April 29, 1924. 1,492,512

P. E. DRINKWATER

COOLING AND HEATING SYSTEM

Filed Sept. 25, 1922 3 Sheets-Sheet 1

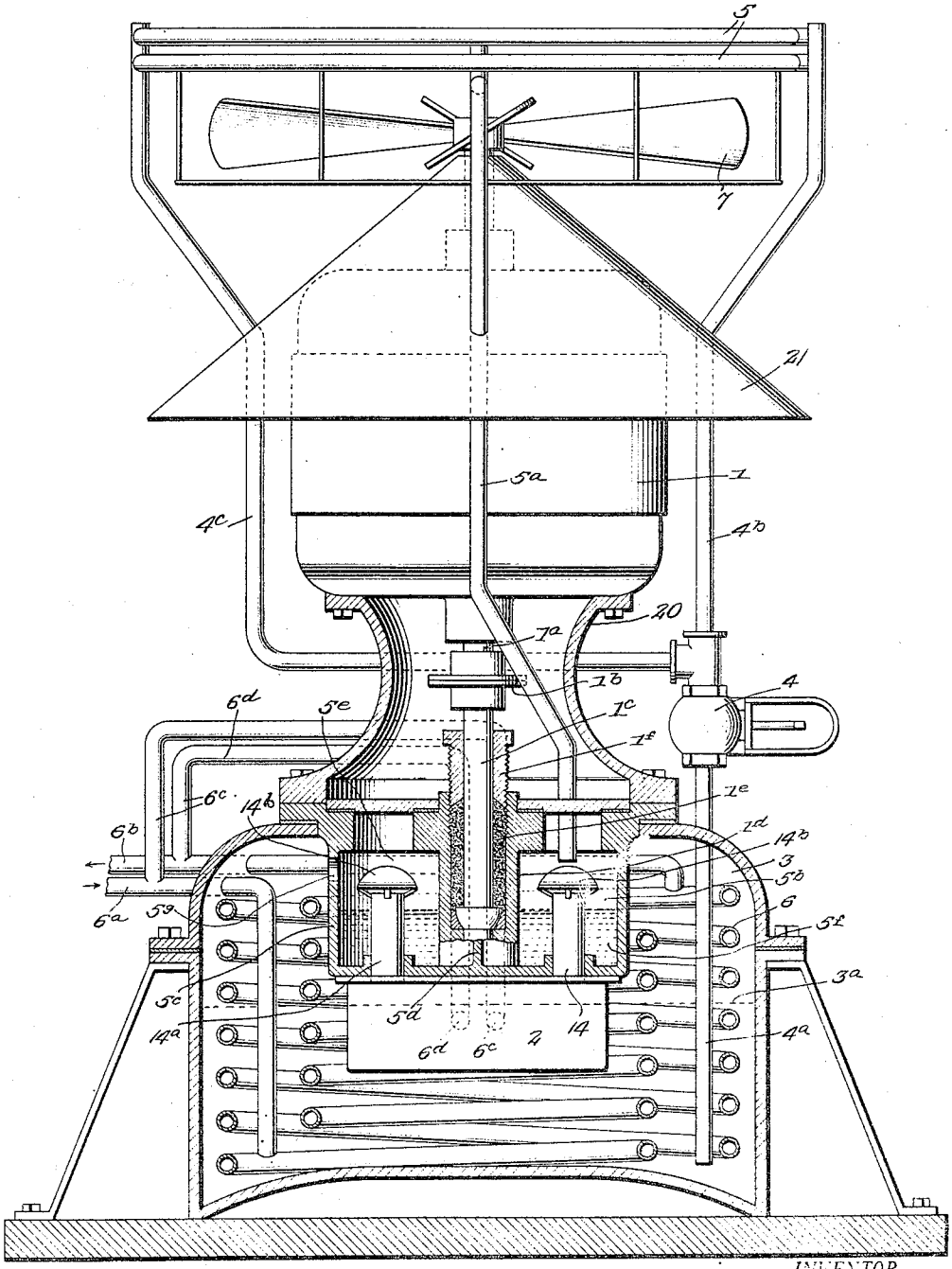


Fig. 1.

INVENTOR.
Paul E. Drinkwater
BY
William W. Deane
his ATTORNEY.

