

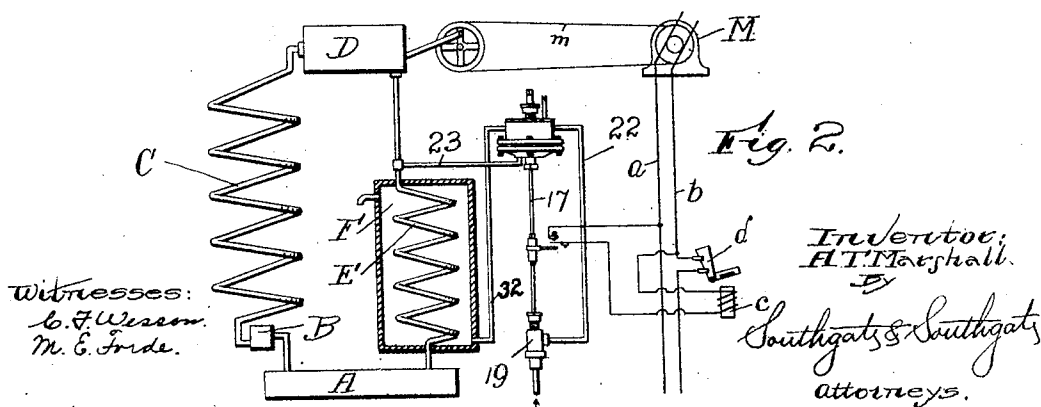
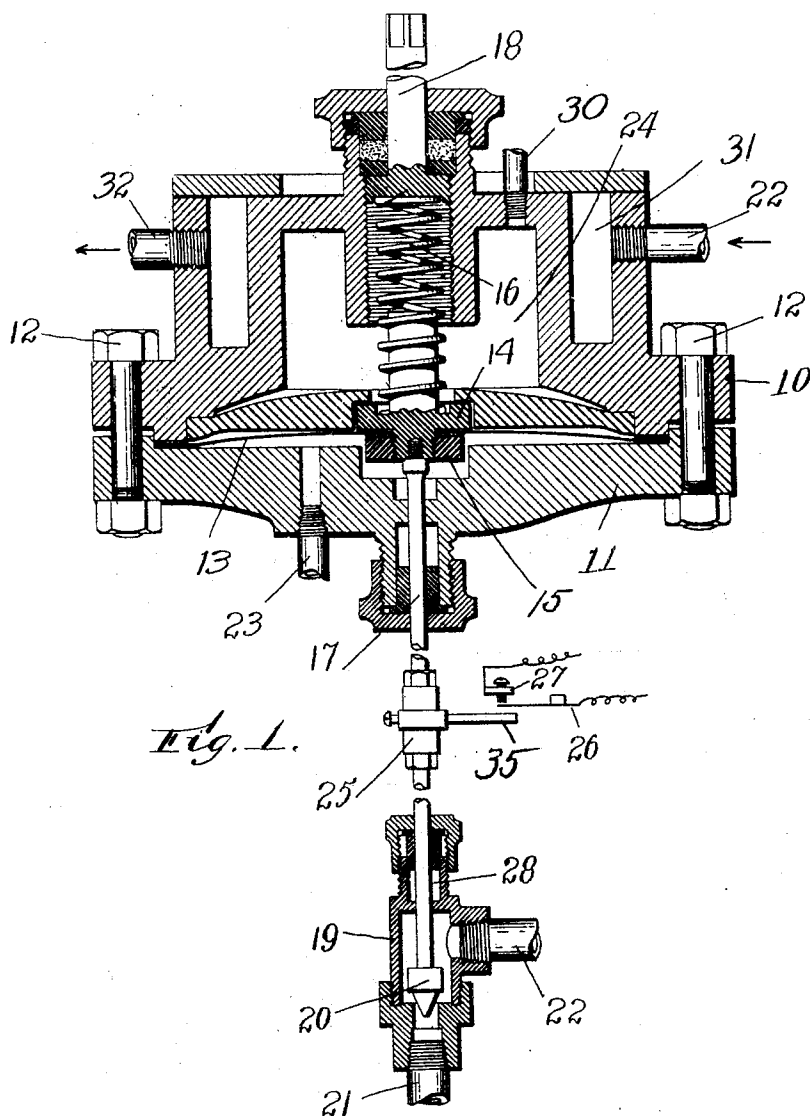
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PATENTED DEC. 5, 1905.

A. T. MARSHALL.

CONDENSER VALVE FOR REFRIGERATING APPARATUS.

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UNITED STATES PATENT OFFICE.

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CONDENSER-VALVE FOR REFRIGERATING APPARATUS.

No. 806,478.

Specification of Letters Patent.

Patented Dec. 5, 1905.

Application filed June 12, 1902. Renewed March 13, 1905. Serial No. 249,820.

To all whom it may concern:

Be it known that I, ALBERT T. MARSHALL, a citizen of the United States, residing at Brockton, in the county of Plymouth and State of Massachusetts, have invented a new and useful Condenser-Valve for Refrigerating Apparatus, of which the following is a specification.

