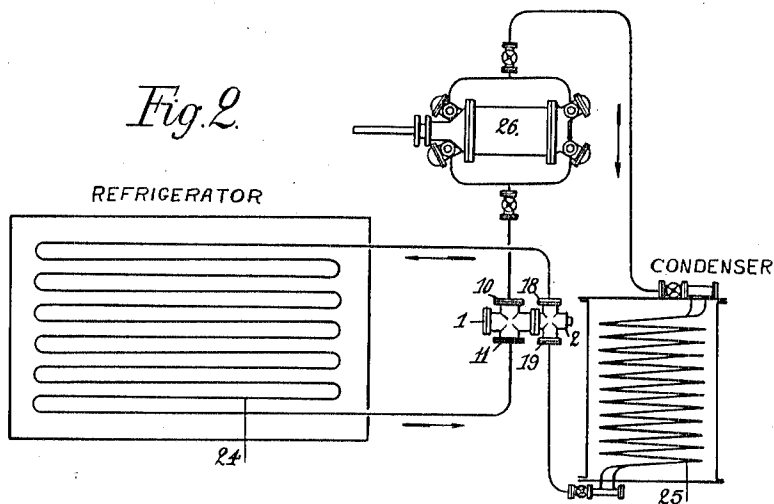
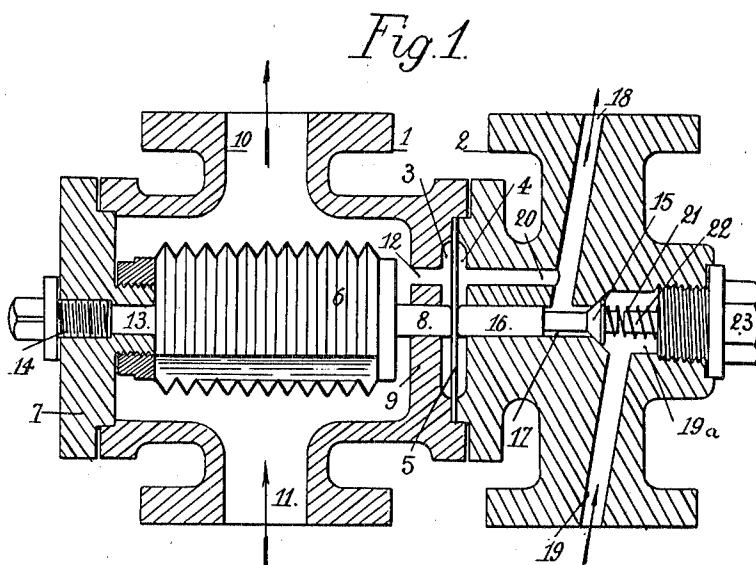


F. A. POLLARD.
 APPARATUS FOR THE AUTOMATIC REGULATION OF REFRIGERATING MACHINES.
 APPLICATION FILED MAR. 21, 1911.

1,120,159.

Patented Dec. 8, 1914.



Witnesses:

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 by *Max F. Myer*
 his Atty.

UNITED STATES PATENT OFFICE.

FREDERIC AUGUSTIN POLLARD, OF PARC ST. MAUR, FRANCE.

APPARATUS FOR THE AUTOMATIC REGULATION OF REFRIGERATING-MACHINES.

1,120,159.

Specification of Letters Patent.

Patented Dec. 8, 1914.

Application filed March 21, 1911. Serial No. 615,883.

To all whom it may concern:

Be it known that I, FREDERIC AUGUSTIN POLLARD, a citizen of the Republic of France, and residing at Parc St. Maur, Seine, France, have invented a new and useful Improvement Relating to Apparatus for the Automatic Regulation of Refrigerating-Machines, which improvement is fully set forth in the following specification.

This invention relates to improvements in the apparatus for the automatic regulation of refrigerating machines described in the specification of the Patent No. 971,788 of October 4th 1910, granted to me, and more particularly to the second form of apparatus therein described, which form of apparatus is also described in my Patent No. 990772, dated April 25, 1911, and whose action is based upon the expansion of two masses of liquid contained within elastic tubes or upon the expansion of a gas liquefied at varying pressure according to its temperature and also contained within elastic tubes.

