J. M. PETERSON.

REFRIGERATING APPARATUS.

APPLICATION FILED APR. 8, 1916.

1,238,051. Patented Aug. 21, 1917.

Fig. 1.

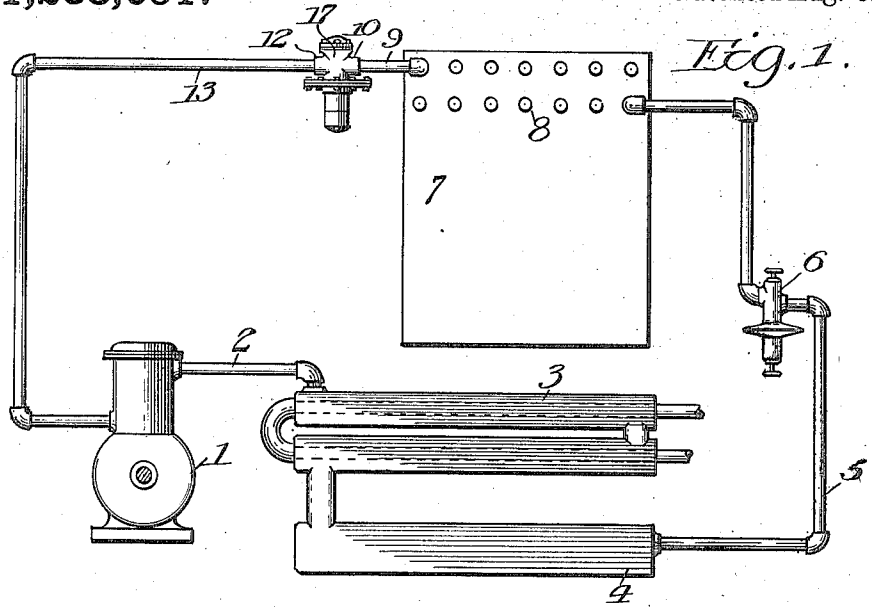
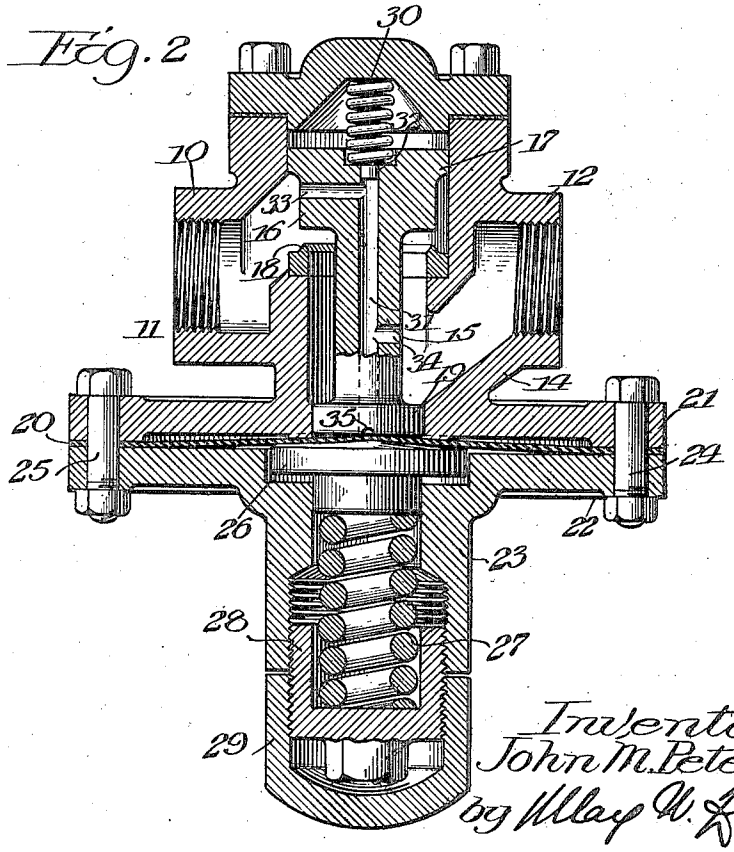


Fig. 2



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UNITED STATES PATENT OFFICE.

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REFRIGERATING APPARATUS.

1,238,051. Specification of Letters Patent. Patented Aug. 21, 1917.

