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C. J. COLEMAN.

REFRIGERATION SYSTEM AND APPARATUS.

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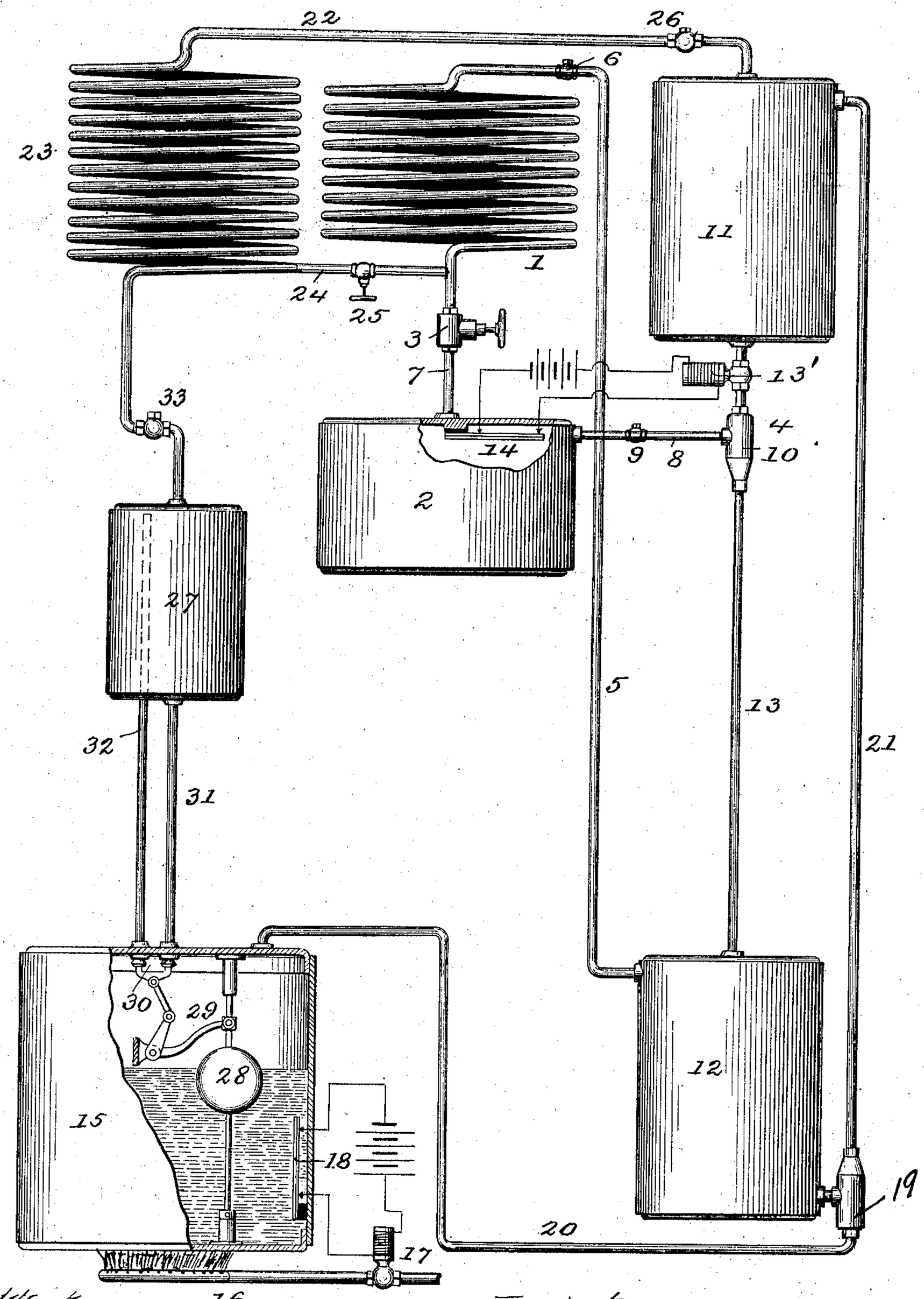
NO MODEL.



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UNITED STATES PATENT OFFICE.

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REFRIGERATION SYSTEM AND APPARATUS.

SPECIFICATION forming part of Letters Patent No. 757,392, dated April 12, 1904.

Application filed October 14, 1899. Renewed July 25, 1902. Serial No. 116,887. (No model.)

To all whom it may concern:

Be it known that I, CLYDE J. COLEMAN, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Refrigeration Systems and Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming a part of this specification.

This invention relates to that class of refrigeration system and apparatus in which the refrigerant medium is positively transferred from the expansion or cooling chamber into the condensing or storage chamber to attain a continued and automatic operation of the system.

The objects of the present improvements are, first, to provide a simple and efficient system of refrigeration in which a single medium is employed in common as the refrigerant medium in the cooling part of the system and as the power medium in the power part of the system to effect a closed cycle of operations in a practical use of the system, all as will hereinafter more fully appear; second, to provide a simple and efficient automatic apparatus in which the different operations of the present class of refrigeration systems are carried on in succeeding cycles, as will hereinafter more fully appear and be more particularly pointed out in the claims.

