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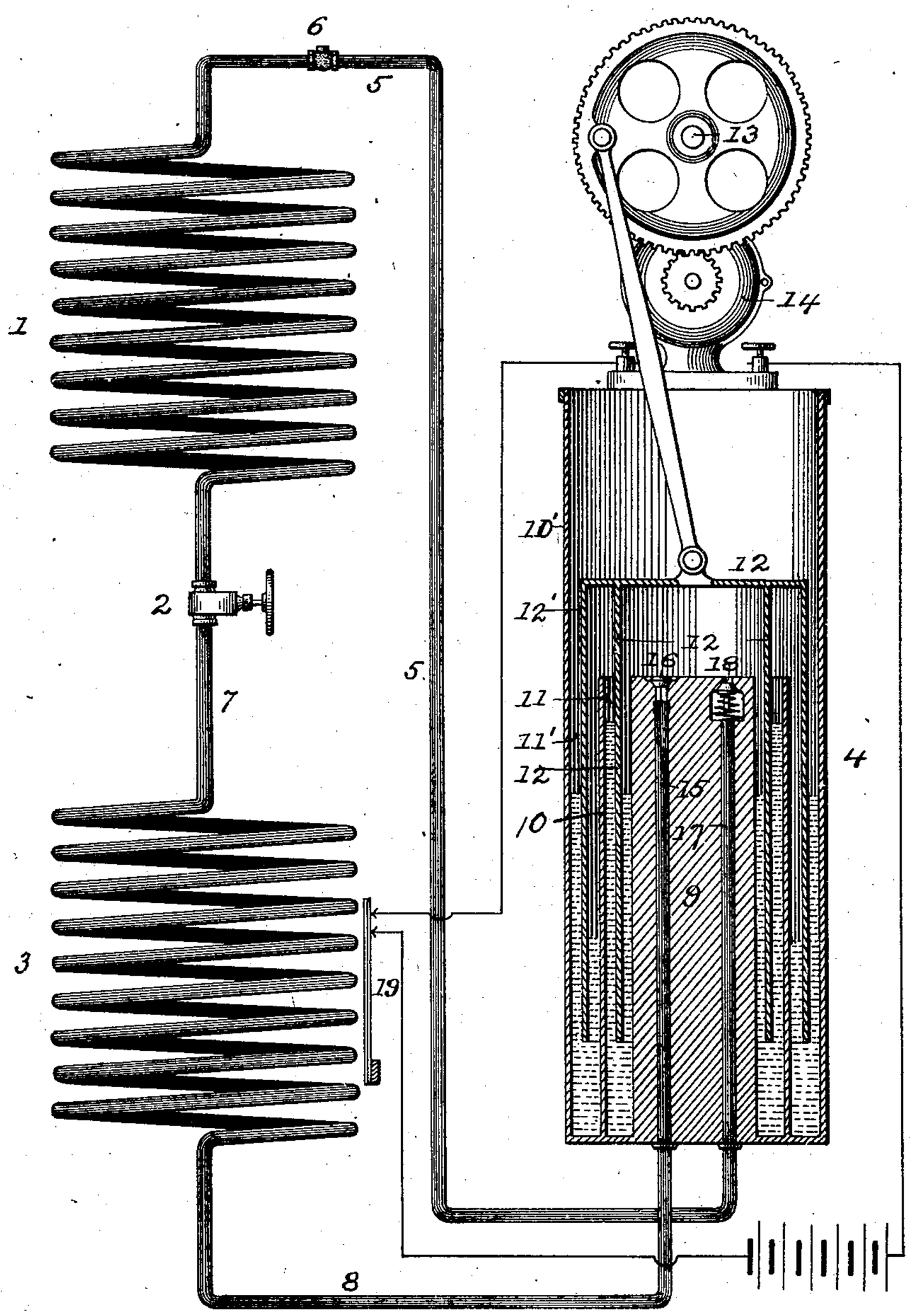
C. J. COLEMAN.

REFRIGERATION SYSTEM.

APPLICATION FILED JAN. 22, 1900. RENEWED JULY 25, 1902.

NO MODEL.



WITNESSES:

John Enders Jr.

M. H. Holmes.

INVENTOR:

Clyde J. Coleman,

BY

Robert Burns

ATTORNEY.

UNITED STATES PATENT OFFICE.

