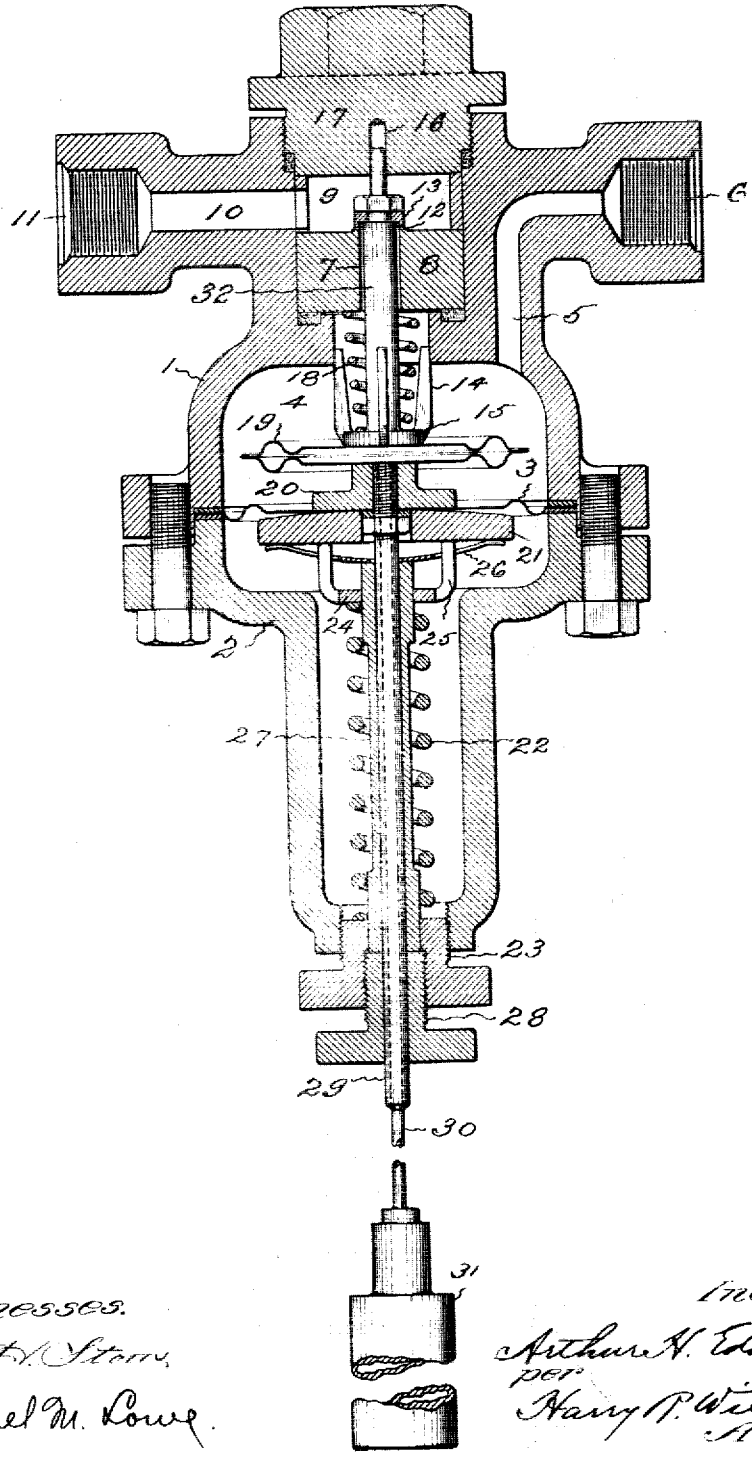
No. 853,541. PATENTED MAY 14, 1907.

A. H. EDDY.

AUTOMATIC EXPANSION VALVE.

APPLICATION FILED JAN. 26, 1906.



Witnesses.

C. F. L. Stamm.

Ethel M. Lowe.

Inventor.

Arthur H. Eddy

per

Harry P. Williams

Attorney.

UNITED STATES PATENT OFFICE.

ARTHUR H. EDDY, OF WINDSOR, CONNECTICUT, ASSIGNOR OF ONE-HALF TO CHARLES E. SHEPARD, OF HARTFORD, CONNECTICUT.

AUTOMATIC EXPANSION-VALVE.

No. 853,541. Specification of Letters Patent. Patented May 14, 1907.

Application filed January 26, 1906. Serial No. 297,979.

To all whom it may concern:

Be it known that I, ARTHUR H. EDDY, a citizen of the United States, residing at Windsor, in the county of Hartford and State of Connecticut, have invented a new and useful Automatic Expansion-Valve for Refrigerating Apparatus, of which the following is a specification.

This invention relates to an expansion valve which operates to automatically control the flow of refrigerating fluid to the expansion coil in the refrigerating compartment according to the temperature of the atmosphere in the compartment or temperature of the liquid in which the expansion coil may be submerged.

The object of this invention is to provide a simple, durable and compact valve of this nature which is sensitive and which is easily regulated so that it will operate at the necessary times to cause an efficient action of the refrigerating apparatus.

In the embodiment of the invention which is illustrated by the accompanying drawing the valve is normally held closed by the pressure of the refrigerating fluid on a diaphragm located on the expansion side of the valve and the valve is opened by the tension of a spring which is arranged in opposition to the pressure of the diaphragm, the action of the diaphragm as affected by the fluid pressure or by the spring pressure being modified by the action of an expansion diaphragm located between the pressure diaphragm and the valve and arranged to be expanded and contracted by the expansion and contraction of a fluid which is exposed in a thermic receptacle placed as desired in the compartment the temperature of which is to be refrigerated.

