Mar. 27, 1923. 1,450,052.

H. J. SMITH.

EXPANSION VALVE.

ORIGINAL FILED JULY 10, 1920.

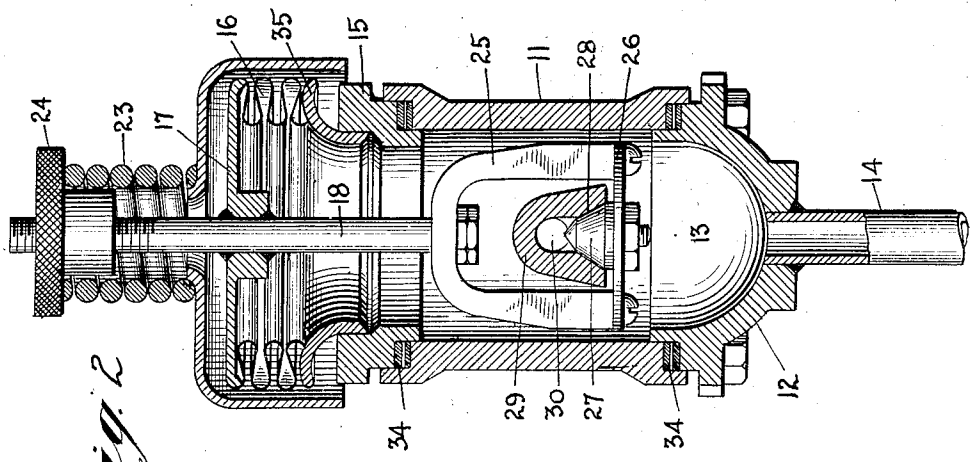


Fig. 2

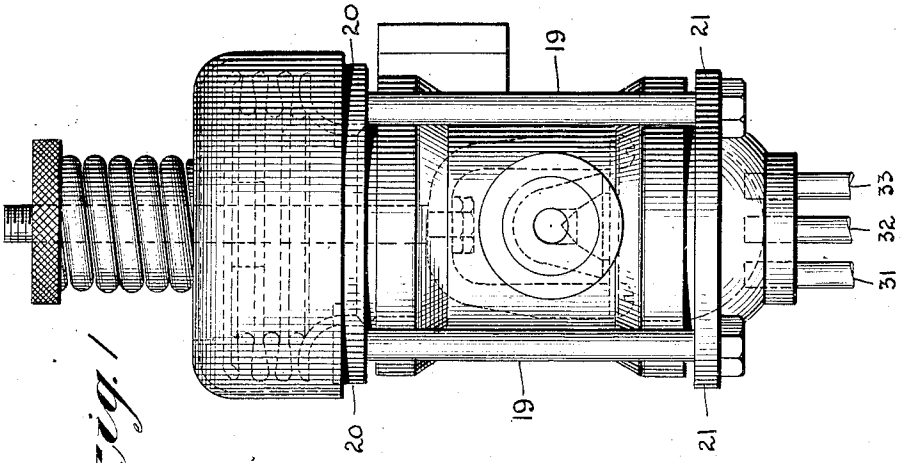


Fig. 1

INVENTOR

HAZOR J. SMITH,

BY

Edwin Bartlett

ATTORNEYS

Patented Mar. 27, 1923. 1,450,052

UNITED STATES PATENT OFFICE.

HAZOR J. SMITH, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-FOURTH TO WILLARD REID AND ONE-HALF TO ALFRED HASTINGS CHAPIN, BOTH OF SPRINGFIELD, MASSACHUSETTS.

EXPANSION VALVE.

Application filed July 10, 1920, Serial No. 395,423. Renewed October 10, 1922. Serial No. 593,654.

To all whom it may concern:

Be it known that I, HAZOR J. SMITH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Expansion Valves, of which the following is a specification.

This invention relates to expansion valves which are adapted to operate by differential pressure. The valve of this invention is adaptable to a number of uses but it is especially designed for use in a refrigerating system, so the valve must be very sensitive to changes in pressure in the low side and at the same time, the differential pressure means must be above the frost line so that they do not clog with ice. Further, the device must have all its parts accessible to lower the cost of keeping the valve in service.

