No. 740,170. PATENTED SEPT. 29, 1903.

E. F. OSBORNE.

AUTOMATIC EXPANSION CONTROLLING VALVE.

APPLICATION FILED OCT. 26, 1899.

NO MODEL.

Fig 1

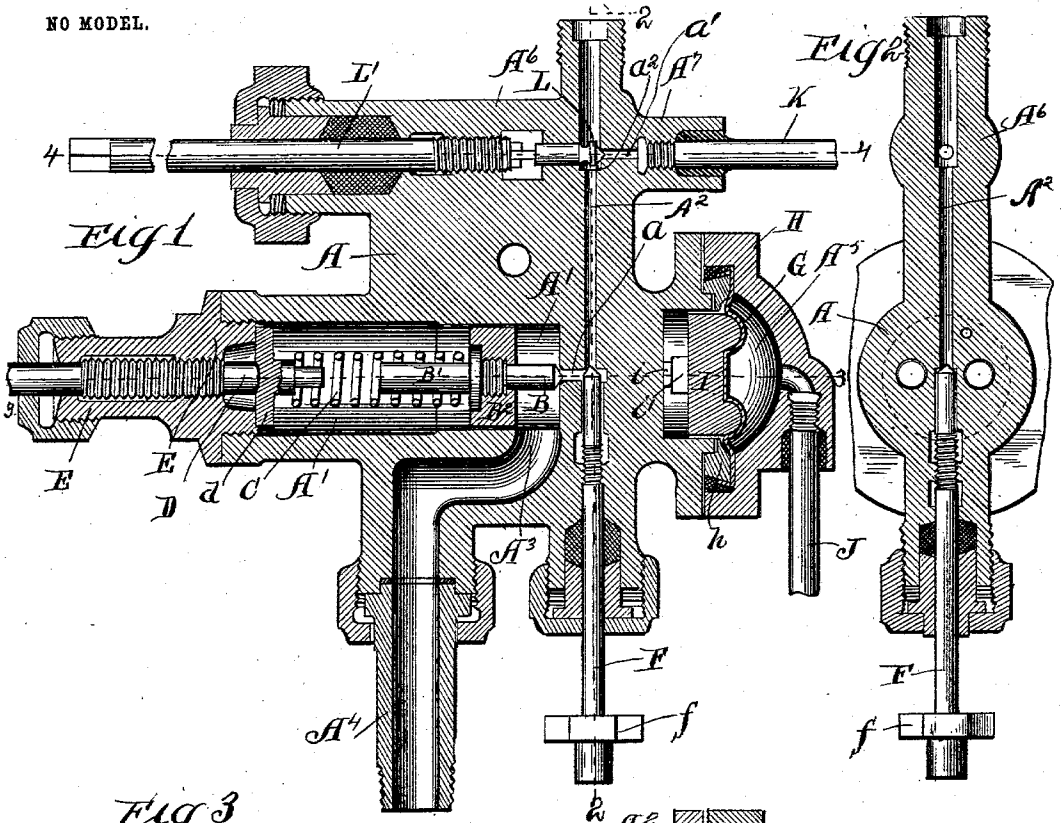


Fig 2

Fig 3

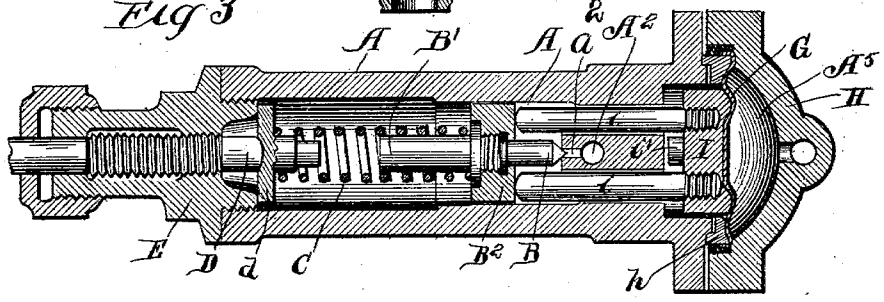
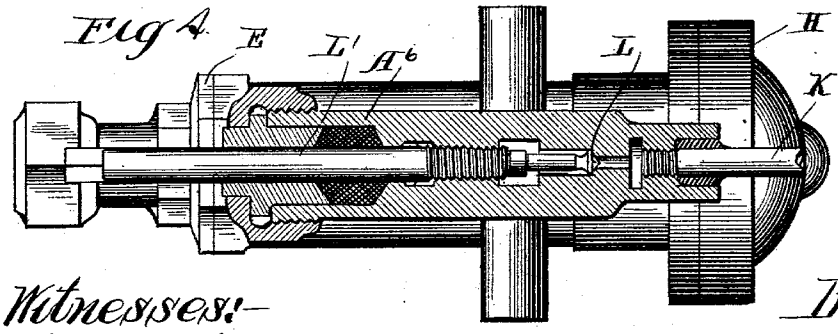


Fig 4



Witnesses:-
C. H. Crawford
William L. Hall.

