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REFRIGERANT RECEIVER AND EXPANDER FOR REFRIGERATING PLANTS.

APPLICATION FILED JUNE 1, 1909.

952,063.

Patented Mar. 15, 1910.

Fig. 1.

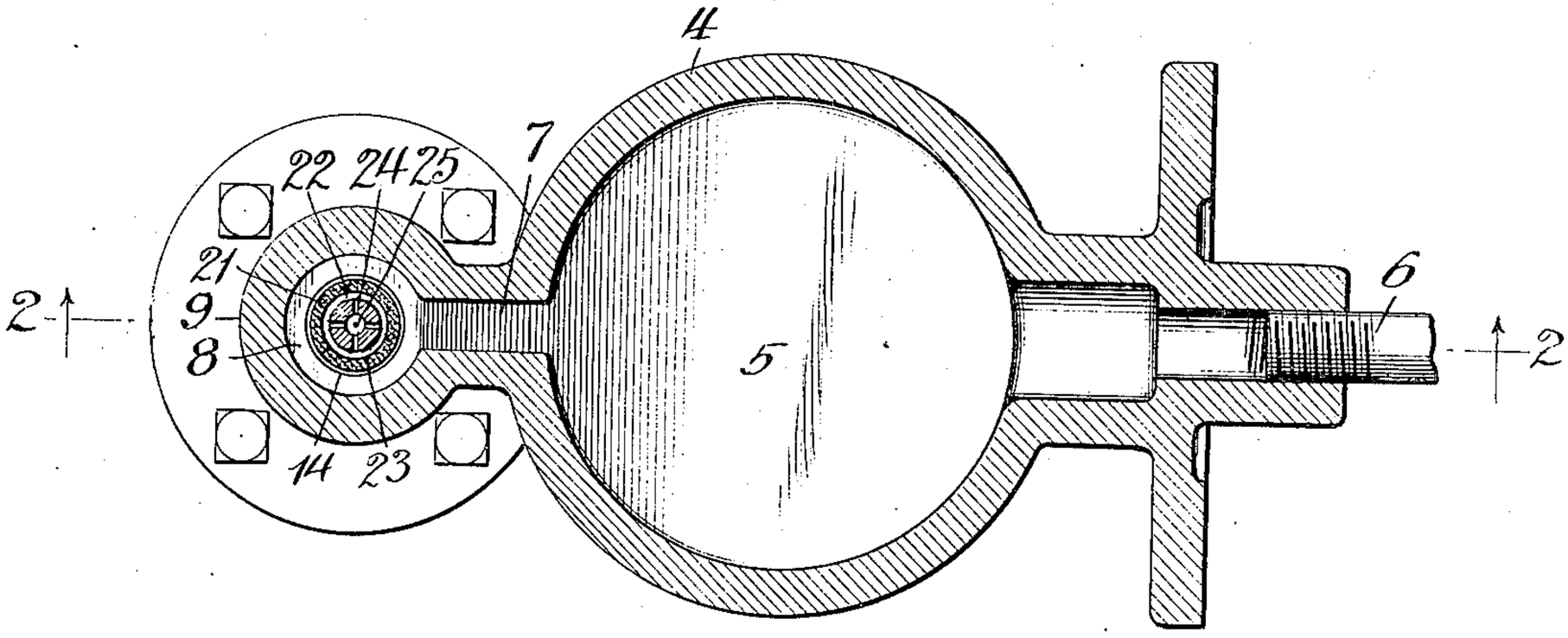


Fig. 2.

