combination of a pair of rings mounted to rotate on a common axis, one of said rings consisting of a 110 series of containers for calcium chloride, the other ring consisting of an equal number of receptacles for liquefied ammonia gas, tubes connecting each of the receptacles to one of the containers to form pairs, and 115 means for heating and cooling the members of each pair alternately.

4. In a refrigerator, the combination of a pair of rings mounted to rotate on a common axis, one of said rings consisting of a series 120 of containers for calcium chloride, the other ring consisting of an equal number of receptacles for liquefied ammonia gas, tubes connecting each of the receptacles to one of the containers to form pairs, and means 125 for heating and cooling the members of each pair alternately, said rings in rotating causing the heating and cooling respectively of the adjacent sections thereof consecutively.

5. In an alternate absorption refrigerating system, a generator absorber comprising 130

a mass of solid absorbent material, and an outer gas tight tube and an inner gas permeable textile tube between which said material is retained.

6. In a refrigerating system, a condenser-receiver-expansion chamber for the refrigerant and comprising a receptacle and a tube connecting thereto and wound onto the same and constituting the sole conductor for the refrigerant to said receptacle.

7. In a refrigerator, the combination of a plurality of containers for calcium chloride, an equal number of receptacles for liquefied ammonia gas, a tube connecting each one of the containers to one of the receptacles to form pairs, means on which said containers and receptacles are mounted to rotate as a unit, and means for heating and cooling the members of each pair alternately to cause the changing of weight of the ammonia in the containers and receptacles to move them as a unit.

8. In a refrigerator, the combination of

a plurality of containers for an absorption medium, an axis about which they may rotate as a unit, a receptacle for a volatile refrigerant on the opposite side of the axis from each container, a tube connecting each of the containers to the diametrically opposite receptacle, said parts being otherwise hermetically sealed, and means for heating and cooling the containers alternately with the receptacles to which they are connected.

9. In a refrigerating machine, the combination of a plurality of containers and gas absorbent material therein, a rotatable axis upon which said containers are mounted, a plurality of receptacles, one for each container and on the opposite side of the axis therefrom and hermetically connected thereto to constitute a pair therewith, and means for heating the container and the receptacle of each pair alternately while cooling the other member of that pair.

RANSOM W. DAVENPORT.