

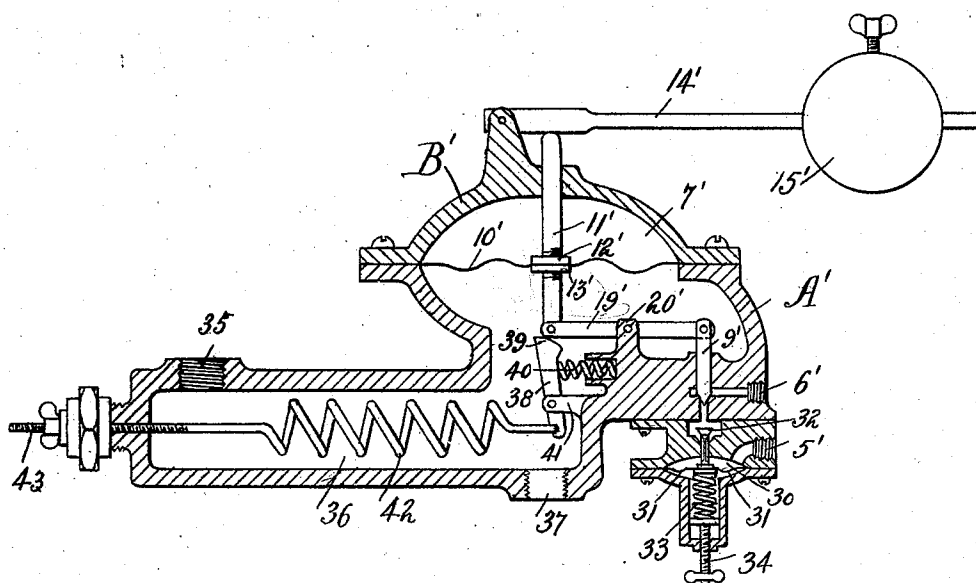
(No Model.)

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EXPANSION REGULATOR FOR REFRIGERATING MACHINES.

No. 578,297.

Patented Mar. 2, 1897.



Witnesses.

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UNITED STATES PATENT OFFICE.

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EXPANSION-REGULATOR FOR REFRIGERATING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 578,297, dated March 2, 1897.

Application filed June 10, 1895. Serial No. 552,236. (No model.)

To all whom it may concern:

Be it known that we, ELIEL L. SHARPNECK and GEORGE F. KNOX, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Expansion-Regulator and Safety Cut-Off for Refrigerating-Machines, of which the following is a specification.

This invention relates to attachments for refrigerating-machines, and its object is to provide means for automatically regulating the pressure and cutting off the flow of liquid.

The invention consists substantially in the construction, combination, location, and relative arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawing, and finally more specifically pointed out in the appended claims.

In the drawing is represented, in vertical central section, a form of apparatus embodying the principles of our invention.

In refrigerating-machines of the class to which the present invention relates ammonia-gas is converted into liquid form by being subjected to high pressure, and this liquid while under pressure is conducted to the expansion coils or chamber and the pressure exerted thereon suddenly reduced, thereby causing the liquid to gasify and producing cold. From the expansion coils or chamber the ammonia-gases are returned to the machine and again subjected to pressure and liquefied and from thence are returned to the expansion-coils and gasified, as above explained.

It becomes a matter of material importance that the degree of pressure to which the gas is subjected in order to liquefy the same be controllable, as upon the difference between the degree of pressure under which the liquid is conducted to the expansion-chamber and the degree to which that pressure is reduced suddenly in the expansion-chamber depends the degree of cold obtained thereby. Again, when the machine is shut down, it is important that the flow of liquid to the expansion-chamber be effectively cut off. In the accompanying drawing we have shown a convenient and effective apparatus for accomplishing these purposes, wherein the seating and unseating of the valve which controls the flow of liquid to the expansion chamber or