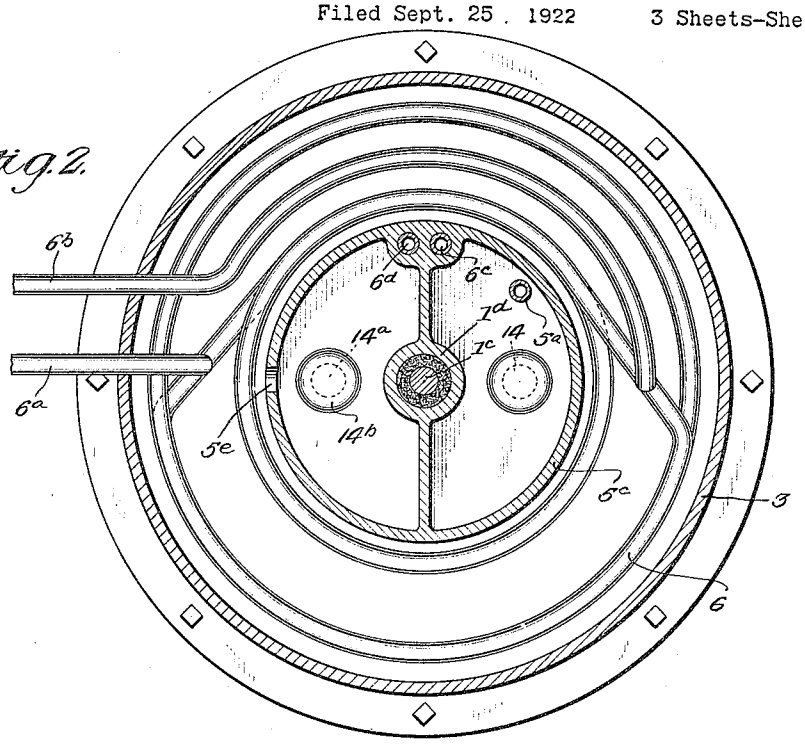
April 29, 1924. **1,492,512**

P. E. DRINKWATER

COOLING AND HEATING SYSTEM

Filed Sept. 25, 1922 3 Sheets-Sheet 2

Fig. 2.



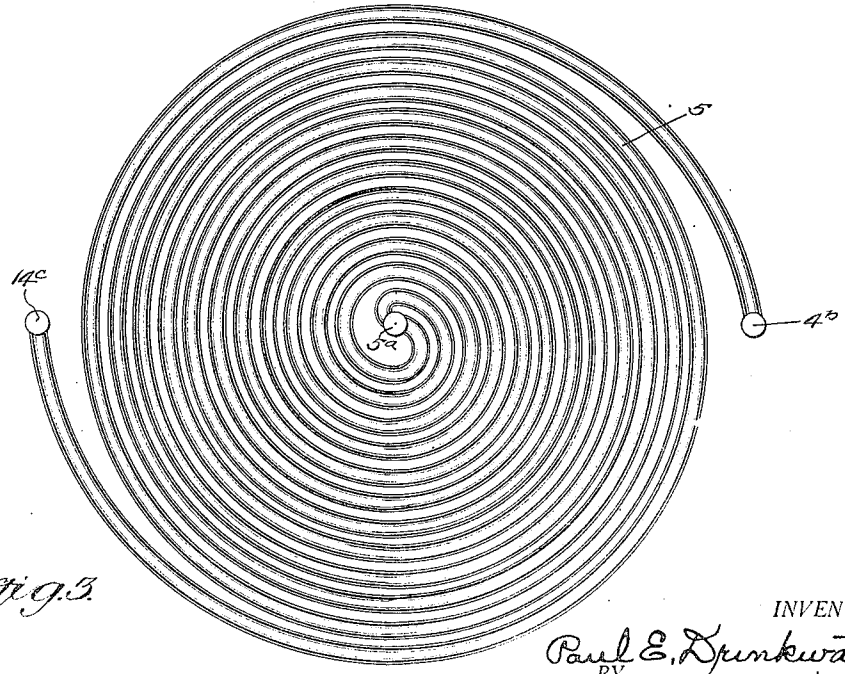


Fig. 3.