This invention relates to an automatic valve which has been especially designed for controlling the circulation of water or other cooling medium through the condenser of a refrigerating plant; and the object of this invention is to improve and cheapen the construction shown and claimed in United States Letters Patent No. 630,616, granted August 8, 1899.

To these ends this invention consists of the automatic valve and the combinations of parts therewith, as hereinafter described, and more particularly pointed out in the claims at the end of this specification.

In the accompanying drawings, Figure 1 is a sectional view of an automatic condenser-valve for refrigerating apparatus constructed according to this invention, and Fig. 2 is a diagrammatic view illustrating a refrigerating apparatus having the automatic condenser-valve applied thereto.

The especial object of this invention is to improve the automatic condenser-valve shown in United States Patent No. 630,616, before referred to, by providing an automatic valve which is constructed so that it may employ a diaphragm which is lighter and more sensitive than the diaphragm required in the form of automatic valve illustrated in said patent and which is also constructed so that there will be no leakage or escape of ammonia or other refrigerating medium if the diaphragm of the condenser-valve becomes broken or perforated. To these ends in an automatic condenser-valve for refrigerating apparatus constructed according to this invention the diaphragm controlling the valve is arranged to be acted upon on one side by the pressure of the refrigerating medium and upon the opposite side by the thermostatic pressure—that is to say, by a pressure generated in a confined volume of expansible medium, (such as anhydrous ammonia,) which is generated by the changes of temper-

ature to which said volume of expansible medium is exposed.

In the construction shown in the prior patent referred to the unbalanced pressure of the refrigerating medium acts on one side of a diaphragm, the pressure of the refrigerating medium being opposed by an adjustable spring, and although this mechanism works well in practice it has been found necessary to employ diaphragms of considerable strength or stiffness, and as a fluid-pressure distributed over an entire surface of a diaphragm is opposed only by a spring-pressure concentrated at the center of the opposite side of the diaphragm there is a liability of the diaphragms becoming ruptured or broken, which is especially undesirable, as in the construction shown in said prior patent the rupture of the diaphragm permits the direct escape of ammonia gas or other refrigerating medium employed.

As distinguished from the prior construction an apparatus constructed according to this invention employs a diaphragm in which the pressure of the refrigerating medium is opposed to a thermostatic pressure, so that when the condenser-pump is not operating the fluid-pressures upon the opposite sides of the diaphragm will be balanced and the water-valve held closed by an adjustable spring. This adjustable spring may be set to allow the water-valve to open at any desired difference between the condenser-pressure and the thermostatic pressure, and in practice it has been found that inasmuch as substantially balanced pressures are employed upon opposite sides of the diaphragm diaphragms may be used which are much lighter and more sensitive than have heretofore been practical.

Referring to the refrigerating plant provided with a condenser-valve constructed according to this invention, as illustrated in Fig. 2, A designates the storage-chamber for the liquid ammonia or other refrigerating medium, from which the ammonia passes through an expansion-valve (indicated at B) to an expansion-coil C, where it expands into the form of a gas to cool an apartment or for other purposes, as may be desired. From the expansion-coil C the refrigerating medium is pumped by a condenser-pump, as D, through the condenser-coils E, contained in

a condenser-casing F, in which condenser-coils E the refrigerating medium is again converted into a liquid. As illustrated, the condenser-pump D is driven by a belt *m* from an electric motor M. The supply of water or other cooling medium admitted to the condenser-casing is controlled by an automatic valve constructed according to this invention, such a valve being most clearly illustrated in Fig. 1. As shown in this figure, two castings or pieces 10 and 11 are secured together by bolts 12 to form a diaphragm-chamber containing a comparatively flexible and light diaphragm 13. A piece 14 on the upper side of the diaphragm 13 is provided with a threaded stud extending down through the diaphragm, threaded onto which is a fastening-nut 15. Coiled on the piece 14 is a spring 16, having its upper end bearing on a piece threaded into the neck of the casting 10 and having a spindle 18, which extends up through a stuffing-box to the outside of the casing. By turning the spindle 18 the tension of the spring 16 may be adjusted as may be found necessary. Connected to the lower part of the diaphragm-casing is a pipe 23 for admitting the pressure of the refrigerating medium to the under side of the diaphragm. In the upper part of the diaphragm-casing is a closed chamber 24, which is filled with ammonia or similar gas to exert a thermostatic pressure on the upper side of the diaphragm—that is to say, to exert a pressure which will vary with the temperatures to which said ammonia or other gas is exposed.

