

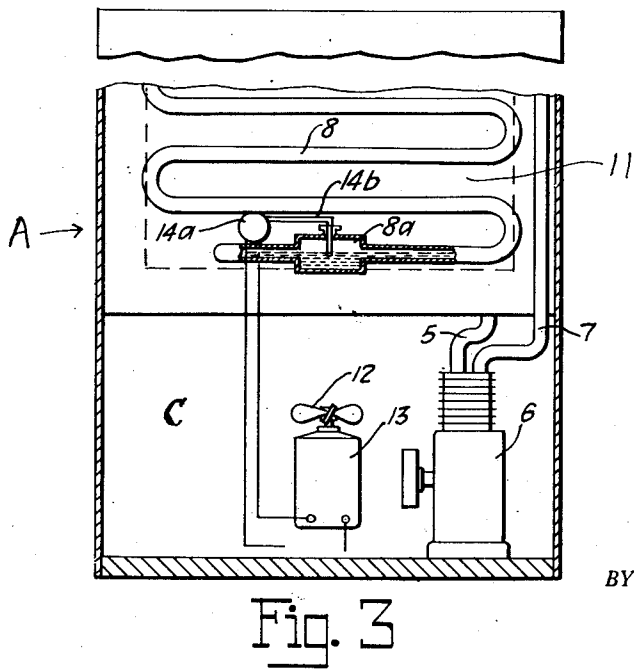
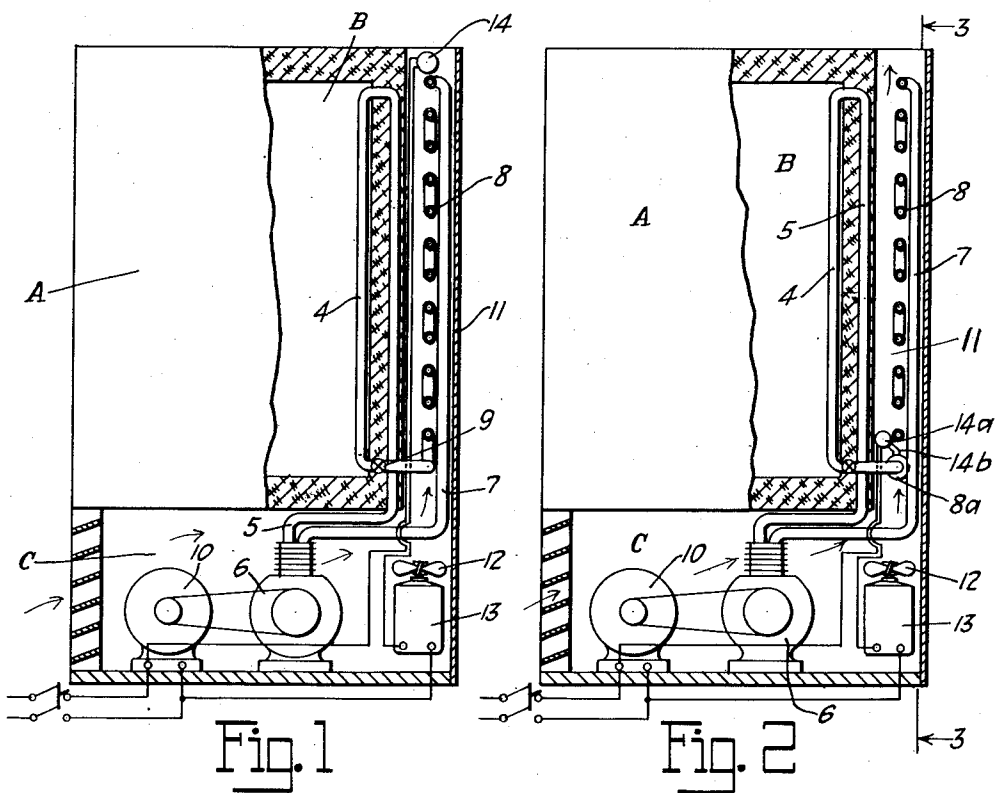
Oct. 21, 1930.