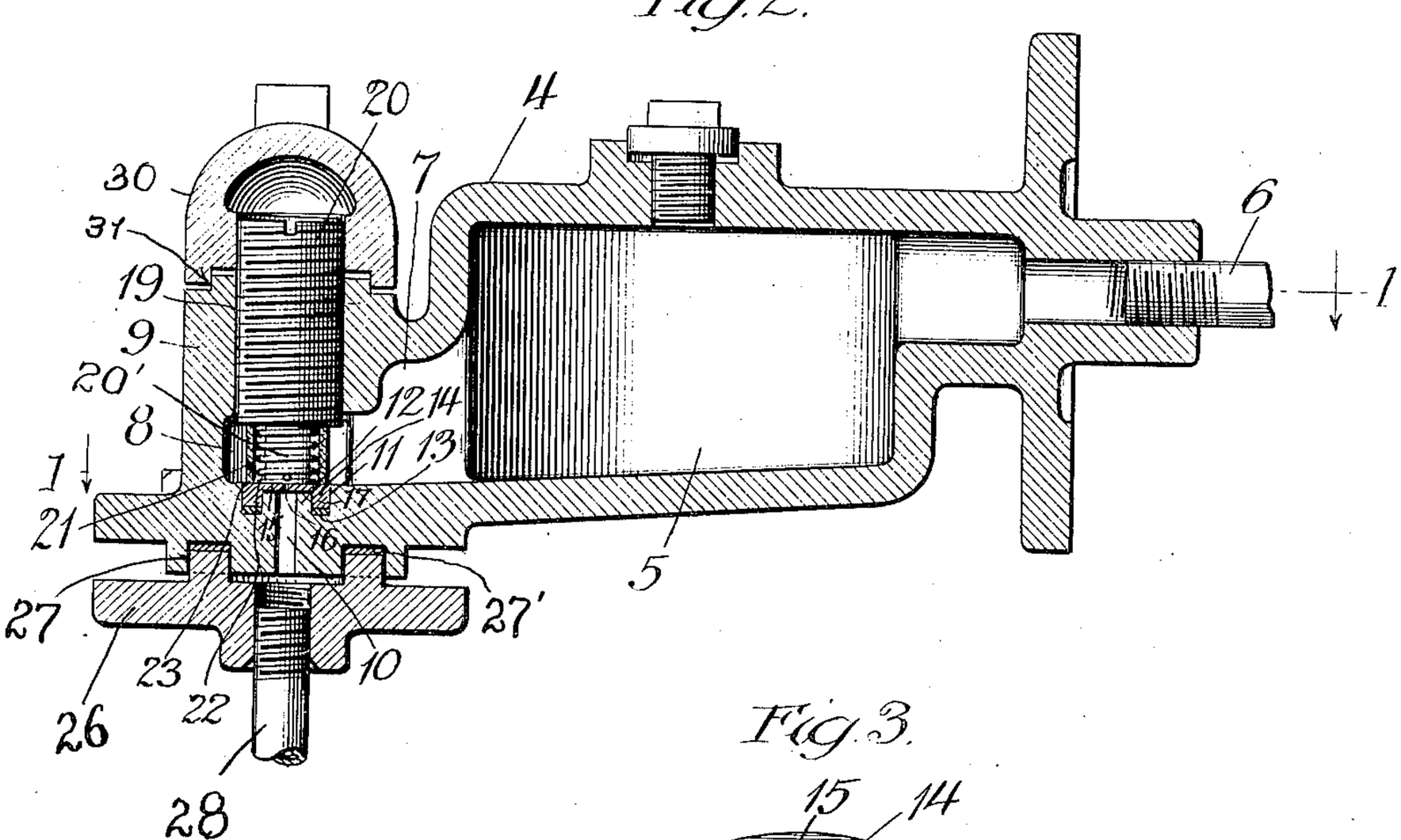
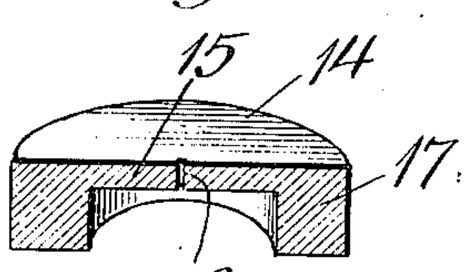


Fig. 3.



Witnesses
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UNITED STATES PATENT OFFICE.

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REFRIGERANT RECEIVER AND EXPANDER FOR REFRIGERATING PLANTS.

952,063. Specification of Letters Patent. Patented Mar. 15, 1910.

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To all whom it may concern:

Be it known that I, FRANK BISHOP, a citizen of the United States, residing at South Bend, in the county of St. Joseph and State of Indiana, have invented certain new and useful Improvements in Refrigerant Receivers and Expanders for Refrigerating Plants, of which the following is a specification.

My invention consists in a refrigerant receiver and expander for refrigerating plants.

Heretofore it has been customary to control the expansion of the refrigerant received from the compressor and condenser—or as I will term it, from the compression side of the system—in condensed form into the refrigerating coils—or expansion side of the system—through an adjustable valve, generally a needle valve. I have found that in refrigerating practice, great difficulty is encountered in providing accurate and proper adjustment of the needle valve. This is particularly true in small refrigerating plants for household service, where the capacity of the condensing and compressing apparatus is small and an undue opening of the expansion valve, providing passageway for the refrigerant in excess of the capacity of the pump and condenser, will result in a most unnecessary drop in the efficiency of the system. Such household systems, furthermore, being under regulation and operation by persons unskilled in the care of such apparatus, are particularly susceptible to incorrect adjustment, and even in the best constructed plants, it is difficult to provide means whereby the exact proper adjustment of the expansion valve to the capacity of the pump and condenser will accurately be determined.