Inventor:-
Eugene F. Osborne
by Pooler Brown
his Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 740,170. Patented September 29, 1903.

UNITED STATES PATENT OFFICE.

EUGENE F. OSBORNE, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO SAID OSBORNE AND J. MOTTE MARTIN, TRUSTEES, OF CHICAGO, ILLINOIS.

AUTOMATIC EXPANSION-CONTROLLING VALVE.

SPECIFICATION forming part of Letters Patent No. 740,170, dated September 29, 1903.

Application filed October 26, 1899. Serial No. 734,862. (No model.)

To all whom it may concern:

Be it known that I, EUGENE F. OSBORNE, of 356 Dearborn avenue, Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Automatic Expansion-Controlling Valves; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in automatic expansion-controlling valves for refrigerating apparatus of that class wherein a liquefiable gas is employed as a refrigerating agent. Said valve is located at the point of gasification of the liquid refrigerating agent, and is designed to control the gasification or expansion of said liquid, and thereby regulating the temperature of the chamber or compartment in which said gaseous refrigerating agent is expanded.

The invention consists of the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a central vertical section of an expansion-controlling valve which is made in accordance with my invention. Fig. 2 is a cross-section taken on line 2 2 of Fig. 1. Figs. 3 and 4 are horizontal sections taken on lines 3 3 and 4 4 of Fig. 1.

As shown in said drawings, A designates the valve-casing, having a valve-chamber A′. Said valve-casing is provided with an inlet-passage A^2, having a port *a* disposed at right angles with the inlet-passage and which opens into the valve-chamber A′.

A^3 designates an outlet-passage connected with a pipe A^4, which leads to the place of use of the fluid and the refrigerator-valve.

B designates a conical valve-plug which forms the valve-closure of the expansion-controlling valve and which in the absence of an opening force is held against its seat in the adjacent end of the port *a* by means of a spring C. Said valve-plug is adapted for connection with a movable part of a thermostat or like controlling device which is adapted to be located in the space or compartment to be cooled and which thermostat acts to hold the valve at a distance from its seat depending upon the temperature of such space, thereby permitting a greater or less flow of the fluid through said valve, according to the temperature required. Such plug is connected with or formed on the end of a valve-stem B′. B^3 designates a piston on said valve-stem, which is herein shown as made separate therefrom and having a screw-threaded engagement with the stem, said piston being made to fit loosely in said chamber, so as to permit the escape of the fluid to the spring-chamber. The spring C is interposed between a shoulder on the valve-stem and a flange *d* on a spindle D, which is mounted in the valve-casing in axial alinement with the valve-plug B. Said spindle D, as shown, has screw-threaded engagement with a detachable head E on the valve-casing, through which head the spindles may be moved inwardly or outwardly to regulate the action of said spring. Said head is shown as having screw-threaded engagement with the casing and as forming a closure for the chamber.

F designates an endwise-movable stem which has screw-threaded engagement with the valve-casing and projects at its inner end into the inlet-passage A^2, between the same and the port *a*. Said stem is provided at its inner end with a conical or needle point and is designed for the purpose of regulating the amount of fluid which passes from said passage A^2 to the valve-chamber A′ without reference to the extent to which the expansion-controlling valve is opened by the thermostat. Said stem projects outside of the valve-casing and is provided at its outer end with a head or thumb piece *f*, which is adapted for manual engagement and by which the conical end thereof may be moved with respect to its seat in the inlet-passage to regulate the flow of liquid therethrough.

Referring now to the connection between the thermostat and the expansion-controlling valve for automatically regulating the flow of liquid through said valve to correspond with the temperature of the space to be cooled, the same is made as follows:

G designates a diaphragm which is located

in a chamber A^5, formed partly in a recess in the outer wall of the valve-casing and partly in a hollow plate H, secured to the valve-casing over said recess. Said diaphragm is made from any suitable flexible material and is secured in place by having the margins thereof confined between the plate H and the ring *h*, which is interposed between said plate and the wall of said casing. A packing is also interposed between the periphery of said ring and the plate to provide a tight joint between these parts.

I designates a plate attached to the diaphragm. Said plate is provided on opposite sides of its center with lugs or pins *i i*, Fig. 3, which pass loosely through openings in the wall of the valve-casing and into the valve-chamber A'. Said pins engage at their inner end the piston B^2, which, as before stated, is attached to the stem of the valve B. The outer part of the chamber A^5, between the diaphragm G and the plate H, is adapted for communication with a fluid-containing thermostat of any approved form, which thermostat is located in the compartment to be cooled. Said chamber is adapted for connection with said thermostat by means of a pipe J, which is in communication with an opening in the plate H.

