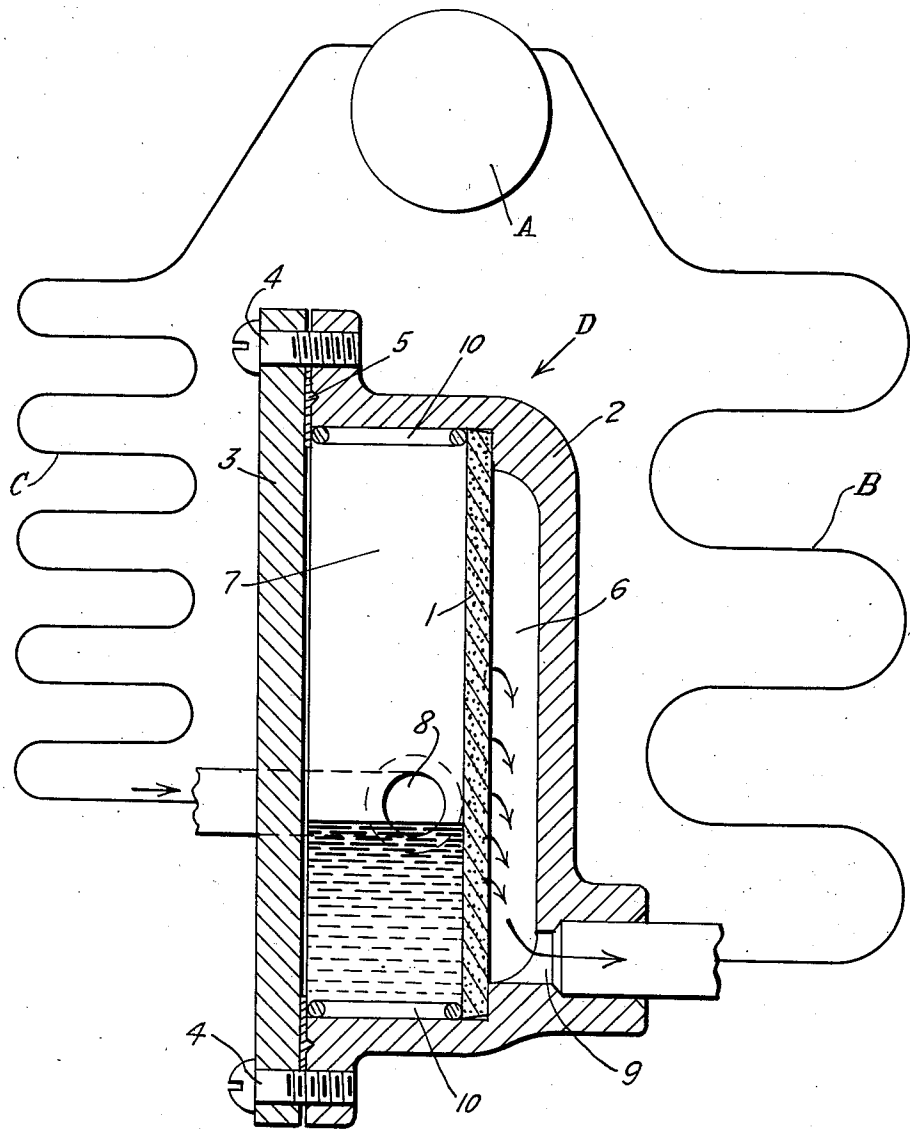
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REFRIGERATING APPARATUS

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INVENTOR.
Ransom W. Davenport

BY

Ira L. Nickerson
ATTORNEY.

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RANSOM W. DAVENPORT, OF DETROIT, MICHIGAN, ASSIGNOR TO CHICAGO PNEUMATIC TOOL COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY

REFRIGERATING APPARATUS

Application filed February 7, 1928. Serial No. 252,447.

This invention relates to refrigerating systems of the compression-expansion type, particularly those operating on the vapor-gas principle set forth in my Patent No. 1,619,196, issued March 1, 1927. More specifically it relates to apparatus for feeding and for controlling the feeding of the products of the condenser into the evaporator.