The general object of my invention is to provide a simple and efficient device for controlling the flow of refrigerant from the compression side to the expansion side in a refrigerating system, applicable especially, by reason of its simplicity, cheapness, and ease and certainty of operation, to small household refrigerating plants.

To this end, my invention contemplates in general the provision of a receptacle for the refrigerant for connection with the compression side of the system, opening to the refrigerating coils only through an accurately gaged and invariable aperture; and it further contemplates the provision of a mechanical structure and arrangement advantageous in cheapness, simplicity, reliability in operation, efficiency, and general utility.

In the drawings, wherein I have illustrated for purposes of full disclosure an embodiment of my invention, Figure 1 is a horizontal section through a device embodying my invention on line 1—1 of Fig. 2; Fig. 2 is a vertical section on line 2—2 of Fig. 1; and Fig. 3 is an enlarged perspective of a section of the reducing member.

In the construction shown, 4 indicates in general a casting providing a receptacle 5 for refrigerant, having communicating therewith a supply pipe 6 leading thereto, it will be understood, from the condenser and compressor so as to supply refrigerant to the receptacle 5 in condensed condition. At its opposite extremity, the receptacle 5 communicates through a passage 7 with a cylindrical chamber 8 in the head structure 9, formed in the casting 4 and having made in its bottom wall a passage 10, surrounded by an annular groove 11, the boss 13 within said groove, immediately surrounding the passage 10, being preferably ground off to a little lower level than the adjoining plane of the internal bottom wall of the casting.

Within the group 11 is seated a packing ring 13 overlain by a reducer 14, preferably in the form of a cup having a planar upper disk-part 15 provided centrally with a very small aperture 16 and having depending from its edge a rim 17. This cup-shaped reducer 14 fits with its rim 17 in the groove 11 immediately upon the packing 13; its planar portion 15 overlying the boss 12 so that its top surface is substantially flush with the bottom of the receptacle; and its orifice 16 communicating with the passage 10. The orifice 16 will vary in diameter according to the particular capacity for which the device is intended, but, for example, I have found that in a small household refrigerating system intended to produce a refrigerating effect substantially equivalent to the melting of 150 pounds of ice per day, an orifice of approximately 1/100 of an inch is adequate. It will be understood by those skilled in the art, that the precise size of the orifice must be calculated according to the characteristics of the plant in which the device is to be installed, and that the data above given are suggestive merely.

For maintaining the reducer 14 in place and minimizing the possibility of its minute orifice 16 clogging by reason of impurities in the refrigerant, I provide means for constantly exerting a pressure upon the reducer to retain it in place upon its yielding packing 13 and for efficiently protecting the orifice with a filtering body. To this end, I provide in the head 9 in alinement with the reducer 14, an aperture 19 threaded to receive the pressure screw 20, and between the screw 20 and the upper surface of the reducer 14, I interpose a filtering body 21, which I prefer shall be in the form of a cylinder of unglazed porcelain, or other equivalent hard porous material, the cylinder standing upright to completely surround the orifice 16 in the reducer, at its lower side pressing upon the reducer and at its upper side receiving the pressure from the screw 20. The screw 20 preferably has a downward extension 20′, which under operative conditions may extend almost or quite into contact with the reducer 14, the extension 22 serving as a guide and internal support for the filtering cylinder 21. The extension 20′ preferably has a spiral groove similar to a screw thread cut in its surface, as indicated at 23, for conducting fluid toward its end; and adjacent its lower extremity may conveniently be provided with transverse bores 24 and a larger axial bore 25 immediately in register with the orifice 16 in the reducer.

To the bottom of the casting 4 beneath the head 9 and in communication with the passage 10, I arrange a gland or fitting 26 consisting of a male member to fit into groove 27 and provided with a gasket 27′, and in communication with the fitting 26 a pipe continuation 28, which it will be understood leads to the refrigerating or expansion pipes.

For imparting a finish to the structure and effectually concealing the screw 20, I provide a screw cap 30 upon the exposed upper end of the screw 20 and making a broken joint with the head 31.

