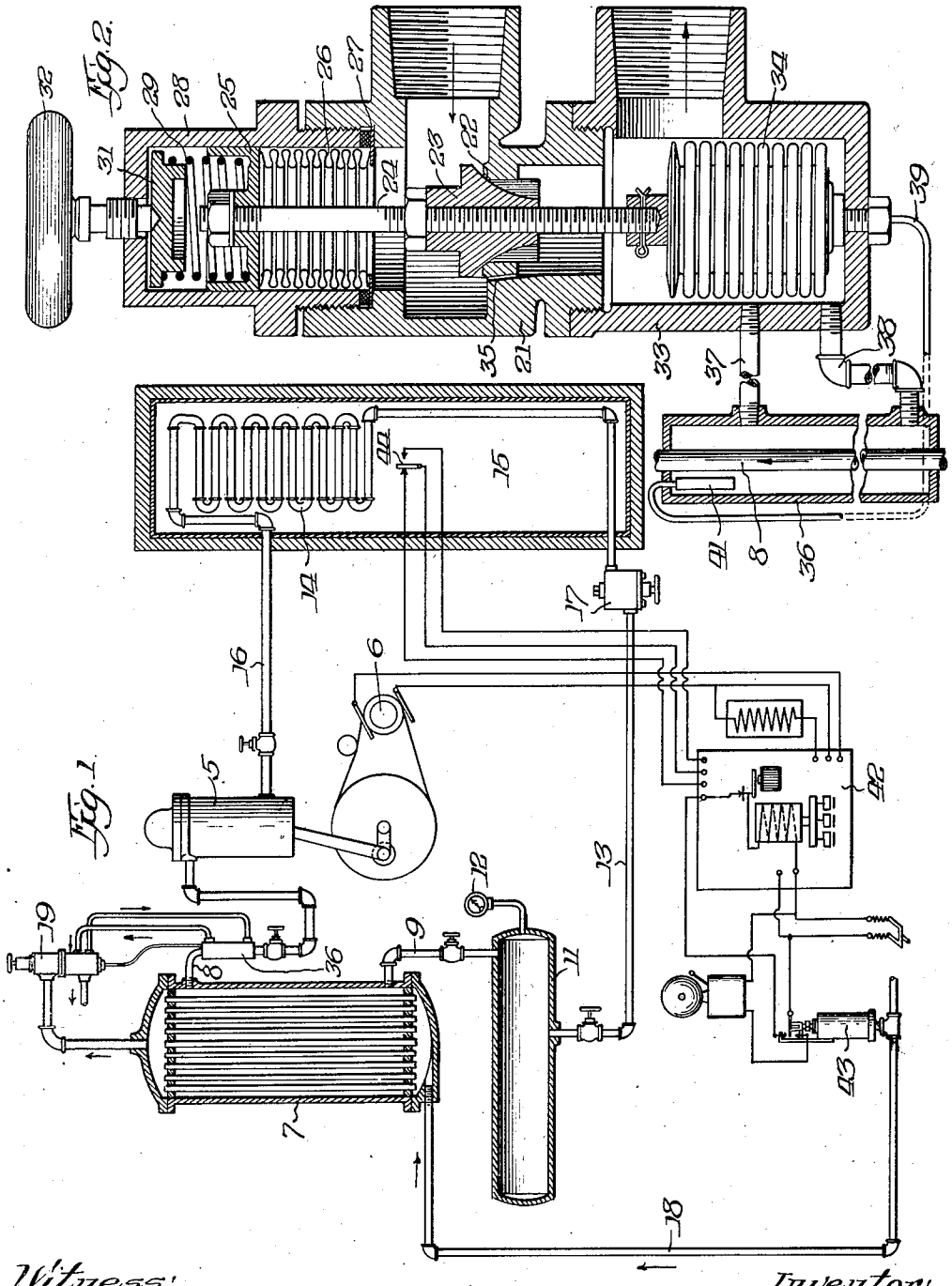
April 19, 1932. J. C. GOOSMANN 1,854,402

REFRIGERATING APPARATUS AND CONTROL VALVE THEREFOR

Filed July 5, 1928



Witness:
Geo. C. Dunn

Inventor:
Justus C. Goosmann
By Wm. J. Wilson
Atty.

Patented Apr. 19, 1932 1,854,402

UNITED STATES PATENT OFFICE

JUSTUS C. GOOSMANN, OF WAYNESBORO, PENNSYLVANIA

REFRIGERATING APPARATUS AND CONTROL VALVE THEREFOR

Application filed July 5, 1928. Serial No. 290,336.

This invention relates generally to refrigerating apparatus and more particularly to a control valve adapted for use in connection with such an apparatus and is a continuation in part of the invention disclosed in my Patent No. 1,701,753, for Refrigerating apparatus, issued February 12, 1929.