According to the present invention, I employ a single elastic tube, containing a quantity of a liquefied gas, placed in the path of the gases passing from the refrigerating coils to the compressor. Such tube may act upon a membrane separating the chamber containing it from another chamber containing the valve regulating the passage of the refrigerating agent, the said valve being arranged in the pipe connecting the condenser to the refrigerator. The elastic tube expands to a greater or less extent, according to the degree of expansion of the gas contained therein and operates the valve, regulating the passage of the refrigerating agent. Thus as in the former arrangement, the gases sucked in by the compressor are slightly overheated or superheated and are thus in the dry state of saturation necessary for the proper working of the apparatus as described in the said prior specification.

Apparatus constructed in accordance with this invention allows the degree of overheating (which may be as little as desired) to be more nearly regulated.

The accompanying illustrative drawing shows one method of carrying out this invention.

In the drawing, Figure 1 is a longitudinal section of the regulating apparatus, and Fig. 2 is a diagrammatic view of the whole plant.

As illustrated in the drawing, the appa-

ratus is composed of two isolated chambers or containers 1 and 2, connected together in such a manner as to leave between them a free space which is divided into two chambers 3 and 4 by an elastic membrane or diaphragm 5 whose periphery is held between the containers. Within the container 1 is an elastic tube 6 capable of lengthwise movement and screwed at one end to one side 7 of the container 1. The other end of the tube 6 terminates in a rod 8 which can slide in a hole formed in the side 9 of the container 1 and thus act upon the membrane 5. The container 1 communicates through a passage 10 with the suction pipe of the compressor, and through a passage 11 with the outlet from the refrigerator. A passage 12 places the container 1 in communication with the chamber 3. Liquefied gas is introduced into the elastic tube 6 through a hole 13 formed in the side 7; 14 is a screw plug normally closing said hole. The tube 6 is charged with the gas utilized in the apparatus itself and it should contain such quantity of liquefied gas that the gas in the tube remains saturated for the highest pressures employed in working.

15 is a valve and 16 its stem arranged within the container 2; the stem 16 acts upon the membrane 5 moving in a passage 17 formed in the container. The passage 17 communicates through the passage 18 with the pipe leading to the refrigerator coils and through the passage 19 with the pipe leading from the condenser. The passage 18 is further in communication with the chamber 4, through the passage 20. The valve 15 is pressed on its seat by a spring 21 and its travel is limited by a stop 22 fixed to a screw plug 23, which closes the enlarged end 19^a of the passage 19.

The diagram Fig. 2 shows the manner in which the containers 1 and 2 are connected by their passages 10, 11 and 18, 19 to the refrigerator 24, the condenser 25 and the compressor 26.

The length of the rod 8 is so calculated that when the tube 6 is empty, the rod maintains the diaphragm 5 in a mid-position against the action of the spring 22 without however lifting the valve from its seat. When the tube 6 is provided with the necessary quantity of liquid gas and the apparatus is connected as in Fig. 2, the apparatus works as follows: The chamber 4 is in communication with the pipe leading to

the refrigerating coil 24 through the passages 20 and 18; the chamber 3 is in communication with the pipe leading from the refrigerator through the passages 12 and 11. As the loss between the inlet and the outlet from a refrigerator coil of normal construction is practically *nil*, the membrane 5, which separates the chambers 3 and 4, is in a state of equilibrium. When the tube 6 expands, the valve 15 is immediately lifted from its seating by the rods 8 and 16 and liquefied gas passes into the refrigerator 24.

The tube 6 containing the liquefied gas will only retain its initial shape so long as the pressure within it is equal to that of the vapors surrounding it (that is vapors passing from the refrigerator 24 and aspirated by the compressor 26); in order therefore that this condition may be fulfilled, the said vapors must be at the temperature of saturation, for so soon as slight overheating takes place, the temperature of the tube 6 and of the liquefied gas within it will increase as will also the pressure within this tube which will elongate and open the valve 15. Liquefied gas will be injected and consequently the temperature of the vapors aspirated will be lowered; the gas within the tube 6 cools and the tube tends to reassume its initial length until a position of equilibrium is established which corresponds to a suitable opening of the valve 15.

It is evident that the tube 6 with its content of liquid gas constitutes a thermostat or thermostatic device sensitive to changes in condition of the expanded refrigerant coming from the coils, and is arranged to govern the flow of condensed refrigerant to the coils in accordance with such changes.

By providing means for suitably regulating the tension of the spring 21, the desired degree of overheating of the aspirated vapors can be obtained without difficulty.