Now it will be understood that the refrigerant, entering the receptacle 5 through the channel 7 and passing thence into the head chamber 8, completely envelops the cylinder 21. Obviously the cylinder 21 offers but little restraint to the compressed refrigerant, but acts as a purifier therefor, removing all physical impurities therefrom which might tend to clog the orifice 16 of the reducer. The refrigerant, passing through the cylinder, may pass down the spiral groove 23 and through the apertures 24 and 25 to the orifice 16 of the reducer. Through this reduced orifice a certain predetermined amount of the compressed refrigerant only will flow in a given space of time and the orifice is preferably calculated with reference to the supply capacity of the condenser and compressor. Passing the orifice 16, the refrigerant escapes through the channel 10 into outlet connection 26 and passes in circulation through the balance of the plant in the usual manner.

In order more clearly to illustrate the effects of my device upon a refrigerating plant and more fully reveal the advantages thereof in producing rapid cooling of the brine, I will now explain the preferred operation of a refrigerating plant embodying my invention. The system is started in operation in the usual manner and is allowed to run until the brine has cooled to about 20° F., at which time the difference in pressure between the upper and lower coils has caused all of the liquid refrigerant to pass below the expanding opening. In this condition the machine may be allowed to stand until the pressures have become substantially equal throughout the system at about 50 pounds and the temperature about 35° F. Upon the renewal of operation of the machine, the compressor begins to pump the refrigerant from the lower coils through the condenser coils into the receiver and thence through the constantly open expander aperture and the remainder of the system. The effect of this operation is a gradual accumulation of liquid on the top of the expander, a gradual drop in the suction pressure, and a consequent rapid cooling effect of the system. Thus in the space of two and one-half hours the pressure may decrease from 80 pounds to 26 pounds and the temperature from 52° F. to 24° F.; or in other words, the same refrigerating effect is produced in an hour shorter time than if a pressure of say 25 or 30 pounds were maintained constant. This preferred operation of the machine is given merely to indicate the effectiveness of my invention and is in no way intended to be understood as an invariable procedure which is essential to the success of the device. I have found in practice, however, that it gives the most satisfactory results to the end in view.

While I have herein described in some detail a specific embodiment of my invention which I have found useful and convenient, it will be apparent to those skilled in the art that many changes in the design and structural details of the device may be effected without departure from the spirit of the invention, and within the scope of the appended claims; and I do not desire, therefore, to be understood as limiting myself to the precise construction shown when the invention is considered in its broader aspects.

What I claim is:

1. A device for incorporation in a refrigerating system to constitute the means of communication between the compression side and the expansion side, comprising a casing structure to form a part of the fluid

passageway, a reducer having a constant opening therethrough and otherwise closing communication between said sides of the system, and a screw plug engaging the casing pressing said reducer positively in its place upon the casing and providing a gas passageway to the opening in the reducer.

2. In a device for incorporation in a refrigerating system to constitute the means of communication between the compression side and the expansion side, a casing structure for forming part of the liquid passageway provided with an outlet duct and a recess surrounding said duct, a cup-shaped reducer interfitting in said recess and overlying the duct and having a small passageway therethrough communicating with the duct, and a pressure screw bearing upon the reducer and leaving free a gas passageway through the reducer.

3. A device for incorporation in a refrigerating system, to constitute the means of communication between the compression side and the expansion side, comprising a casing structure forming part of the fluid passageway, a reducer having a constant opening therethrough and otherwise closing communication between said sides of the system, and a filtering appliance interposed between said reducer and the compression side of the system.

4. A device for incorporation in a refrigerating system, comprising a casing having inlet and outlet openings, a reducer interposed between said openings having a single constant opening therethrough, and a filtering body superposed upon the reducer and interposed between the same and the inlet.

5. In a device of the character described, a casing having inlet and outlet openings, a reducer interposed between said inlet and outlet openings having an orifice therein, a cylindrical filtering body superposed upon said reducer and enveloping the orifice, and pressure means maintaining said cylinder upon said reducer.

6. In a device of the character described, a casing having an inlet, and a bottom outlet, a reducer overlying the outlet opening provided with a constantly open orifice, a porous, hollow, cylindrical filtering body superposed upon the reducer, and a pressure screw engaging and covering the top of the cylinder.

7. In a device of the character described, a casing having an inlet, and a bottom outlet opening, a reducing cup having a constantly open orifice therethrough overlying the outlet, a porous hard body of cylindrical form superposed upon the reducer surrounding the orifice, a pressure screw engaging the top of the cylinder and having a central extension entering said cylindrical filtering body and centering the same.

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

FRANK BISHOP.

In the presence of—

FRANCIS L. ALWARD,

CLAIR C. CALAHAN.