When the pipes are connected in the manner suggested and the temperature of the compartment to be regulated is increased beyond the temperture of the thermostatic medium, it serves, by the expansion of the fluid within the thermostat or the part of said thermostat which expands under the action of an increase of temperature, to move such diaphragm toward the valve, which latter acts, through the medium of the pins *i i* and the piston B^2, to move the valve away from its seat against the action of the spring C. Obviously a lowering temperature causes the thermostatic fluid to be condensed and permits the valve to be moved against its seat through the action of said spring C. The screw-threaded connection of the stem with the head E of the casing provides means for varying the tension of the spring C, so that the valve may be operated with greater or less pressure and the rate of flow of the fluid through the exhaust-valve regulated as desired. A stop-stud *i'* on the inner face of the plate I is adapted to strike against the inner wall of the recess forming part of the chamber A^5, and thereby limit the movement of the diaphragm and the pins *i i* when thrown inward by the action of the thermostat.

The gasification or expansion of the liquid refrigerating agent takes place at the opening of the port *a* of the valve-chamber, and the gaseous refrigerating agent is conducted through the outlet A^3 of the valve to the refrigerating-coil or to other points of use.

When the thermostat by which the valve is controlled is a fluid-containing thermostat, it may continuously be filled with the refrigerating agent used in the system of which the valve herein shown forms a part. Means are therefore provided for charging the thermostat with such refrigerating agent from the same source of supply with which the expansion-valve is connected. As herein shown, the said charging means are made as follows: A^6 designates a valve-casing which, as herein shown, is integral with the casing A and is provided on the side thereof adjacent to the thermostat with a passage *a'*, which opens into the inlet-passage A^2 of the regulating-valve and in communication to a pipe K, which leads to the thermostat. Said inlet-passage *a'* passes through the valve-casing A^6 and terminates in a screw-threaded nipple A^7 on said last-mentioned casing and is adapted for connection therewith of the pipe K. L designates a valve-plug in a chamber a^2 in said casing A^6. Said valve-plug is provided with a conical-shaped end which projects through the inlet-opening A^2 and engages a seat on the inner end of the passage *a'*, which leads to the thermostat. Said valve-plug L is connected at its end remote from said passage a^2 with a spindle L', which has screw-threaded engagement with the valve-casing and by means of which the valve may be moved to control the passage *a'*. The thermostat, which is adapted to be used with the expansion-valve herein shown, may, however, be filled with the liquefied gas at the place where such gas is liquefied and transported to its place of use under such temperature as to maintain such gas in its liquid state until the thermostat is connected to the valve.

I claim as my invention—

1. An expansion-controlling valve comprising a casing provided with a valve-chamber, with inlet and outlet passages communicating therewith and with a diaphragm-chamber, a spring-pressed valve-closure between the inlet-passage and the valve-chamber, a diaphragm in said diaphragm-chamber, connections between said diaphragm and the valve-closure, comprising a flange on the valve-stem and two studs attached to the diaphragm and which extend through openings in said casing and engage the said flange at the sides of the closure, a pipe leading to the outer side of the diaphragm-chamber and adapted for communication with a thermostat, a passage communicating with the inlet-passage of the valve and adapted to be connected with the thermostat to fill the same with the liquid passing through said valve, and a valve-plug for closing said filling-passage.

2. An expansion-controlling valve comprising a casing provided with a valve-chamber, with inlet and outlet passages communicating therewith and with a diaphragm-chamber, a spring-pressed valve-closure between the inlet-passage and the valve-chamber, a diaphragm in said diaphragm-chamber, connections between said diaphragm and the valve-closure, comprising a flange on the valve-stem and two studs attached to the diaphragm and which extend through openings in said cas-

ing and engage the said flange at the sides of the closure, a pipe leading to the outer side of the diaphragm-chamber and adapted for communication with a thermostat, a passage communicating with the inlet-passage of the valve and adapted to be connected with the thermostat to fill the same with the liquid passing through said valve, a valve-plug for closing said filling-passage, and a valve in said casing for determining the maximum amount of fluid which may pass through the inlet-passage to the valve-chamber.

3. An expansion-controlling valve comprising a casing provided with a valve-chamber, with inlet and outlet passages communicating therewith and with a diaphragm-chamber, a spring-pressed valve-closure between the inlet-passage and the valve-chamber, an exhaust-passage connected with said valve-chamber, a diaphragm in said diaphragm-chamber and connections between said diaphragm and the valve-closure comprising a flange on the valve-stem and two studs which are attached to the diaphragm and which extend through openings in said casing and engage said flange at the sides of the closure.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 19th day of October, A. D. 1899.

EUGENE F. OSBORNE.

Witnesses:

WILLIAM L. HALL,

GERTRUDE BRYCE.