No. 709,814. Patented Sept. 23, 1902.

C. J. COLEMAN.

REFRIGERATING APPARATUS.

(Application filed Oct. 14, 1899.)

(No Model.)

Fig. 1.

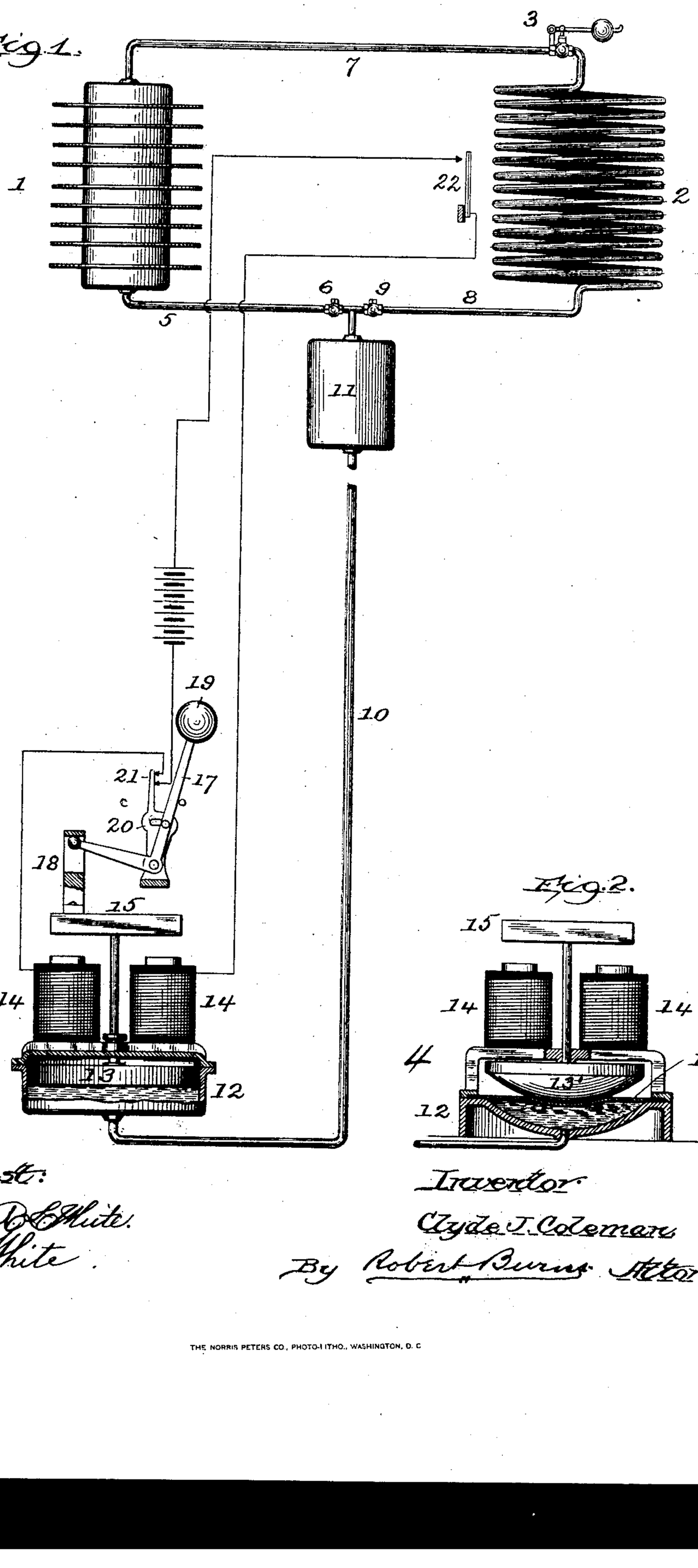

Fig. 2.

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REFRIGERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 709,814, dated September 23, 1902.

Application filed October 14, 1899. Serial No. 733,686. (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 Refrigerating 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 drawings, forming a part of this specification.

This invention relates to that type of refrigerating systems 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 cycle of operations in the system.

The object of the present improvement is to provide a simple and efficient automatic refrigerating apparatus in which the refrigerant medium is positively transferred from the expansion or cooling chamber of the apparatus back into the condensing or storage chamber thereof and which involves the provision of a fluid piston or column intermediate of such chambers adapted to govern the amount of vacuum or pressure in the system in accordance with the varying requirements thereof by a variation of the height of such liquid column or piston, such variation in the degree of vacuum or pressure being automatically controlled by the varying requirements or conditions prevailing in the refrigerating portion of the system, all as will hereinafter more fully appear and be more fully set forth in the claims.

In the accompanying drawings, illustrative of the present invention, Figure 1 is a general elevation, with parts in section, of an apparatus embodying the present invention. Fig. 2 is a detail sectional elevation illustrating a modified form of the motive-power portion of the system.

Similar numerals of reference indicate like parts in both views.

Referring to the drawings, 1 represents the storage or condensing coil or chamber; 2, the expansion or cooling chamber or coil, 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 in a closed and continuous cycle of operations.