Heretofore it has been proposed to utilize porous means for feeding condensate in conventional refrigerating systems operating on the reversed Clausius-Rankine cycle, but such porous means were kept constantly submerged in liquid and were arranged to form the liquid seal which is essential to the operation of the systems of that type.

One object of the present invention is to provide improved means for feeding vapor-gas mixtures as well as liquids in systems of the vapor-gas type. Another object is to utilize a single member for several important functions. Other objects will be apparent from the detail description which follows.

In order to illustrate the invention one concrete embodiment thereof is shown in the accompanying drawing the single view of which shows the feeding device or expansion member in vertical section and indicates diagrammatically the remaining elements of a closed cycle refrigerating system.

In the drawing a pump or compressor A withdraws refrigerant vapor and gas from the evaporator B and discharges the same at higher pressure and temperature into a condenser C, whence it is returned through expansion device D to the evaporator. Elements A, B, and C which are indicated diagrammatically may be of any suitable or desired type. Since the system is intended to operate on the vapor-gas principle a charge of refrigerant, such for example as sulphur dioxide or methylene chloride is put in evaporator B and the remainder of the system is arranged to contain an inert and insoluble gas, such as air or nitrogen.

The expansion or feeding device D to which the present invention more particularly relates is arranged to utilize for the direct feeding of the products of the condenser to the evaporator a porous member 1. Instead of submerging the porous member in the liquid refrigerant as has heretofore been suggested and maintaining it in the submerged state to form the liquid seal, which is essential to the operation of systems of the conventional reversed Clausius-Rankine type, the present feeding device is so arranged that only a portion of the porous member 1 is in contact with the liquid whereby provision is made for a feeding through said member the gaseous as well as the liquid products of the condenser to cause the system to operate on the vapor-gas principle.

Accordingly, feeding device *d* comprises a hollow casing 2 forming a chamber within which is disposed the porous member in the form of a wall or partition, the chamber being closed by a cover 3 secured to casing 2 in any suitable manner as by screws 4, a gasket 5 being interposed between the contacting portions to prevent leakage. The porous partition 1 is substantially vertically disposed within casing 2 in the operating position of device D, extends transversely across the chamber provided therein, and is by preference disposed adjacent the portion of the casing remote from cover 3 so as to divide the chamber into a relatively small space 6 and a relatively large space 7. Large space 7 is used as the inlet chamber and has an inlet port 8 intermediate the top and bottom of the device and connected to condenser C. Small space 6 forms the outlet chamber and has an outlet connection 9 from the bottom thereof extending to evaporator B.

Partition member 1 may be of any desirable material which is sufficiently porous for the purpose, suitable substances being alundun and unglazed earthenware. The partition may be in any desired form, such as a cone, a cup, or a disc. The disc form disclosed in the drawing is preferred. Any suitable means may be used for maintaining disc 1 in place, such as one or more spring retainers 10 interposed between the disc and cover 3. The area and porosity of porous partition or disc 1 bears such a relation to the displacement of the compressor A with which it is to be used that when the system is in normal operation, a portion of the area of disc 1 is in

direct contact with the liquid condensate while the remainder is in the direct contact with the gaseous products of condenser C. A desirable arrangement provides for approximately 1/3 of the area of the disc to be contacted by the liquid and the inlet port 8 should be positioned accordingly.

With a feeding device of the described type, it will be obvious that the proportions of liquid and vapor-gas passing through the porous feeding member will vary with changes in the liquid level resulting from changes in the operating conditions of the system, and that the liquid and gaseous components of the working substance tend to be fed in inversely varying amounts, which is a desirable feature in systems of the vapor-gas type. It is also to be noted that the feeding member itself acts as a filter for the liquid.

While the invention has been herein shown and described in what is now considered to be its preferred form, it is to be understood that the invention is not limited to the specific details thereof, but covers all changes, modification, and adaptations within the scope of the appended claims.

