A. T. MARSHALL.

REFRIGERATING APPARATUS.

APPLICATION FILED FEB. 25, 1922.

1,436,815. **Patented Nov. 28, 1922.**

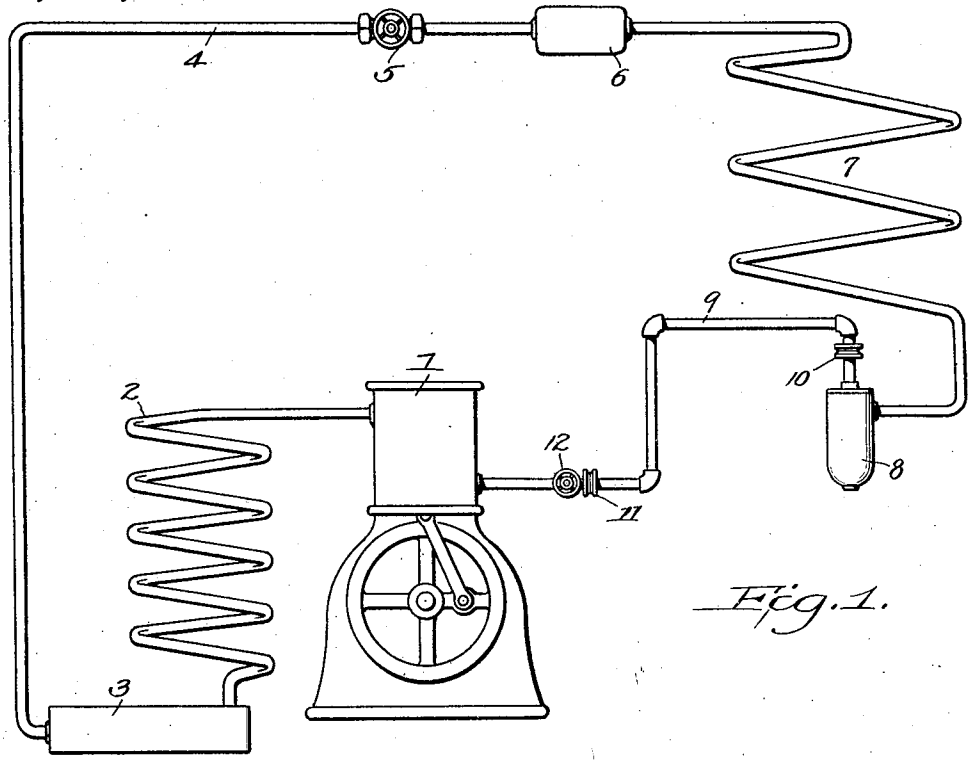


Fig. 1.

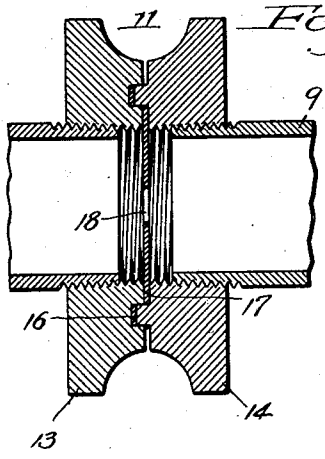


Fig. 2.

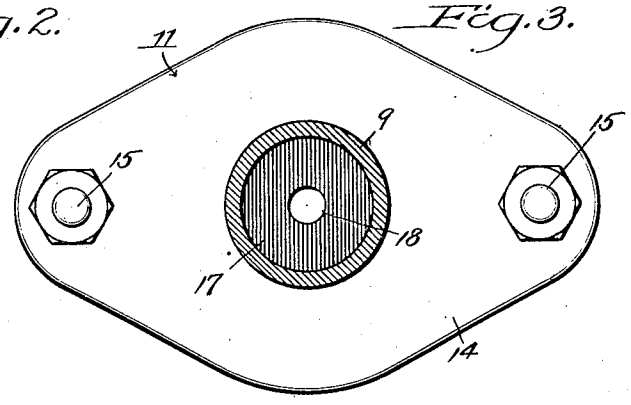


Fig. 3.

WITNESSES

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UNITED STATES PATENT OFFICE.

ALBERT T. MARSHALL, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE AUTOMATIC REFRIGERATING COMPANY, OF HARTFORD, CONNECTICUT, A CORPORATION OF NEW JERSEY.

REFRIGERATING APPARATUS.

Application filed February 25, 1922. Serial No. 539,198.

To all whom it may concern:

Be it known that I, ALBERT T. MARSHALL, a citizen of the United States, and a resident of Hartford, county of Hartford, State of Connecticut, have invented certain new and useful Improvements in Refrigerating Apparatus, of which the following is a specification.

My invention relates to refrigerating apparatus in which a refrigerating fluid circulates through a compressor, condenser and refrigerating coil, the fluid being constantly reduced to a liquid form in the condenser and re-evaporated in the refrigerating coil. In all such systems, irregularities of operation occur at intervals which cause a certain amount of the liquid to pass through the refrigerating coil without assuming the gaseous condition. When such bodies of liquid arrive at the compressor they are apt to cause trouble, due to the fact that liquids are incompressible, and unless special precautions are taken, the compressor may be seriously damaged and persons in the vicinity injured.