coils are dependent upon the degree of cold which is produced. In this construction is a casting A', which is provided with communicating passages 5' and 6', leading from the pressure-machine and to the expansion coils or chamber, respectively. A plug-valve 9', mounted upon one end of a lever 19', serves to control the communication between passages 5' and 6'. Lever 19' is pivoted intermediate its ends upon a lug 20', suitably cast with or otherwise formed on casting A', and is connected at its opposite end to a rod 11', upon which a pivotally-mounted weighted arm 14' is arranged to act, the weight 15' of said arm being made adjustable, as shown. The rod 11' is arranged to pass through a suitable diaphragm 10' and the joint made perfectly tight by means of the nuts and washers 12' and 13'. A cap-piece B', serving to inclose the diaphragm in chamber 7', may, if desired, be provided. The chamber 7', however, does not communicate with the passage traversed by the liquid on its way from the pressure-machine to the expansion coils or chamber, but the diaphragm 10' is actuated in a different manner, as will presently more fully appear.

Arranged in the path of the passage 5' is a chamber 30, in which is suitably arranged a diaphragm 31, carrying a valve 32, adapted, when seated, to cut off the flow of liquid to the expansion-coils. Valve 32 is normally arranged to be held unseated by diaphragm 31 and is seated by the undue pressure of the incoming fluid acting upon the diaphragm. The pressure tending to seat said valve 32 is opposed by a suitably-mounted spring 33, the tension of which may be adjusted in any suitable or well-known manner, as by set-screw 34.

Instead of returning the gases from the expansion coils or chamber directly to the machine, where they are again subjected to pressure and liquefied, said gases are, in the case illustrated, passed from the expansion coils or chamber through an opening into a chamber 36, formed in casting A' and arranged to communicate freely with one side of diaphragm 10'. Thence the gases pass out through an opening 37 and back to the machine.

The operation of the construction shown,

as so far described, is as follows: The liquid ammonia under pressure is passed from the pressure-machine into passage 5'. The valve 32 being normally unseated, the liquid passes through the seat of said valve, and thence raises the plug-valve 9' and passes to the expansion coils or chamber, thence to chamber 36 in the form of gases, and thence to the machine, to be again compressed into liquid form. The pressure of the gases upon diaphragm 10' serves to oppose the tendency of weighted arm 14' to unseat the plug-valve 9', and by suitably adjusting the position of weight 15' on arm 14' its leverage is controlled and the pressure regulated. When the pressure of the incoming fluid becomes too great, it acts upon diaphragm 31 against the action of spring 33 and effects a closing of valve 32, thereby cutting off the flow of liquid, and hence acting as a safety-stop.

We will now describe a construction by which the flow of liquid is automatically controlled by the degree of cold produced or required. Suitably arranged in convenient position to engage one end of lever 19' is a pivotally-mounted catch 38, having a cam-surface 39 formed upon the engaging face thereof and adapted, when engaging said lever, to hold the same in position to cause valve 9' to be seated. A suitably-arranged spring 40 is provided and bears against catch 38, normally tending to disengage said catch from lever 19'. Catch 38 may be in the form of a lever, as shown, pivoted intermediate its ends upon a lug 41. To the opposite ends of said catch is connected a thermostat of any desirable or suitable construction, arranged in the chamber 36 and acted upon by the gases coming from the expansion coils or chamber. In the particular form shown, though we do not desire to be limited or restricted thereto, the thermostat may consist of a coiled spring 42, provided with a threaded portion 43, by which it may be suitably adjusted. By the contraction or expansion of this spring due to variations in the temperature of the incoming gases the catch 38 is operated to engage or release lever 9' at its seat, thus cutting off the flow of liquid or else permitting the valve to be unseated, and hence allowing the fluid to flow into the expansion chamber or coils.