While the valve of this invention is particularly adapted for use in connection with a refrigerating apparatus it is to be understood it may have other uses.

It is highly desirable in a refrigeration system to control the condenser pressures so as to maintain these pressures within predetermined reasonable limits, particularly in a system of the character hereinafter described, wherein the flow of refrigerating medium to the expansion coils is controlled by the condenser pressure to automatically regulate such flow in accordance with the load on these coils.

Accordingly the primary object of this invention is to provide a valve capable of automatically controlling the flow of the condensing water so that such flow is increased or decreased as the condenser temperature and consequently pressure, rises or falls respectively.

Other and further objects of this invention will be apparent as the same becomes better understood from an examination of the specification and claims in connection with the accompanying drawings wherein:

Fig. 1 is a diagrammatic sketch of a refrigerating apparatus embodying this invention, and

Fig. 2 is a sectional view of the condensing water control valve.

Referring to the drawings more particularly, reference character 5 indicates generally the compressor which may be of any preferred type and which in this instance is driven by an electric motor 6. A condenser 7 is adapted to receive the refrigerating medium from the compressor through a pipe 8. The medium condensed in the condenser is delivered through a pipe 9 into an accumulator 11 preferably provided with a pressure gauge 12 and from this accumulator the liquid medium is delivered through a pipe 13 to the expansion coils 14 located in the refrigerating chamber 15. From these coils the evaporated medium is returned to the compressor through a pipe line 16. The elements thus far described may be of any well known or preferred construction.

In the pipe line 13 leading from the condenser to the evaporator coils there is interposed an expansion valve 17 which, while it may be of any preferred construction, is preferably of the type more particularly illustrated and described in connection with my aforementioned patent. The refrigerating medium under pressure from the condenser is delivered through the valve 17 and after passing through the same is discharged therefrom to the expansion coils. The refrigerating medium delivered to the condenser by the compressor is cooled and condensed by condensing water delivered by a pipe 18 connected with any suitable source of water supply.

After passing through the condenser, the water is discharged through a control valve 19, the details of which are shown in Fig. 2 from which it will be observed that the valve comprises a casing 21 provided with a seat 22 against which a valve 23 carried by a stem 24 is adapted to close. The upper end of this stem is carried by a balance and guiding piston 25 to the lower face of which is hermetically sealed a hollow expansible and contractable metal bellows 26 hermetically attached at its lower end to a ring or disc 27 clamped against a shoulder of the valve casing by a casing cap 28.

The bellows 26 forms a seal which without the employment of packing or the usual stuffing boxes precludes leakage at the upper end of the casing without binding or cramping the valve stem so as to interfere with its delicacy of operation. The effective area of the bellows 26 and the underside of the piston 25 is greater than the effective area on the upper side of the valve 23 whereby the pressure of the water on the inlet side of said valve acts to produce a slight lifting effect on the valve.

The aforedescribed slight lifting effect due to the pressure on the piston 25 is in turn

counteracted by an expansion spring 29 disposed above said piston and between the same and a member 31 the position of which may be adjusted by manipulation of a hand wheel 32 to thereby regulate the compression of said spring. The spring 29 may be adjusted very delicately to normally urge the valve 23 against its seat.

A thermostatic element 34 in the form of a hollow expansible and contractable metal bellows is mounted in a well formed within a lower cylindrical portion 33 of the valve casing which is screw threaded to the main portion of said casing. The metal bellows 34 contains a thermostatic fluid for causing said metal bellows to expand or contract in accordance with its temperature or the temperature and pressure of the fluid. The upper end of the bellows 34 is closed and is connected with the valve stem 24 as shown so that elongation of the bellows serves to elevate the valve 23 from its seat. A by-pass port 35 is provided around the valve through which water flowing from the condenser passes when the valve 23 is closed to thereby influence the thermostatic element 34 and effect the initial opening of the valve when the temperature of the water begins to rise.

If the water flowing from the condenser is of a temperature below that for which the valve is adjusted the valve will remain closed thereby obviating wastage of condensing water. As the temperature of the water rises, however, due to increased temperature of the refrigerating medium delivered to the condenser by the compressor the heated water flowing through the by-pass 35 will cause the thermostatic element 34 to expand thereby opening the valve, the extent of such opening, however, being determined by the temperature of the water surrounding the thermostatic element and the tension of spring 29.