The object of my invention is to prevent liquid refrigerant that passes through the refrigerating coils from damaging the compressor or from disturbing the regular operation of the apparatus. To accomplish this object, I may provide the suction line near the compressor with a diaphragm having a small orifice at its center on the axis of the pipe.

In order that my invention may be readily understood, it is described in connection with the accompanying drawings, in which—

Figure 1 is a diagrammatic view of a refrigerating system in which my invention is incorporated.

Figure 2 is a sectional view of the diaphragm and fitting holding it.

Figure 3 is a side view of the diaphragm and fitting of Figure 2.

Referring more particularly to the drawings, a usual arrangement of parts for a system using ammonia as the refrigerant is shown in Figure 1 where the compressor 1, the condenser 2, the liquid ammonia receiver 3, pipe 4, hand-valve 5, expansion valve 6, refrigerating coil 7, scale trap 8, suction pipe 9 including flange unions 10 and 11, and hand-valve 12 constitute the apparatus used. The expansion valve 6 may be of any well-known form and it is not thought necessary to show the driving means for the compressor or the customary controlling means.

The flange unions 10 and 11 are constructed as shown in Figures 2 and 3 and are made in two halves 13 and 14, held together by bolts 15. A lead gasket 16 serves to make the joint tight. A diaphragm 17 of thin material, preferably metal, is held between the two halves 13 and 14. The diaphragm 17 has in its center a small hole 18. I ordinarily employ a diaphragm in but one of the flange unions 10 and 11 and prefer to place it in union 11, which is nearest the compressor.

I have found that when the area of the hole 18 is from 1/10 to 1/15 the area of the suction pipe, good operating results are attained and that over long periods of time the compressor will run smoothly and show no symptoms of slugs of liquid having been drawn in through the suction pipe.

This beneficial action may be ascribed to the different effects of the change of velocity at the orifice on the gaseous and liquid refrigerant. In passing the orifice the gas is greatly accelerated and afterward slowed down. The velocity of the gaseous refrigerant may be easily changed and I have found that the difference in pressure on the two sides of the orifice amounts to little more than one pound per square inch. It requires considerable energy to accelerate the liquid, however, to the velocity of the gas. Therefore, when a body of liquid, together with gaseous refrigerant, is drawn through the suction pipe by the compressor, the gas passes through the orifice carrying with it some small quantity of the liquid while the major portion is arrested at the diaphragm to be gradually picked up by the rushing current of vapor in small quantities until it has all been carried off. In this way the compressor is spared the shock of suddenly receiving a considerable volume of liquid.

I have described specifically the use of a centrally perforated diaphragm, as I have found in actual practice that entirely satisfactory results may be obtained by such arrangement, but similar results may be obtained by other forms of constriction in the suction pipe. In certain cases, the amount of liquid may be so great as to fill the suction

pipe for a short distance on the side of the diaphragm away from the compressor. In this event, the action is similar to that described above in that the liquid must pass the constriction gradually. In passing the liquid may or may not be evaporated. The fact remains that it is, in any event, prevented from being carried into the compressor in a body of considerable volume. In locating the constriction in the suction line, it is important that there be no enlargements between the constriction and the compressor where liquid might be trapped and accumulate. The invention comprises broadly the provision of any liquid arresting means interposed across the suction line with fixed area orifice of considerably less area than the area of the suction pipe.

I claim:—

1. A refrigerating apparatus comprising a compressor, a refrigerating coil, a suction line from said refrigerating coil to said compressor, and a diaphragm interposed across said suction line having an aperture of less than one-eighth the area of the said suction line.

2. A refrigerating apparatus comprising a compressor, a refrigerating coil, a suction line from said refrigerating coil to said compressor, and means in said suction line for materially increasing the velocity of the refrigerant above normal and for subsequently decreasing the velocity to the normal velocity, said means comprising a diaphragm having a fixed aperture of considerably less area than the area of said suction line.

3. A refrigerating apparatus comprising a compressor, an expansion valve, a refrigerating coil, a suction line from said refrigerating coil to said compressor and means in said suction line for preventing the sudden passage of a body of liquid refrigerant while permitting the gradual passage thereof.

4. A refrigerating apparatus comprising a compressor, an expanison valve, a refrigerating coil, a suction line from said refrigerating coil to said compressor, and means in said suction line for preventing the sudden passage of a body of liquid while permitting the gradual passage thereof, said means consisting of a diaphragm having an orifice of relatively small diameter to that of said suction line.

5. A refrigerating apparatus comprising a compressor, an expansion valve, a refrigerating coil, a suction line from said refrigerating coil to said compressor, and means in said suction line for preventing the sudden passage of a body of liquid while permitting the gradual passage thereof, said means consisting of a constriction, the total open area of said constriction being considerably less than the area of cross-section of said suction line.

ALBERT T. MARSHALL.