While we have shown and described a specific form of mechanism embodying the principles of our invention, it is evident that many alterations and variations in the details of construction and arrangement would readily suggest themselves to persons skilled in the art and still fall within the spirit and scope of our invention. We do not desire, therefore, to be limited or restricted to the exact details of construction and arrangement shown and described; but,

Having explained the object and nature of our invention and a form of apparatus embodying the same, and having explained the principle thereof and its mode of operation,

what we claim as new and useful and of our own invention, and desire to secure by Letters Patent of the United States, is—

1. In a refrigerating apparatus, a valve, arranged to control the flow of refrigerant to the expansion chamber or coils, means for seating said valve by excess of pressure, and means arranged in the path of flow of the refrigerant and adapted to be actuated by variations of temperature thereof, for locking said valve in seated position; as and for the purpose set forth.

2. In a refrigerating apparatus a valve, arranged to control the flow of refrigerant to the expansion coils or chamber, means normally tending to unseat said valve, means adapted to be actuated by excess of pressure for seating said valve, and means arranged in the path of flow of refrigerant from the expansion coils or chamber, and actuated by variations in temperature of said refrigerant, for locking and releasing said valve; as and for the purpose set forth.

3. In a refrigerating apparatus, a valve arranged to control the flow of refrigerant to the expansion coils or chamber, means normally tending to unseat said valve, means actuated by excess of pressure for seating said valve, and means for retaining said valve to its seat, said means adapted to be automatically released by variations in temperature of the refrigerant from said expansion coils or chamber; as and for the purpose set forth.

4. In a refrigerating apparatus, a valve arranged to control the flow of refrigerant, said valve adapted to be seated by excess of pressure of the refrigerant, means for locking said valve to its seat, and means for releasing said valve, comprising a thermostat arranged in the path of flow of the refrigerant from the expansion coils or chamber, and means for adjusting the action of said thermostat; as and for the purpose set forth.

5. In a refrigerating apparatus, a valve arranged to control the flow of refrigerant, means for locking said valve to its seat, a spring arranged in the path of flow of the refrigerant from the expansion coils or chamber and connected to said locking means, and adapted to release the same by the expansion thereof, due to the decrease of temperature of said refrigerant; as and for the purpose set forth.

6. In a refrigerating apparatus, a valve arranged to control the flow of refrigerant, a pivoted latch arranged to hold said valve to its seat, and a thermostat arranged in the path of flow of gases from the expansion coils or chamber, adapted to control said latch; as and for the purpose set forth.

7. In a refrigerating apparatus, a valve arranged to control the flow of refrigerant, a pivoted latch for holding said valve to its seat, and a spring arranged in the path of flow of the gases from the expansion coils or chamber and adapted by the expansion and con-

traction thereof, due to variations in the temperature of said gases, to actuate said latch; as and for the purpose set forth.

5 8. In a refrigerating apparatus, a valve arranged to control the flow of refrigerant, a pivotal catch, a spring arranged in the path of flow of gases from the expansion coils or chamber, attached to said catch, whereby the expansion or contraction of said spring, due
10 to variations in temperature of said gases, effects a movement of said catch to release said valve or to hold the same to its seat; as and for the purpose set forth.

15 9. In a refrigerating apparatus, a valve arranged to control the flow of refrigerant, a pivoted latch for holding said valve to its seat, a thermostat arranged in the path of flow of the gases from the expansion chamber or coils and adapted to actuate said latch, and means
20 for adjusting said thermostat; as and for the purpose set forth.

10. In a refrigerating apparatus, a passage through which the refrigerant flows to the expansion coils or chamber, a valve arranged to control the flow of refrigerant and a safety- 25 valve arranged in said passage, yielding means adapted to hold said valve normally unseated, said yielding means adapted to be actuated by excess of pressure to seat said valve to cut off the flow of refrigerant, and 30 means for adjusting the tension of said yielding means, whereby the point at which the flow of refrigerant is cut off may be regulated; as and for the purpose set forth.

In witness whereof we have hereunto set 35 our hands this 2d day of May, 1895.

ELIEL L. SHARPNECK.
GEORGE F. KNOX.

In presence of—

M. I. CAVANAGH,
S. E. DARBY.