The accompanying drawing, illustrative of the present improvements, is an elevation, partly in section, of an apparatus embodying the present improvements.

Referring to the drawing, 1 represents the storage or condensing coil or chamber; 2, the expansion or cooling coil or chamber in which the refrigerant medium is expanded to effect the cooling operation of the system; 3, the expansion-valve by means of which the refrigerant medium is admitted to the expansion coil or chamber 2 at a predetermined pressure or density, and 4 the compression apparatus by which the expanded refrigerant medium is drawn from the expansion-coil and forced into the condensing or storage chamber, from whence it is again expanded within the expansion-coil in a closed and continuous cycle of operations.

The above-described parts of a refrigeration system and apparatus are, in a broad sense, usual to the present class of refrigeration apparatus and may be of any well-known and approved construction and connected together in any usual manner.

In the accompanying drawing, illustrative of the present invention, the outlet end of the compressing or pumping engine 4 is connected by pipe connection 5 with the condensing-chamber 1, such pipe connection being provided with a check-valve 6 to prevent a return flow of the refrigerant medium from the condensing-chamber into the compression or pumping engine aforesaid.

The condensing-chamber 1 is connected to the expansion or cooling chamber 2 by a pipe connection 7, in which is arranged the expansion-valve 3, heretofore described, and the expansion-chamber is in turn connected with the inlet end of the compression apparatus 4 by return-pipe connection 8, provided with a check-valve 9 to prevent backflow from the compression apparatus into such expansion or cooling chamber.

The first part of the present invention involves, broadly, the use of the same fluid medium in common in both the refrigerating or cooling portion and in the thermally-actuated portion of the system, and to this end the condensing or cooling chambers of the two portions will be coupled together to have common action, or a single condensing-chamber may be used in common for both portions of the system, as will hereinafter be more fully described in connection with the description of the special apparatus shown in the drawing as illustrative of this part of the present invention.

Another part of the present invention involves the use of a jet or injector pump for exhausting the expanded refrigerant medium from the expansion or cooling chamber and forcing the same into the condensing or storage chamber of the system and in connection therewith of a thermally-actuated generator

and jet-pump for effecting a constant circulation of the motive fluid that actuates the jet or injector pump that is interposed between the expansion-chamber and the storage chamber of the system to effect the before-mentioned transfer of the refrigerant medium from one to the other.

In the construction shown in the accompanying drawing as illustrative of the different parts of the present invention, 10 is an injector or jet pump receiving its supply of actuating fluid, preferably mercury, from an elevated tank 11, its inlet or suction orifice being connected by pipe connection 8 with the expansion or cooling chamber 2 of the system and adapted to draw or exhaust the expanded refrigerant medium therefrom.

12 is a closed receiving tank or chamber into which the eduction-pipe 13 of the jet-pump discharges the motor liquid, leaving the refrigerant medium in the upper portion of such chamber, from which it passes through pipe connection 5 into the condensing or storage chamber 1 for reuse in the process of refrigeration.

13′ is an electromagnetic controlling-valve in the motive-fluid-supply pipe to the injector-pump 10, and 14 is a thermostat located under the influence of the expansion or cooling chamber 2 and adapted to open or close the electromotive circuit of the operating electromagnet of the valve 13′ to regulate the operation or speed of the pump in accordance with the varying conditions existing in the expansion or cooling chamber.

15 is a thermal pressure-generator or tank provided with a gaseous-fuel-supply pipe and burner 16, the supply of fuel-gas thereto being regulated and controlled by an electromagnetic controlling-valve 17 and a thermostat 18, located under the influence of the generator 15 and adapted to open or close the electromotive circuit of the operating-electromagnet of the valve 17 to regulate the supply of fuel-gas in accordance with the variation of temperature within the generator.

19 is an injector or jet pump receiving its supply of actuating gaseous pressure from the thermal generator 15 through pipe connection 20, its inlet or suction orifice being connected with the lower end of the receiving tank or chamber 12 and adapted to force the motive-power fluid of the main injector or pump 10 from the tank 12 upward through pipe connection 21 into the elevated supply-tank 11. The motive gaseous pressure-fluid collects in the upper end of the chamber 11 and from thence passes through the connecting-pipe 22 into the auxiliary condenser 23 to be liquefied.

The main storage or condensing chamber 1 and the auxiliary condensing-chamber 23 may be in the form of a single chamber common to both the motive power and the refrigerant portions of the system. Preference is, however, given to the arrangement shown, in that the two condensers are connected together by a pipe 24, so as to be in common when so required, and when it is desired to have them act individually for their particular portion of the system a valve 25 in such pipe connection can be closed to shut off communication between the two chambers.

26 is a check-valve in the pipe connection 22 to prevent a back flow from the auxiliary condenser 23 into the chamber 11.

27 is an elevated tank having pipe connection with the auxiliary condenser 23 and with the thermal generator 15 and constituting a stand-pipe to receive the condensed liquid from said condenser and return the same to the thermal generator 15 in an automatic manner, so as to preserve a substantially uniform liquid-level in said generator, and to this end the present construction involves the following automatic means of control.