To fill or charge the closed chamber 24, if desired, the diaphragm-casing may be provided with a small by-pass controlled by a needle-valve—as shown, for example, in United States Letters Patent No. 630,617, dated August 8, 1899, although in practice it is preferable to keep the upper and lower compartments of the diaphragm-casing entirely separate and supply the ammonia gas or other expansible medium to the closed chamber 24 through a small supply-pipe 30. Extending down from the under side of the diaphragm and passing out of the diaphragm-casing through a suitable stuffing-box is a stem or rod 17, which extends down through a stuffing-box 28 into a valve-chamber 19. The rod or stem 17 is provided with a valve 20, arranged to close or shut the inlet 21, while extending from the side of the valve-casing 19 is an outlet-pipe 22, which extends to a water-jacket 31, surrounding the closed chamber 24. From the water-jacket 31 the water passes through a pipe 32 to the bottom of the condenser-casing.

In addition to employing the condenser-valve for regulating the admission of a cooling medium to the condenser-casing the same may also be used as a safety device for stopping the condenser-pump when excessive pressures are generated thereby. To accom-

plish this purpose, a piece 25 is adjustably secured on the stem or rod 17 and is provided with a finger 35, arranged to lift a terminal or spring finger 26 up into engagement with a screw in a contact-piece 27. These electrical connections are preferably arranged to close a shunt-circuit from the motor-circuit, and located in this shunt-circuit is a magnet for operating a cut-out to break the motor-circuit. An arrangement of this character has been found to work well, as by adopting this arrangement the cut-out will not only operate to break the motor-circuit, but will also break the shunt-circuit through the magnet itself.

As shown in Fig. 2, *a* and *b* designate the circuit-wires for the electric motor M. A cut-out or switch (indicated diagrammatically at *d*) is arranged to be operated by an electric magnet *c*, located in a shunt-circuit taken from the motor-circuit, as shown, so that by means of this arrangement after the cut-out has been operated the current not only will be shut off from the motor, but also from the magnet controlling the cut-out device.

The cut-out device *d* may be directly operated by its magnet *c*, or, if desired, the cut-out may be of substantially the construction illustrated in United States Patent No. 630,616, before referred to.

The operations of the condenser-valve have been so fully explained in describing the parts thereof that a further description of its operation is not believed to be necessary.

Many changes may be made in the valve by those who are skilled in the art without departing from the scope of the invention as expressed in the claims. It is not desired, therefore, to be limited to the construction herein shown and described; but

What is claimed, and sought to be secured by Letters Patent of the United States, is—

1. The combination of the condenser of a refrigerating apparatus, a valve connected to supply a cooling medium thereto, and a diaphragm arranged to be acted upon on one side by the pressure of the refrigerating medium, and on the opposite side by a thermostatic pressure, said diaphragm being connected to operate the valve.

2. The combination of the condenser of a refrigerating apparatus, a valve connected to supply a cooling medium to said condenser, a diaphragm connected to operate the valve, and arranged to be acted upon on one side by the pressure of the refrigerating medium, and on the opposite side by a thermostatic pressure, and a spring for normally holding the valve closed.

3. The combination of the condenser of a refrigerating apparatus, a valve connected to supply a cooling medium to said condenser, a diaphragm connected to operate the valve, and arranged to be acted upon on one side by the pressure of the refrigerating medium, and

on the opposite side by a thermostatic pressure, a spring for normally holding the valve closed, and connections for adjusting the spring so that the valve will open at any desired difference in pressure between the thermostatic pressure and the pressure of the refrigerating medium.

4. The combination of the condenser of a refrigerating apparatus, a valve for admitting a cooling medium thereto, a diaphragm, a closed chamber in the upper part of the diaphragm-casing, and containing an expansible medium for exerting a thermostatic pressure on the upper side of the diaphragm, a pipe connected to the under side of the diaphragm-chamber for admitting the pressure of the refrigerating medium to act on the under side of the diaphragm, a spring mounted in the diaphragm-chamber, and a spindle extending to the outside of the diaphragm-chamber for adjusting the pressure of said spring.

5. The combination of the condenser of a refrigerating apparatus, a pump, a valve connected to supply a cooling medium to the condenser, a diaphragm connected to operate the valve, and arranged to be acted upon on one side by the pressure of the refrigerating medium and on the opposite side by a thermostatic pressure, a spring for normally holding the valve closed, connections for adjusting the spring so that the valve will open at

any desired difference in pressure between the thermostatic pressure and the pressure of the refrigerating medium, an electric motor for driving the pump, a cut-out for the motor-circuit, an electric magnet for releasing the cut-out, said magnet being located in a shunt-circuit taken from the motor-circuit, and connections for completing the shunt-circuit when the pressure generated by the pump becomes excessive.

6. The combination of the condenser of a refrigerating apparatus, a pump, an electric motor driving the pump, a valve connected to supply a cooling medium to the condenser, a diaphragm connected to operate the valve, and arranged to be operated upon on one side by the pressure of the refrigerating medium, and on the opposite side by a thermostatic pressure, a spring normally holding the valve closed, and a finger adjustably mounted on the stem or rod operated by the diaphragm for bringing electric terminals into contact to close a shunt-circuit taken from the motor-circuit, and including a magnet for operating a cut-out.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ALBERT T. MARSHALL.

Witnesses:

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HERBERT F. FRENCH