Application filed April 8, 1916. Serial No. 89,746.

To all whom it may concern:

Be it known that I, JOHN M. PETERSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Refrigerating Apparatus, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to refrigerating systems, and has for its object the provision of means to prevent overloading the motive devices when starting under those conditions where the pressure throughout the system has been to an extent equalized by leakage during disuse of the system.

To illustrate, it might be assumed that the low pressure side is operating under a pressure of fifteen pounds per square inch, whereas the high pressure side is operating under one hundred and fifty pounds per square inch when the compressor and system are in normal operation. If now the system should be shut down for a certain length of time then leakage will permit equalization of the unlike pressures, the tendency of course being to approach equality of pressure. If then the compressor is started, the intake pressure is high and thus permits a greater amount of gas to be taken in than is contemplated in the design, and the compressor must compress this great amount of gas and force it into the high pressure side. This tends to overload the motive devices and requires them to perform a duty greater than contemplated.

I have provided means which in addition to performing other functions prevent this overloading of the motive device. It is furthermore true that should the pressures of the high and low pressure sides have been equalized so that the pressures are the same, then without my device it might require a considerable length of time, say fifteen minutes more or less, before the compressor would be able to establish a sufficient difference of pressure to get the system into normal operation.

I will explain one form of my invention capable of performing the functions above outlined in connection with the accompanying drawing, illustrating the same, in which—

Figure 1 is a diagrammatic view of a refrigerating system, and

Fig. 2 is a longitudinal sectional view of a valve structure constructed in accordance with my invention.

In the general view of Fig. 1, I show a compressor 1 which supplies ammonia gas or other refrigerant under pressure through the tube 2 to the condenser 3, the gas then passing through the liquid receiver 4 and from thence to the tube 5 and expansion valve 6 into the refrigerating chamber 7 having the ordinary expansion coils indicated at 8. The refrigerant flows away from the refrigerating chamber, through the tube or pipe 9 into the nipple 10 of my improved device 11. After passing through the device the refrigerant leaves through the nipple 12 by way of the pipe 13 back to the compressor.

It will be seen that my improved device 11 forms part of that portion of the system called the low pressure side. My improved device consists of a body portion 14 having the nipples 10 and 12 and having a hollow interior within which a suitable valve stem 15 is longitudinally movable. This valve stem carries at its upper extremity a valve 16 and a guide portion 17. The valve 16 cooperates with the valve seat 18 to control the passageway between the nipples 10 and 12. The valve stem has at its lower extremity an enlargement or head 19 adapted to act against a diaphragm 20. The diaphragm is rigidly held within the diaphragm chamber between an enlarged flange 21 of the body portion 14 and a flange 22 of a cap structure 23, suitable bolts 24 holding the two flanges tightly together so as to make an airtight joint. The diaphragm 20 rests on top of a plunger 26 pressed upwardly by the spring 27, the spring 27 being mounted in the cap structure 23 in a manner so that its pressure may be adjusted by the cover 28. A cap 29 closes the entire structure to prevent tampering with the cover 28. The valve stem 15 is held against the diaphragm 20 by the spring 30, the spring 30 merely exerting

sufficient pressure to cause the said valve stem always to follow the movements of the diaphragm. The valve stem has a hollow interior bore 31 which is closed at the upper extremity of the stem by the plug 32. The bore has an upper outlet 33 and has a lower outlet 34. This bore extends entirely through the head 19, a small slot 35 being provided transversely of this head upon its lower surface so that the diaphragm will at no time entirely seal the lower portion of the bore 31. It will thus be seen that the bore 31 communicates with the passageway leading to the nipple 10 and also with the passageway leading to the nipple 12. The spring 27 is so arranged that the normal pressure of the low pressure side of the system will not be sufficient to compress the spring and close the valve 16. Should the pressure of the low pressure side which enters through the nipple 10 be in excess of a certain predetermined amount, say thirty pounds, (if the normal pressure be fifteen pounds) then this pressure is exerted against the diaphragm to press the plunger 26 downwardly, whereupon the valve stem and valve 16 due to the influence of the spring 30 close this valve.

Of course it is readily apparent that the automatic spring action thus controls the size of the opening of the valve 16 and permits more or less gas to flow through in accordance with the pressure of the low pressure side.