INVENTOR.
Paul E. Drinkwater
BY
William A. Deane
his ATTORNEY

April 29, 1924. 1,492,512

P. E. DRINKWATER

COOLING AND HEATING SYSTEM

Filed Sept. 25, 1922 3 Sheets-Sheet 3

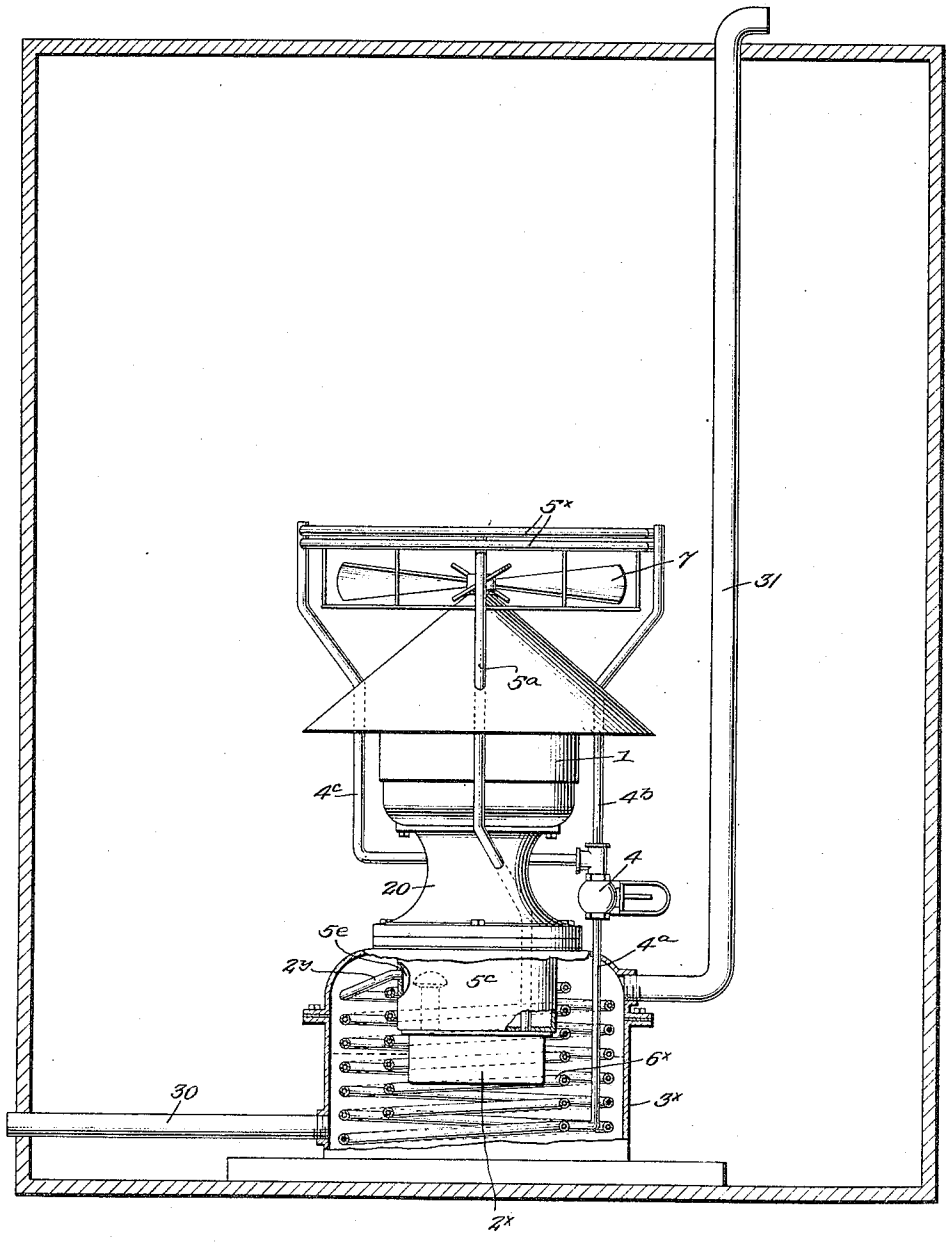


Fig. 4.

INVENTOR.
Paul E. Drinkwater,
BY
William W. Deane
his ATTORNEY.

Patented Apr. 29, 1924. 1,492,512

UNITED STATES PATENT OFFICE.

PAUL E. DRINKWATER, OF PHOENIX, ARIZONA; MARY L. DRINKWATER EXECUTRIX OF SAID PAUL E. DRINKWATER, DECEASED.

COOLING AND HEATING SYSTEM.

Application filed September 25, 1922. Serial No. 590,364.

To all whom it may concern:

Be it known that I, PAUL E. DRINKWATER, citizen of the United States, residing at Phoenix, in the county of Maricopa and State of Arizona, have invented certain new and useful Improvements in Cooling and Heating Systems, of which the following is a specification.

This invention relates to improvements in devices for creating either heat or cold and the primary object of the invention is to furnish an apparatus which may be used for gasifying liquids and liquefying gases.

A further object of the invention is to provide an apparatus capable of utilizing the temperature changing properties of certain chemicals and adapted to operate continuously with a minimum amount of recharging with the heating or refrigerating agent.

Another object of the invention is to provide an apparatus adapted to utilize sulphur dioxide, carbon dioxide or an equivalent substance for creating either heat or cold, and so constructed and operated that said substance will be alternately changed from gaseous to liquid state or from liquid to gaseous state and vice versa.