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

In the accomyanying drawings, illustrative of the present apparatus, the extreme upper and outlet end of the motive-power portion of the system is connected by pipe connection 5 with the condensing or storage chamber 1, such pipe connection being provided with a check-valve 6 to prevent a return flow of the refrigerant medium from such condensing-chamber into the medium-forcing portion of the motive-power part of the system.

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 or cooling chamber 2 is in turn connected with the extreme upper and inlet end of the motive-power portion of the system by the return-pipe connection 8, provided with a check-valve 9 to prevent backflow from the medium-forcing portion of the motive-power part of the system into such expansion or cooling coil.

In the type of apparatus shown in Fig. 1 of the drawings as illustrative of the present invention the containing means for the liquid piston or column above described will comprise a vertical stand-pipe 10, provided at its upper end with a closed tank 11 and communicating at its lower end with the piston-chamber of the reciprocating pumping-engine 12, which in the construction shown in said Fig. 1 comprises a single-acting piston 13 and cylinder. The piston receives a positive and forcible downard movement by

an operating-electromagnet 14, the armature 15 of which is connected to the piston, as shown. A reverse upward movement is imparted to the piston by fluid column or piston in the stand-pipe 10, communicating with the under side of the piston, as shown.

With the above-described construction upon a forcible downward movement of the piston 13 through the instrumentality of the electromagnet and armature 14 and 15 the liquid column, usually mercury, is forced upward in the stand-pipe 10, displacing any refrigerant medium that may be in the upper part of the tank 11 into the condensing or storage tank 1 through the pipe connection 5 and check-valve 6. With a return or downward movement of the liquid column or piston due to gravity a vacuum will be created in the upper end of the tank 11, which immediately acts to draw the expanded refrigerant medium from the cooling or expansion coil 2 through the pipe connection 8 and check-valve 9 to institute a fresh expansion of the refrigerant medium within the same and a consequent fresh cooling operation of the same, and it is within the province of this part of the present invention to employ a duplicate arrangement of stand-pipes and operative connections arranged to operate alternately, and thus render the action of the cooling or expansion coil continuous in its nature.

In the modification shown in Fig. 2 the piston 13 is shown as acting through the instrumentality of a diaphragm 16 to impart movement to the fluid in the piston-chamber and stand-pipe containing the fluid piston or column of the present invention.

The operation of the pumping-engine under normal conditions will be of a constant and automatic nature, and to this end suitable automatic means will be employed for alternately opening and closing the circuit of the electromagnet 14 of such pumping-engine to cause it to operate in a constant manner.

In the mechanism shown in Fig. 1 of the drawings for attaining the above-stated results 17 is a weighted trip-lever of a right-angle formation, one end of which is adapted to receive intermittent actuation from the slotted yoke 18, carried by the piston 13, while its other end or arm carries the trip-weight 19, that is adapted to fall by gravity on either side of a perpendicular and in such fall cause the lever 17 to actuate a pivoted arm 20, that is adapted to close the circuit through the contact-points 21 with one movement of the lever 17 and to open said circuit in the other movement of said lever 17.

Another part of the present invention involves the automatic regulation of the operation of pumping-engine in accordance with the conditions prevailing in the refrigerating portion of the system in this: 22 is a thermostat under the influence of the expansion or cooling coil and adapted with a predetermined drop in temperature in such coil to open the circuit of the operating-electromagnet 14 of the pumping-engine and render the same inoperative until the circuit is again closed with a rise in temperature in the cooling-coil 2, with a corresponding action of the thermostat 22 to again close the electric circuit of the electromagnet 14 when the motive mechanism of the pumping-engine is again rendered active.

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

1. In a refrigerating apparatus, the combination with a condenser and a cooling-chamber, of a static-column conduit containing a liquid column constituting a piston at its upper end, valved conduits connecting the top of the static-column conduit with the condenser and cooling-chamber, and an electrically-operated pumping apparatus containing a piston or diaphram arranged to press directly upon the liquid column at the lower portion thereof.

2. In a refrigerating apparatus, the combination with a condenser and a cooling-chamber, of a static-column conduit containing a liquid column constituting a piston at its upper end, valved conduits connecting the top of the static-column conduit with the condenser and the cooling-chamber, an electromagnetic pumping apparatus containing a piston or diaphragm arranged to press directly upon the liquid column at the lower portion thereof, and a thermostat arranged within the influence of the cooling-chamber and connected to the electromagnetic pumping apparatus so as to control the operating electric current thereof.

3. In a refrigerating apparatus, the combination with a condenser and a cooling-chamber, of a static-column conduit containing a liquid column constituting a piston at its upper end, valved conduits connecting the top of the static-column conduit with the condenser and with the cooling-chamber, an electromagnetic pumping apparatus containing a piston or diaphragm arranged to press directly upon the liquid column at the lower end thereof, an automatically-operated circuit make and break device controlling such electromagnetic pumping apparatus, and a thermostat arranged within the influence of the cooling-chamber and connected to the electromagnetic pumping apparatus so as to control the operating electric current thereof.

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

CLYDE J. COLEMAN.

In presence of—
ROBERT BURNS,
CHARLES PICKLES.