As the condenser temperature rises more water will be permitted to pass through the condenser for the purpose of removing the heat units from the refrigerating medium. The valve is so proportioned that the temperature and consequently the pressure in the condenser will be restrained within reasonable limits so as to balance or control the operation of the system as a whole. To further insure the delicacy of operation of the valve by overcoming the lag between the rise in the temperature of the compressed refrigerant delivered to the condenser and the resultant rise in the temperature of the circulating water a water jacket 36 is provided around a portion of the pipe 8 in the vicinity of the condenser and this jacket is connected at spaced points by means of pipes 37 and 38, respectively, to the interior of the portion 33 of the valve casing whereby the thermostatic element 34 will be controlled to an extent by the temperature of the refrigerating medium delivered by the compressor to the condenser.

Since the temperature of the refrigerating medium delivered by the compressor to the condenser will be greater when the load on the expansion coils is greater and will be lower when the load on the expansion coils is less, a rise in temperature in the pipe 18 will be transmitted by the water in jacket 36 to the thermostatic element and cause the valve 23 to open. Thus the amount of circulating water passing through the condenser per unit of time will be increased promptly in anticipation of a greater transference of heat to the condensing water and will provide a more nearly instantaneous control. A greater degree of control of the thermostatic element 34 in accordance with the temperature of the compressed refrigerant in the pipe 8 is provided by means of a connection 39 which establishes communication for the thermostatic fluid within the element 34 between said element and an auxiliary element 41 within the water jacket 36.

The lifting effect of the pressure beneath the piston 25 greatly reduces the work of the thermostatic element 34 in lifting the valve thus contributing to the delicacy of operation of the valve. The hand wheel 32 may be adjusted to permit the valve to be operated at varying temperatures depending upon seasonal temperature changes or other changes which may effect the temperature of the water supplied through the line 18.

The motor 6 which drives the compressor receives its current through a starting and control box mechanism 42, the details of which are well known and need not be here described. In order to prevent the occurrence of excessively high temperatures and pressures in the apparatus, such as would result from failure of the supply of condensing water I have interposed in the condensing water supply pipe 18 a pressure actuated switch control device 43 which upon failure of the condensing water supply automatically breaks the circuit to the motor and stops the apparatus. This pressure actuated switch control device may be of any suitable type but is preferably such as shown and described in my aforementioned patent.

For purposes of economy it is desirable to shut off the apparatus when the temperature in the refrigerating chamber 15 reaches a predetermined minimum and to accomplish this result a thermostatic switch designated generally by reference character 44 is located in this chamber and connected with the control box 42 in such a manner that the motor supply circuit will be broken when the temperature in the chamber drops to a predetermined point and will be automatically closed to start the motor again when the temperature subsequently rises.

It is believed that the construction, operation and advantages of my invention will be

understood from the foregoing without further description.

I am aware that many changes may be made without departing from the principles of this invention and I therefore do not wish to be limited to the details shown or described.

I claim:

1. In a valve, the combination of a housing, a valve therein, a thermostatic element within the housing adapted to operate the valve in accordance with the temperature of the fluid flowing therethrough, and a balance or counterpressure piston adapted to cooperate with said element to facilitate opening the valve thereby.

2. In a valve, the combination of a housing, a valve therein, a thermostatic element within the housing adapted to operate the valve in accordance with the temperature of the fluid flowing therethrough, a balance or counterpressure piston adapted to cooperate with said element to facilitate opening the valve thereby, and a flexible cylinder acting as a seal between the piston and the interior of said housing.

3. In a valve, the combination of a housing, a valve therein, a thermostatic element in the housing situated in a well therein, a pipe line provided with a water jacket and a connection between the water jacket and housing for circulating water between the jacket and well around said element for partly controlling the same by the heat in the pipe line.

4. In a valve, the combination of a housing, a valve therein, a thermostatic element in the housing, a pipe line provided with a water jacket and a connection between the water jacket and housing for circulating water between the jacket and housing around said element for partly controlling the same by the heat in the pipe line.

5. In a valve, the combination of a housing, a valve therein, a thermostatic element in the housing situated in a well therein, a pipe line provided with a water jacket, a connection between the water jacket and housing for circulating water between the jacket and well around said element for partly controlling the same by the heat in the pipe line, and an auxiliary thermostatic element connected to the first element and situated in said water jacket.

6. In a valve, the combination of a housing, a valve therein, a thermostatic element in the housing, means for passing the fluid controlled by said valve through said housing and in contact with said element for partly controlling the same by the heat of said fluid, a pipe line provided with a water jacket and a connection between the water jacket and housing for circulating water between the jacket and housing around said element for partly controlling the same by the heat in the pipe line.

7. In a valve, the combination of a housing, a valve therein, a thermostatic element in the housing, a by-pass in said housing for permitting a limited flow of the fluid controlled by said valve to pass around said valve and in contact with said element, a pipe line provided with a water jacket and a connection between the water jacket and housing for circulating water between the jacket and housing around said element for partly controlling the same by the heat in the pipe line.

In witness of the foregoing I affix my signature.

JUSTUS C. GOOSMANN.