With the foregoing objects outlined and with other objects in view which will appear as the description proceeds, the invention consists in the novel features hereinafter described in detail, illustrated in the accompanying drawings and more particularly pointed out in the appended claims.

Referring to the drawings:

Figure 1 is a side view partly in vertical section of one form of the apparatus.

Fig. 2 is a transverse horizontal sectional view taken through the lower portion of said apparatus.

Fig. 3 is a plan view of the heat or cold exchanging coil arranged at the upper portion of the apparatus.

Fig. 4 is a modified form of apparatus adapted for use in refrigerating cars and the like.

In the drawings, 1 designates a suitable form of prime mover which in the present instance preferably consists of a reversible electric motor.

2 designates a rotary compression pump which is located in a compression or expansion cylinder or chamber 3. The prime mover is provided at its lower end with a stub shaft 1^a connected by a suitable coupling 1^b to the shaft 1^c of the pump 2. The shaft 1^c extends through a sleeve 1^d and is provided with a packing 1^e held in position by a suitable screw 1^f. It will be understood that reversal of the movement of the prime mover 1 will cause reverse movement of the pump 2. The shaft of the motor extends upwardly and drives a means of circulation 7 which in the present instance consists of a fan.

The cylinder 3 houses a coil 6 through which water may be circulated, the water entering the coil at 6^a and being discharged at 6^b. The coil pipe is provided with branches 6^c and 6^d which supply and discharge water from a water jacket of the pump 2. Owing to this construction it will be understood that water passing in at 6^a would circulate through the coil 6 and will also pass around the compression pump before being discharged at 6^b. A suitable heating or cooling agent is placed in the cylinder 3 and in its liquefied condition, its level reaches the line 3^a. A pipe 4^a is adapted to conduct the agent to or from an expansion valve 4, connected by pipes 4^b and 4^c to the ends of coils 5, for the purpose of illustration, being arranged above the circulating means 7. The agent is conveyed from the coils 5 by means of a pipe 5^a which extends into a chamber 5^b. This chamber is arranged in a casing 5^c provided with a cross partition 5^d which divides the interior of the casing into the chambers 5^b and 5^e. One of the compression pump ports is connected to a pipe 14 which extends into the chamber 5^b, while the other port of the pump is connected to a pipe 14^a which extends into the chamber 5^e. The upper ends of these pipes are provided with deflectors 14^b. The chambers 5^b and 5^e contain bodies of oil or the like 5^f which are adapted to lubricate the pump 2 and seal the latter. The deflectors 14^b are adapted to separate the oil from the heating or refrigerating agent, when the same has passed through the pump, and has gathered some oil therein. The casing 5^c is provided with a port 5^g which places the chamber 3 in communication with the chamber 5^e.

The cylinder 3 supports a casing 20 which in turn supports the prime mover 1, and the prime mover supports a deflector 21.

In the operation of producing cold, the prime mover 1 is started forward, and this causes the means of circulation 7 to circulate air around the coils 5, where units of heat in the air are absorbed in the expanded refrigerating gas. The chilled air passes on into the space to be cooled. The heat absorbed in the coil 5 is carried by the agent and, through the drawing or suction action of the pump, is passed through pipe 5^a which leads the same to the chamber 5^b. From this chamber the agent passes through pipe 14 into the pump where it is compressed to a high degree and is forced out through the pipe 14^a, and the oil is separated from the heated gas by the deflector 14^b.

The heated gas passes through the hole 5^g into the cylinder 3, where the heat is absorbed in the water circulating in coil 6. The heat absorbed in the water is carried by circulation to the exterior of the apparatus. The gaseous agent, coming in contact with water coil 6 and losing its heat, condenses to liquid and falls to the lower portion of the cylinder 3, where an approximate liquid refrigerant level is shown at 3^a. Owing to the compression by the pump 2, the liquefied gas is forced up pipe 4^a out of the cylinder 3 to the expansion valve 4. Expansion and evaporation takes place at this point and the pressure is reduced to a low level. The gaseous agent, by expansion and evaporation, becomes extremely cold and then passes through the pipes 4^b and 4^c to the coils 5. The cooling is effected due to the heat which the refrigerant absorbs in passing from the liquid to the gaseous state and which becomes latent in the gas. A continuous cycle of the gas is maintained while the machine is in operation, and from this point the circulation continues as hereinbefore described.