CLYDE J. COLEMAN, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CLARENCE W. COLEMAN.

REFRIGERATION SYSTEM.

SPECIFICATION forming part of Letters Patent No. 726,218, dated April 21, 1903.

Application filed January 22, 1900. Renewed July 25, 1902. Serial No. 116,891. (No model.)

To all whom it may concern:

Be it known that I, CLYDE J. COLEMAN, a citizen of the United States of America, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Refrigeration Systems, of which the following is a specification.

The present invention relates to that type of refrigerant apparatus in which positive means are employed to withdraw the expanded refrigerant medium from the cooling-chamber of the system and forcing such expanded medium in a direct manner into the storage-chamber in a substantially continuous and automatic manner, an example of which system is shown in my former application for Letters Patent, Serial No. 730,007, filed September 9, 1899.

The object of the present improvement is to provide a simple, durable, and efficient arrangement and construction of the compression apparatus of the system, with which the refrigerant medium is transferred from the cooling to the storage chamber for continued reuse in effecting a continued cooling operation of the system, and in which a liquid seal is employed between the expansion and storage or condensing sides of the system to determine the degree of compression within such storage-chamber, as will hereinafter more fully appear, and be more particularly pointed out in the claims.

The accompanying drawing is a vertical sectional elevation, partly diagrammatic, of a refrigeration system and apparatus embodying the present invention.

Referring to the drawing, 1 represents the storage or condensing coil or chamber; 2, the expansion-valve; 3, the expansion or cooling coil or chamber, in which the refrigerant medium is expanded to effect the cooling operation of the system, and 4 the compression apparatus, by means of which the expanded refrigerant medium is drawn from the cooling-chamber 3 and forced or compressed into the storage-chamber 1, from whence it is again expanded within the cooling-chamber in a closed and continuous cycle of operations and in an automatically-controllable manner, as hereinafter set forth.

The above-described members of a refrigeration system and apparatus are in a broad sense usual to the present type of such systems and may be of any usual and approved construction and connected together in any usual manner.

In the accompanying drawing, illustrative of the arrangement of the present invention, the outlet end of the compression apparatus 4 is connected by pipe connection 5 with the storage-chamber 1, such pipe connection being provided with a check-valve 6 to prevent a return flow of the refrigerant medium from the storage-chamber. The storage-chamber 1 is in turn connected to cooling-chamber 3 by a pipe connection 7, in which is arranged the expansion-valve 2, and the cooling-chamber is in turn connected with the inlet end of the compression apparatus by a return-pipe connection 8.

The present improvement in the above-described type of refrigeration apparatus involves, broadly, the combination of a mechanically-operated reciprocating pump provided with a liquid seal or column intermediate of the piston and piston-cylinder thereof and arranged intermediate of the storage and cooling sides of the system and means connected with the cooling-chamber for automatically controlling the operation of such pumping apparatus.

In the apparatus illustrated in the drawing the pumping or compressing apparatus, by which the expanded and attenuated refrigerant medium as it comes from the cooling-chamber is forced into the storage-chamber in the state of condensation or compression for reuse in effecting a subsequent cooling operation of the system, will comprise the following construction of parts: 9 is a stationary filling member or plunger, centrally arranged with relation to an outer cylindrical casing 10, the two constituting the stationary cylinder portion of the pump. 11 is an annular chamber between the parts 9 and 10 and adapted to contain a quantity of sealing liquid, usually mercury. 12 is an inverted-bell-shaped plunger fitting the annular chamber 11 and constituting the movable piston of the pumping or compressing apparatus. 13 is the power-shaft, having crank-pin and

pitman or other like operative connection with the piston or plunger 12 to impart positive vertical reciprocation thereto. 14 is the electric motor, the armature-shaft of which has operative connection in any usual manner with the power-shaft 13. 15 is the inlet port or passage to the interior or chamber of the piston 12, such passage being controlled by an inwardly-opening check or inlet valve 16, and 17 is an outlet port or passage from the interior or chamber of the piston 12, such passage being controlled by an outwardly-opening or outlet valve 18. The outlet-port 17 communicates with the storage-chamber through pipe connection 5, while the inlet-port 15 communicates with the cooling-chamber by pipe connection 8.