The invention consists of a valve unit having a body portion adapted to encircle the valve mechanism. From the top of the body portion extends a differential pressure mechanism which operates to raise and lower a stem carrying a valve head, which valve head is adapted to seat, when it is moved upwardly in a downwardly directed valve seat. The valve seat is carried by a hood-like member encircling the end of an inlet pipe leading from the liquid receiver of an ice machine and the pipe is therefore filled with a refrigerating agent. In opening, the valve tends to let the agent out of the valve seat in a conical stream or spray but this is collected in a cup-shaped lower closure member for the body portion of the expansion valve, and directs it into the outlet pipe or pipes leading to the expansion coils. The differential pressure means are preferably a bellows member having a diaphragm carried by the valve stem, a hood or cover for this bellows supported from the valve main body and a spring supported from the hood exerting an upward tension upon the valve stem.

I have illustrated one embodiment of my invention which is the best of which I am at present informed and in the accompanying drawings:

Figure 1 shows a side elevation of the invention with its interior parts shown in dotted lines;

Figure 2 shows a vertical section through the device on the axis of the inlet passage.

In the drawings, the numeral 11 indicates the main body portion of the automatic valve closed at its bottom by a cover 12 having an interior cup-shaped part 13 opening into a discharge passage or pipe 14 which is connected to the low side of the refrigerating system in which the device is used. The upper part of the main body portion 11 is closed by cover 15 which carries a bellows-like member 16 which in turn operates a diaphragm 17 secured to a valve stem 18. The upper and lower covers 15 and 12 are held together by bolts 19 passing through bosses 20 on the upper cover 15 and 21 on the lower cover 12.

The bolt bosses 20 on the upper cover 15 support a cover or hood 22 which protects the bellows member 16 and supports a spring 23 which bears upwardly upon an adjusted screw 24 carried by the valve stem 18.

The valve stem carries at its lower end a stirrup 25 supporting a valve block 26 and the valve block carries an upwardly extending valve 27 of substantially conical shape which is adapted to co-act with a downwardly directed valve seat 28. The valve seat is in a casing 29 which surrounds the end of the inlet passage or pipe 30.

The cup-shaped chamber 13 may lead into one pipe 14 to feed the low side of the system or expansion coil, or, the chamber may feed into a plurality of pipes 31, 32 and 33 leading to more than one line of expansion coils as shown in Figure 1. 34 indicates packing to keep the valve joints tight. 35 represents an outwardly curved, or trumped-shaped, rigid support for the bellows 16 and its diaphragm 17 supported from the upper cover 15.

The device of this invention is an automatic valve especially for use in refrigerating systems where the tension of the low side is less than atmospheric pressure and its motion is derived from the difference in pressure between the inside of the low side and the atmosphere. In operation the inlet passage 30 is attached to the liquid receiver of the ice machine and is therefore filled with refrigerating agent while the outlet pipe 14 is attached to the expansion lines. If pressure within the valve body is equal to atmospheric pressure, no differential exists and there is no tendency of the valve to open against the residual tension of the

spring 23. But let a vacuum be established within the body of the valve chamber when the difference in pressure between the inside and outside of the valve body as exerted upon the head or diaphragm 17 exceeds the tension of the spring 23, the spring will be compressed, the diaphragm 17 moved and the motion thereof transmitted along the stem 18, the stirrup 25, the valve plate 26, whereby the valve 27 will be opened to admit the refrigerating agent into the body of the valve from whence it will be conducted by means of the cup 13 and pipe 14 to the low side of the system. The refrigerating agent or medium will enter the valve chamber in a substantially conical stream due to the shape of the valve but this will be collected by the cup-shape 13 of the closure member 12. When sufficient refrigerant has passed into the valve to relieve the tension, the spring 23 will close the valve by its upward pressure upon the adjusting nut 24 carried by the valve stem 18. The nut 24 can be adjusted to permit the carrying of any degree of vacuum desired in the low side.

The advantages of this valve are manifold when used with the lower volatiles as it is a bottom discharge valve. It is very sensitive to changes in pressure in the low side and by its general arrangement the syphonic bellows is above the frost line and does not clog with ice. The accessibility of every part lowers the cost of keeping the valve in service.

What I claim as my invention is:

1. An expansion valve having a valve seat, a valve, a stem for the valve, a bellows-like member for operating the valve stem, a spring for counteracting the action of the bellows and a hooded member protecting the bellows and supporting the spring.

2. An expansion valve having a body portion, a closure for the body, a valve, differential pressure means for operating the valve including the trumpet shaped support for the means extending from the closure for the body portion of the valve.

3. An expansion valve having a metallic valve seat, a non-metallic valve, a stem for the valve, a bellows-like member for operating the valve stem, a spring for counteracting the action of the bellows and a hooded member protecting the bellows and supporting the spring.

In testimony whereof I affix my signature.

HAZOR J. SMITH.

Witnesses:

WILLARD REID,

H. Y. SMITH.