28 is a float within the generator-chamber 15, adapted in its final upward or downward movement to trip the bell-crank lever 29 to open or close, as the case may be, the double valve 30, that controls communication between the pipe connections 31 and 32 of the chamber 27 with the thermal-generator chamber 15, and thus admit or cut off the inlet of the fluid according to the circumstances of the case. The pipe 32 is a vent-pipe extending to the upper end of the tank 27 and adapted to vent the same in the operation of effecting an automatic fluid-feed to the generator-chamber.

33 is a check-valve in the pipe connection between the auxiliary condensing-chamber 23 and the tank 27 for the purpose of preventing a return flow from such tank 27 into the condensing-chamber 23.

Having thus fully described my said invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a refrigeration system of the class herein described, the combination with the storage-chamber and the cooling-chamber, of an injector arranged intermediate of said chambers, and means connected with the cooling-chamber for automatically controlling the action of such injector, substantially as set forth.

2. In a refrigeration system of the class herein described, the combination with the storage-chamber and the cooling-chamber, of an injector arranged intermediate of said chambers, and means connected with the cooling-chamber for automatically controlling the motive fluid of such injector, substantially as set forth.

3. In a refrigeration system of the class herein described, the combination with the storage-chamber and the cooling-chamber, of an injector arranged intermediate of said chambers, means connected with the cooling-chamber for automatically controlling the action of such injector, and means for preventing a re-

trograde movement of the refrigerant medium, substantially as set forth.

4. In a refrigeration system of the class herein described, the combination with the storage-chamber and the cooling-chamber, of an injector arranged intermediate of such chambers, means connected with the cooling-chamber for intermittently controlling the action of such injector, and means for preventing a retrograde movement of the refrigerant medium, substantially as set forth.

5. In a refrigeration system of the class herein described, the combination with the storage-chamber and the cooling-chamber, of an injector arranged intermediate of such chambers, means connected with the cooling-chamber for intermittently controlling the motive fluid of said injector, and means for preventing a retrograde movement of the refrigerant medium, substantially as set forth.

6. In a refrigeration system of the class herein described, the combination with the storage-chamber and the cooling-chamber, of a gravity-injector arranged intermediate of such chambers, and means connected with the cooling-chamber for automatically controlling the action of such injector, substantially as set forth.

7. In a refrigeration system of the class herein described, the combination with the storage-chamber and the cooling-chamber, of a gravity-injector arranged intermediate of such chambers, means connected with the cooling-chamber for automatically controlling the action of such injector, and means for elevating the motive fluid to such gravity-injector, substantially as set forth.

8. In a refrigeration system of the class herein described, the combination with the storage-chamber and the cooling-chamber, of a gravity-injector arranged intermediate of such chambers, an elevated supply-chamber, means connected with the cooling-chamber for automatically controlling the action of such injector, and means for elevating the motive fluid to such supply-chamber, substantially as set forth.

9. In a refrigeration system of the class herein described, the combination with the storage-chamber and the cooling-chamber, of a gravity-injector arranged intermediate of such chambers, an elevated supply-chamber, means connected with the cooling-chamber for automatically controlling the action of such injector, and an injector for elevating the motive fluid to such supply-chamber, substantially as set forth.

10. In a refrigeration system of the class herein described, the combination with the storage-chamber and the cooling-chamber, of a gravity-injector arranged intermediate of said chambers and adapted to effect the transfer of the refrigerant medium from one to the other, a lifting-injector for elevating the motive fluid to such gravity-injector, and a thermal pressure-generator, connected to said lifting-injector, subtantially as set forth.

11. In a refrigeration system of the class herein described, the combination with the storage-chamber and the cooling-chamber, of a gravity-injector arranged intermediate of said chambers, and a closed power-circuit embracing a thermal pressure-generator, a lifting-pump for the motive fluid of the gravity-injector, a condensing-chamber, and a return connection to the pressure-generator, substantially as set forth.

12. In a refrigeration system of the class herein described, the combination with the storage-chamber and the cooling-chamber, of a gravity-injector arranged intermediate of said chambers, and a closed power-circuit embracing a thermal pressure-generator, a lifting-pump for the motive fluid of the gravity-injector, a condensing-chamber, a return connection to the pressure-generator, and means for automatically controlling such return connection, substantially as set forth.

13. In a refrigeration system of the class herein described, the combination with the storage-chamber and the cooling-chamber, of a gravity-injector arranged intermediate of said chambers, and a closed power-circuit embracing a thermal pressure-generator, a lifting-pump for the motive fluid of the gravity-injector, a condensing-chamber, a return connection to the pressure-generator, and means for automatically controlling such return connection, the same comprising a valve controlling the inlet from such connection, and a float within the generator controlling said valve, substantially as set forth.

In testimony whereof witness my hand this 2d day of September, 1899.

CLYDE J. COLEMAN.

In presence of—
ROBERT BURNS,
CHARLES PICKLES.