Assume now that the pressure of the low pressure side instead of being thirty pounds has reached an amount equal to a hundred pounds. Then it will be apparent that if there were no valves 16 that the cylinder of the compressor 1 would be supplied with a very large amount of gas, thus overloading the motive device. With the interposition of my device however this increase in pressure thus entirely closes the valve 16 and when the compressor begins to operate upon being started, then the total gas supplied to the compressor is by way of the ducts 33, 31 and 34. This throttling action of course controls the amount of refrigerant, so that the required amount is furnished which the compressor can conveniently accommodate. As soon as the operation of the compressor has reduced the pressure of the low pressure side to an extent where it no longer overcomes the action of the spring 27, then the valve 16 is opened to an extent to permit additional refrigerant to be supplied to the compressor. This action continues and the valve continues to open until such a time as the system is operating normally with the valve 16 wide open.

In order to properly supply the pressure of the low pressure side to the diaphragm I have provided the slot 35 which at all times furnishes a communication between the diaphragm chamber and the low pressure side of the system.

From what has been thus described the nature of my invention will be readily apparent as will also its various modifications within the scope of the appended claims.

Having however thus described one form which my invention may take, what I claim as new and desire to secure by Letters Patent is:

1. In a refrigerating system the combination with a compressor for compressing refrigerant, means supplied by said compressor wherein said refrigerant expands, and a valve responsive to the pressure in said means to control the charge taken by said compressor from said means.

2. A refrigerating system having a high pressure side and a low pressure side, a compressor for compressing refrigerant received from the low pressure side and supplying it at increased pressure to said high pressure side, and an automatic valve to at times control the amount of charge taken in by said compressor.

3. A refrigerating system having a high pressure side and a low pressure side, a compressor for compressing refrigerant received from the low pressure side and supplying it at increased pressure to said high pressure side, and means to at times control the amount of charge taken in by said compressor.

4. A refrigerating system having a high pressure side and a low pressure side, a compressor for compressing refrigerant received from the low pressure side and supplying it at increased pressure to said high pressure side, and an automatic valve responsive to the pressure of the refrigerant in said low pressure side to at times control the amount of charge taken in by said compressor.

5. A refrigerating system having a high pressure side and a low pressure side, a compressor for compressing refrigerant received from the low pressure side and supplying it at increased pressure to said high pressure side, and means responsive to the pressure of the refrigerant in said low pressure side to at times control the amount of charge taken in by said compressor.

6. A refrigerating system having a high pressure side and a low pressure side, a compressor for compressing refrigerant received from the low pressure side and supplying it at increased pressure to said high pressure side, an automatic valve to at times control the amount of charge taken in by said compressor, and a diaphragm responsive to the pressure of the refrigerant in said low pressure side to control said valve.

7. A refrigerating system having a high pressure side and a low pressure side, a compressor for compressing refrigerant re-

ceived from the low pressure side and supplying it at increased pressure to said high pressure side, an automatic valve to at times control the amount of charge taken in by said compressor, and a restricted passageway forming a by-pass about said valve.

8. A refrigerating system having a high pressure side and a low pressure side, a compressor for compressing refrigerant received from the low pressure side and supplying it at increased pressure to said high pressure side, an automatic valve to at times control the amount of charge taken in by said compressor, a diaphragm responsive to the pressure of the refrigerant in said low pressure side to control said valve, and a restricted passageway forming a by-pass about said valve.

9. In a refrigerating system the combination with a compressor for compressing refrigerant, means supplied by said compressor wherein said refrigerant expands, and control means responsive to the pressure in said means to control the charge taken by said compressor from said means.

10. A refrigerating system having a high pressure side and a low pressure side, a compressor for compressing refrigerant received from the low pressure side and supplying it at increased pressure to said high pressure side, an automatic valve to at times control the amount of charge taken in by said compressor, a diaphragm responsive to the pressure of the refrigerant in said low pressure side to control said valve, a restricted passageway forming a by-pass about said valve, and a stem for said valve, said stem having a duct for conducting fluid by way of said stem against said diaphragm.

In witness whereof I hereunto subscribe my name this 24th day of March, A. D., 1916.

JOHN M. PETERSON.

Witnesses:
MAX W. ZABEL,
HAZEL A. JONES.