In the described construction, the body of sealing fluid, usually mercury, in the annular chamber 11 of the pumping apparatus, the vertical height of which will determine the degree of compression maintained upon the refrigerant medium on the compression side of the system, in that with a continued operation of the pumping apparatus, the liquid seal will be gradually displaced to the outside of the piston 12, as shown, to maintain differential columns at the respective sides of the skirt of such piston.

In the present system the differential fluid columns just described are adapted to maintain a continued pressure upon the storage side of the system during the periods at which the compression apparatus is dormant.

19 is a thermostat located within the influence of the cooling coil or chamber 3 and adapted to open or close the electromotive circuit of the electric motor 14, by which the pumping apparatus of the system is propelled, in accordance with the varying conditions existing in the cooling or expansion side of the system.

Another part of the present invention involves the formation of the piston-chamber with a secondary annular chamber 11′, formed by the cylindrical wall 10 and a secondary outer wall 10′, and the formation of the piston 12 with a secondary skirt 12′, fitting the secondary annular chamber 11′, as shown. With this construction a duplex column of the sealing fluid is attained with a comparatively small height of the pumping apparatus, and accordingly the necessity of making such pumping apparatus of an excessive height can be avoided by such construction and arrangement of parts.

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

1. In an automatic system of refrigeration, the combination with the storage-chamber and the cooling-chamber, of a reciprocating compression apparatus arranged intermediate of such chambers, and a vertical liquid seal between the piston and piston-chamber of the compression apparatus constituting a fluid column which determines the difference in pressure between the cooling and storage chambers of the system and adapted to maintain a continued pressure upon the storage side of the system during a dormant condition of the compression apparatus, substantially as set forth.

2. In an automatic system of refrigeration, the combination with the storage-chamber and the cooling-chamber, of a reciprocating compression apparatus arranged intermediate of such chambers, a vertical liquid seal between the piston and piston-chamber of the compression apparatus constituting a fluid column which determines the difference in pressure between the cooling and storage chambers of the system and adapted to maintain a continued pressure upon the storage side of the system during a dormant condition of the compression apparatus, and means connected with the cooling-chamber for automatically controlling such compression apparatus, substantially as set forth.

3. In an automatic system of refrigeration, the combination with the storage-chamber and the cooling-chamber, of a reciprocating compression apparatus, the same comprising a piston having a series of skirts and a piston-cylinder having a series of annular chambers filled with a sealing liquid and adapted to receive the skirts of the piston, to constitute a fluid column which determines the difference in pressure between the cooling and storage chambers of the system and adapted to maintain a continued pressure upon the storage side of the system during a dormant condition of the compression apparatus, substantially as set forth.

4. In an automatic system of refrigeration, the combination with the storage-chamber and the cooling-chamber, of a reciprocating compression apparatus, the same comprising a piston having a series of skirts and a piston-cylinder having a series of annular chambers filled with a sealing liquid and adapted to receive the skirts of the piston, to constitute a fluid column which determines the difference in pressure between the cooling and the storage chambers of the system and adapted to maintain a continued pressure upon the storage side of the system during a dormant condition of the compression apparatus, and means connected with the cooling-chamber for automatically controlling the compression apparatus, substantially as set forth.

5. In an automatic system of refrigeration, the combination with the storage-chamber and the cooling-chamber, of a motor, a reciprocating pumping apparatus arranged intermediate of such chambers, and a vertical liquid seal between the piston and piston-chamber of the pumping apparatus constituting a fluid column which determines the difference in pressure between the cooling and storage chambers of the system and adapted to maintain a continued pressure upon the storage side of the system during a dormant

condition of the compression apparatus, substantially as set forth.

6. In an automatic system of refrigeration, the combination with the storage-chamber and the cooling-chamber, of a motor, a reciprocating pumping apparatus arranged intermediate of such chambers, a vertical liquid seal between the piston and piston-chamber of the pumping apparatus constituting a fluid column which determines the difference in pressure between the cooling and storage chambers of the system and adapted to maintain a continued pressure upon the storage side of the system during a dormant condition of the compression apparatus, and means connected with the cooling-chamber for automatically controlling the motor of the pumping apparatus, substantially as set forth.

Signed by me at New York, N. Y., this 16th day of January, 1900.

CLYDE J. COLEMAN.

Witnesses:

ROBERT BURNS,

M. H. HOLMES.