Claims—

1. In a regulator for refrigerating machines, a chamber having an inlet and an outlet for refrigerating fluid, a valve member for controlling flow through said chamber, a second chamber having an inlet and outlet for expanded refrigerating fluid, a diaphragm separating the two chambers and exposed to the pressures therewithin, a connection between said diaphragm and said valve member, and a thermostatic device within said second chamber and in actuating connection with said diaphragm.

2. In a regulator for refrigerating machines, a chamber having an inlet and an outlet for refrigerating fluid, a valve member for controlling flow through said chamber, a second chamber having an inlet and outlet for expanded refrigerating fluid, a diaphragm separating the two chambers and exposed to the pressures therewithin, a connection between said diaphragm and said

valve member, and a closed expansible tubular member containing a quantity of refrigerating fluid located within said second chamber and in actuating connection with said diaphragm.

3. In a regulator for refrigerating machines, conduits or passages for flow of expanded refrigerant and condensed refrigerant, respectively, a thermostat arranged in the conduit for expanded refrigerant, and a valve controlling the flow of condensed refrigerant, in combination with a flexible diaphragm forming a wall common to both conduits, the valve and the thermostat being provided with stems bearing against the diaphragm, and yielding means for holding the valve against the diaphragm.

4. In a regulator for refrigerating machines, two chambers adapted respectively for the flow therethrough of refrigerating fluid and expanded refrigerating fluid, a diaphragm separating the two chambers and exposed to chamber pressure on each side, a valve controlling the flow of refrigerating liquid and operatively connected to the diaphragm, and a thermostat in the path of flow of expanded refrigerating liquid and also operatively connected to said diaphragm.

5. Refrigerating apparatus comprising the combination, with a refrigerator, conduits for supplying refrigerating fluid thereto and leading expanded refrigerating fluid therefrom, respectively, a valve controlling the flow of refrigerating fluid to the refrigerator, and a thermostat in the path of expanded refrigerating fluid coming from the refrigerator, of a flexible diaphragm, a stem on said valve bearing against one side of the diaphragm, a spring yieldingly holding the valve stem against the diaphragm, and a stem connected to said thermostat and bearing against the opposite side of the diaphragm.

6. In a regulator for temperature modifying systems, a radiator having an inlet and an outlet for modifying medium, conduits connected, respectively, to said inlet and outlet, a thermostat consisting of a closed fluid containing vessel, arranged in the outlet conduit in the path of the modifying medium and in direct contact with the same, in combination with a valve for controlling the supply of modifying medium passing to the inlet, a diaphragm separating the valve from the thermostat, and connections between the thermostat and the valve for modifying the position of the valve according to the condition of the thermostat.

7. In a regulator for refrigerator machines, a supply conduit, a valve controlling the flow of refrigerating fluid therethrough, a return conduit for expanded refrigerating fluid, and a thermostat partly filled with the same fluid as used for refrigerating and ar-

5 ranged in the return path of the expanded refrigerating fluid, and operatively connected to the valve, in combination with an elastic diaphragm for closing off the valve against the thermostat.

10 8. A regulator for the supply of refrigerating fluid comprising a casing having two isolated chambers separated by a flexible diaphragm, one chamber being traversed by the refrigerating fluid and the other by expanded refrigerating fluid, in combination with an expansion body in one chamber and a valve controlling the flow of the fluid arranged in the second chamber, and connections between the valve and the expansion body whereby the expansion or contraction of the said expansion body actuates the valve to regulate the amount of passing refrigerating fluid.

20 9. In an apparatus for automatic regulation of liquefied gas for refrigerating apparatus, a regulator consisting of two isolated chambers or containers respectively adapted for the passage of refrigerating

fluid and of expanded refrigerating fluid, 25 and elastic diaphragm separating the two chambers, in combination with an expansion body containing an easily expansible substance arranged in one chamber, a passage for refrigerating gas arranged in the other 30 chamber, a valve regulating the flow of fluid through said passage arranged in the other chamber, a rod or stem arranged between the expansion body and the diaphragm and bearing against the same, a 35 similar stem arranged between the valve and the diaphragm and bearing against the same at the opposite side and yielding means for urging the valve and the valve-stem against the diaphragm. 40

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

FREDERIC AUGUSTIN POLLARD.

Witnesses:

DEAN M. MARION,
L. J. COMBE.