I claim as my invention:

1. A refrigerating system comprising an evaporator, a compressor, and a condenser connected together to form a closed cycle system utilizing as a working substance a volatile liquid and an inert and insoluble gas, and means interposed between said condenser and said evaporator and providing a porous wall disposed at an angle to the horizontal and arranged to pass simultaneously both the liquid and the gaseous products of said condenser, thereby to cause said system to operate on the vapor-gas principle.

2. A refrigerating system comprising an evaporator, a compressor, and a condenser connected together to form a closed cycle system utilizing as a working substance a volatile liquid and an inert and insoluble gas, means disposing a porous wall between said condenser and said evaporator, and means maintaining both the liquid and the gaseous products of said condenser in contact with said wall during the normal operation of said system.

3. A refrigerating system comprising an evaporator, a compressor, and a condenser connected together to form a closed cycle system utilizing as a working substance a volatile liquid and an inert and insoluble gas, and a feeding device interposed between said condenser and said evaporator, said device providing a member of porous material in a substantially vertical position and normally having the liquid products of said condenser in contact with only a portion of said member.

4. A refrigerating system comprising an evaporator, a compressor, and a condenser connected together to form a closed cycle system utilizing as a working substance a volatile liquid and an inert and insoluble gas, and a feeding device between said condenser and said evaporator comprising a disk of porous material whose area and porosity bears such a relation to the capacity of said compressor and which is so disposed that the gaseous products of said condenser are in direct contact with a greater portion of the area of said disk than the liquid products.

5. A refrigerating system comprising an evaporator, a compressor, and a condenser connected together to form a closed cycle system utilizing as a working substance a volatile liquid and an inert and insoluble gas, and expansion means including a porous member disposed at an angle to the horizontal and interposed between said condenser and said evaporator for feeding the liquid and gaseous products of the former simultaneously and in inversely varying amounts to the latter.

6. The combination with a refrigeration system of the closed cycle type having an evaporator, a compressor, and a condenser arranged to operate on the vapor-gas principle of an expansion device for feeding vapor-gas and liquid from said condenser to said evaporator comprising a substantially vertically disposed porous partition and means for maintaining both vapor-gas and liquid from said condenser in contact with said partition.

7. An expansion device for refrigerating system comprising a casing and a cover for providing a fluid tight chamber, a partition member of porous material within said chamber and resilient means engaged by said cover for maintaining said partition in place.

8. An expansion device for refrigerating systems comprising a casing and a cover for providing a fluid tight chamber, said casing having an inlet and an outlet, and means for passing simultaneously from said inlet to said outlet both gas and liquid including a partition of porous material substantially vertically disposed in said chamber between said inlet and outlet.

9. An expansion device for refrigerating systems comprising a casing and a cover for providing a fluid tight chamber, said casing having an inlet and an outlet, and means for passing simultaneously from said inlet to said outlet both gas and liquid including a partition of porous material in said chamber between said inlet and outlet, said partition being substantially vertically disposed in the operating position of said device and closely adjacent said outlet to provide an inlet space of large capacity within said casing.

10. An expansion device for refrigerating systems comprising a casing and a cover for providing a fluid tight chamber a disk of porous material extending transversely across

said chamber in substantial parallelism with said cover, and spring retaining means interposed between said disk and said cover for retaining the former in place.

11. An expansion device for refrigerating systems comprising a casing and a cover for providing a fluid tight chamber, and a disk of porous material vertically disposed and extending transversely across said chamber adjacent the end of said casing remote from said cover for passing simultaneously both gas and liquid, said casing having an outlet in the end wall thereof beyond said disk and an inlet on the cover side of the disk intermediate the top and bottom of the casing.

12. An expansion device for refrigerating systems comprising a casing and a cover for providing a fluid tight chamber, and a disk of porous material vertically disposed and extending transversely across said chamber adjacent the end of said casing remote from said cover, said casing having an outlet in the end wall thereof beyond said disk and an inlet on the cover side of the disk intermediate the top and bottom of the casing, and spring retaining means interposed between said cover and said disk for holding the latter in place.

Signed by me at Detroit, in the county of Wayne, and State of Michigan this second day of February, 1928.

RANSOM W. DAVENPORT.