In producing heat, the entire circulation of the machine excepting only the circulation of water in the coil 6, is reversed. This is accomplished by reversing the action of the prime mover 1. The means of circulation 7 causes the air to be heated to be passed through coils 5 where radiation takes place. Heat is radiated from the water in coil 6 into the refrigerating gas in cylinder 3. The temperature in cylinder 3 is extremely low. Heat absorbed in the refrigerating gas is drawn through opening 5^g into the chamber 5^e, thence into pump 2 through the pipe 14^a. The gas is compressed and the additional heat of compression is added at this point. The heated gas passes out through the pipe 14 into the chamber 5^b where the oil and gas are separated by deflector 14^b, the oil dropping to the bottom of the chamber and maintaining the oil level shown. The heated gas passes through pipe 5^a at high pressure and into the coils 5, where it imparts its heat to the air forced by the means of the circulation 7. The gas in the coils 5 becomes liquefied and this liquid passes out through pipes 4^b and 4^c to expansion valve 4. At this point the liquid becomes extremely cold through expansion and is discharged into the cylinder 3 through pipe 4^a. The process continues from this point as hereinbefore described, and a continuous cycle of the gas is maintained while the machine is in operation.

In the embodiment of the invention shown in Figure 4, the apparatus is exactly the same with the exception that the coil 6^x. arranged in the cylinder 3^x, is connected to the outlet or inlet of the chamber 5^e and is also connected to the pipe 4^a, and instead of circulating water through the casing or cylinder 3^x, I provide said cylinder with an air inlet pipe 30 and an air outlet pipe 31. This apparatus is particularly adapted for refrigerator cars and the like, and in action the pump 2^x forces the heated gas into the coil 6^x at the point 2^y. Air passing through the pipes 30 and 31 is allowed to circulate about the coil 6 and this causes the gas therein to condense. The liquefied gas is forced by the pump 2^x through the coil and up the pipe 4^a to the expansion valve 4 where expansion takes place. The gas becomes extremely cold at this point and passes into the coils 5^x. Heat from the space to be cooled is absorbed in the coils 5^x and passes with the gaseous agent through the pipe 5^a back to the compression pump 2^x. The gas is here compressed and passes again directly into the top of the coil 6^x where the heat from the gas is radiated into the circulating air about the coil. The ventilator pipe 31 passes the heat that is then absorbed into the air outside of the space to be cooled. The liquefied gas at the bottom of the coil 6^x, passes onto the expansion valve 4, where the same continuous cycle of the gas takes place. This type of machine can be used wherever an air cooled machine is desirable.

In addition to the foregoing uses the apparatus may be utilized for heating and cooling plus refrigeration, for chest purposes; producing cold for cold storage and large refrigerator service. For small refrigerator service the means of circulation may be eliminated and the coils 5 may be submerged in a tank of brine inside of the chest. For refrigerator car service or other service where an air cooled machine is desirable, the apparatus may also be used.

What I claim and desire to secure by Letters-Patent is:

1. An apparatus for creating heat or cold including a heating or cooling agent conducting means adapted to be arranged in

the medium to be heated or cooled, a fan for forcing said medium past said means a compression pump, conducting means placing said conveying means in communication with said compression pump, a second conveying means also communicating with said compression pump, pipes placing the second conveying means in communication with the first mentioned conveying means, an expansion valve arranged in said pipes, means for conveying a heating or cooling medium in close proximity to the second mentioned conveying means in order to heat or cool the agent passing through the second conveying means, and means for driving said pump and fan in reversed directions.

2. An apparatus for creating heat or cold including a coil adapted to be arranged in the medium to be heated or cooled, a fan for forcing said medium past said coil, a reversible motor connected to the fan for driving the latter, a hollow casing supporting said motor, a rotary compression pump arranged in said casing and driven in reversed directions by said motor, said pump having inlet and outlet ports, a pipe placing said coil in communication with one of said ports, means placing the other one of said ports in communication with the interior of said casing, a second pipe placing the interior of said casing in communication with said coil, an expansion valve arranged in the second pipe, and means for conveying a heating or cooling medium through said casing.

3. An apparatus for creating heat or cold including a casing having an aperture at its upper end, a second casing closing said aperture and extending into the first casing, a partition dividing the interior of the second casing into two compartments, a rotary compression pump arranged in the first casing and having inlet and outlet ports extending into said compartments, a support connected to and arranged above one of said casings, a motor carried by said support and having a driving shaft, the lower end of said shaft extending through the second casing and connected to said pump for driving the latter, a coil arranged above the motor, a pipe placing said coil in communication with one of the ports of the pump, a second pipe placing said coil in communication with the other port of the pump, an expansion valve arranged in the second pipe, a fan mounted on the upper end of the motor shaft and adapted to force air past said coil, and means for passing a heating or cooling medium through the first casing.

In testimony whereof I affix my signature.

PAUL E. DRINKWATER.