The accompanying drawing shows a central vertical section of a valve that embodies the invention.

Over the end of the casing 1 and held in place by the frame 2 of this valve is a diaphragm 3. The expansion chamber 4 above this diaphragm is connected by a passage 5 with the outlet 6 which is adapted to be connected with a pipe that leads to the expansion coil in the compartment which is to be refrigerated. The expansion chamber communicates through the port 7 in the block 8 with the pressure chamber 9 that is connected by the passage 10 with the inlet 11 which is adapted to be connected with a pipe from a receptacle containing the supply of refrigerating fluid, usually ammonia, in a liquid state and under pressure.

On the upper surface of the block about the port is a valve seat 12 and movable toward and from this seat is a valve 13. The valve stem 32 may be guided in its movement so that the valve will seat properly by prongs 14 extending from the head 15 at its lower end and by extending its upper end into a recess 16 in the cap 17. A spring 18 thrusts between the block and the head of the stem so as to hold the head against the expansion diaphragm 19 which is located in the expansion chamber. The spring which is shown between the block and the valve stem head need not be employed if the valve stem is attached permanently to the expansion diaphragm.

Between the pressure diaphragm and the expansion diaphragm is a pad 20 and below the pressure diaphragm is a pad 21. A spiral spring 22 thrusting between the screw plug 23 and a washer 24 with legs 25 tends to hold the lower pad in position and a spider-shaped spring 26 held by a sleeve 27, the position of which is determined by the adjustment of the screw plug 28, presses the lower pad and the diaphragm upwardly with the requisite force.

A tube 29 extends through the plugs, sleeve, pads and the pressure diaphragm, and opens into the expansion diaphragm. This tube is connected by a pipe 30 with a closed receptacle 31 which is designed to be placed in a brine tank or in the atmosphere in the compartment cooled by the expansion of the refrigerating fluid in the expansion coil. This receptacle, pipe, tube and the expansion diaphragm are preferably filled full of an expansible fluid such as alcohol. The expansion and contraction of this fluid due to the various changes of temperature to which the receptacle is subjected in the compartment being cooled, causes an expansion and contraction of the expansion diaphragm and this of course causes a variation of the length of the connection between the pressure diaphragm and the valve.

The refrigerating fluid pressure on the pressure diaphragm tends to contract the expansion diaphragm and force down the pressure diaphragm and allow the valve to be

closed against its seat by the valve stem spring. The spring pressure that opposes the fluid pressure on the diaphragm tends to move the valve from its seat. In this case the spring pressure and the expansion of the expansion diaphragm tend to open the valve and the spring and the fluid pressure in the expansion chamber and the contraction of the expansion diaphragm tend to close the valve. Consequently the times of opening and closing of the valve and the extent of the opening depends on the relations of the amount of downward pressure on the pressure diaphragm due to the fluid pressure, the pressure of the valve stem spring, the condition of the expansion diaphragm due to internal pressure, and the amount of upward pressure due to the force of the springs below the pressure diaphragm.

If there is not sufficient flow of refrigerating fluid to keep down the temperature in the compartment being cooled the temperature will rise and the rising temperature will cause an expansion of the regulating fluid and consequently an expansion of the expansion diaphragm. This lengthens the distance between the pressure diaphragm and the valve and consequently if the pressure in the expansion chamber is normal the valve is lifted from its seat so as to permit more refrigerating fluid to flow. If the pressure in the expansion chamber is abnormal it may be that it will force the pressure diaphragm back against the springs and still hold the valve to its seat. As more refrigerating fluid flows past the valve to the expansion coil and the temperature drops as a result of this the regulating fluid contracts and the contraction of this fluid allows the expansion diaphragm to contract and cause the valve to close unless there is an unusually low fluid pressure in the expansion chamber.

The invention claimed is:—

1. A refrigerating apparatus having a valve for controlling the flow of refrigerating fluid, an expansion diaphragm controlling the opening and closing of the valve, a diaphragm mounted to control the position of the expansion diaphragm and subject to the pressure of the refrigerating fluid on the expansion side of the valve, and a thermostatic regulator connected with the expansion diaphragm for contracting and expanding the expansion diaphragm, substantially as specified.

2. A refrigerating apparatus having a valve for controlling the flow of refrigerating fluid, a pressure diaphragm subject to the pressure of the refrigerating fluid on the expansion side of the valve, an expansion diaphragm located between and connected with both the pressure diaphragm and the valve, and a thermal regulator connected with the expansion diaphragm for causing its expansion and contraction, substantially as specified.

3. A refrigerating apparatus having a valve for controlling the flow of refrigerating fluid, a pressure diaphragm subject to the pressure of the refrigerating fluid on the expansion side of the valve, a spring arranged to thrust the pressure diaphragm against the pressure of the refrigerating fluid, an expansion diaphragm located between and connected with both the valve and the pressure diaphragm, and a thermal regulator connected with and adapted to cause the expansion and contraction of the expansion diaphragm, substantially as specified.

ARTHUR H. EDDY.

Witnesses:
HARRY R. WILLIAMS,
ETHEL M. LOWE.