R. W. DAVENPORT

1,779,116

CONDENSING PROCESS AND APPARATUS

Filed May 19, 1928



INVENTOR.
Ransom W. Davenport

BY

Ira L. Nickerson
ATTORNEY.

UNITED STATES PATENT OFFICE

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

CONDENSING PROCESS AND APPARATUS

Application filed May 19, 1928. Serial No. 278,944.

The present invention relates to cooling processes and apparatus with particular reference to the ejection or removal of heat from condensing systems. It has special application to refrigerating processes and apparatus, particularly of the type intended for household use and in certain respects may be considered as a further development of or improvement upon the processes and apparatus disclosed in my copending application Serial No. 244,847, filed January 6, 1928, Patent No. 1,769,119, dated July 1, 1930.

My aforesaid copending application comprises natural draft and forced draft cooling of the condenser, the operation of the forced draft means being controlled by the weather or the room temperature. In such a system it is found that under certain conditions, such as when the refrigerator door is left open or when there are unusual demands upon the system as in the freezing of a large amount of water, the forced draft means may not be set in operation with the result that the condensate leaves the condenser hot, or at least above room temperature. The entrance of such warm condensate into the evaporator creates an uneconomical situation and impairs the efficiency of the apparatus.

One object of the invention is to improve the control of the forced draft means in a combined natural draft and forced draft condensing system. Another object is to control the forced draft means by the temperature of the condenser. Other objects will be apparent from the detailed description which follows.

In order to illustrate the invention concrete embodiments thereof are shown in the accompanying drawings in which:

Fig. 1 is a vertical sectional view of a refrigerating cabinet equipped with apparatus embodying the invention, a portion of the cabinet being shown in elevation;

Fig. 2 is a view similar to Fig. 1 showing a modification; and

Fig. 3 is a vertical sectional view substantially on the line 3-3 of Fig. 2.

The present invention arranges for forced draft as well as natural draft cooling of the heat ejecting members of the refrigerating

system but the control of the forced draft means is responsive to variations in the temperature of one of the heat ejecting members, preferably the condenser. The invention is illustrated in the drawings in connection with a refrigerator cabinet A providing a refrigerating chamber B and an apparatus compartment C beneath chamber B. Heat is extracted from chamber B by an evaporator 4 of any suitable or desired type, which contains the refrigerating liquid, the vapor of which is withdrawn through a pipe 5 by pump 6 and discharged at higher temperature and pressure through a pipe 7 into a condenser 8 of any suitable or desired type suspended from or disposed adjacent to the cabinet A, the condensate being fed back into the evaporator through a suitable feeding device 9. Pump 6 is driven by any suitable prime mover, such as an electric motor 10, which may be disposed in apparatus compartment C along with pump 6.

The cabinet is formed with a flue 11 which extends from apparatus compartment C and encloses condenser 8 so as to induce movement of air by natural draft of gravity through the apparatus compartment C and up and over condenser 8 in flue 11. A fan 12 operated by a separate motor 13 in parallel with motor 10 is arranged to direct a blast of air through flue 11 to augment the movement of cooling air therethrough. Fan motor 13 is automatically controlled in response to variations in temperature in the heat ejecting members, preferably condenser 8. The means for controlling the fan may be a thermostat 14 disposed in thermal proximity or relation to condenser 8. By preference thermostat 14 is disposed within flue 11. In Fig. 1 it is shown adjacent the top of flue 11 and consequently adjacent the hottest part of the condenser therein disclosed since the latter is arranged counterflow to the column of cooling air. A slightly different arrangement is shown in Figs. 2 and 3 wherein thermostat 14^a is positioned adjacent the bottom of the flue and in direct contact with the condenser, with the condensate, or with both. For this purpose, the lower end of the condenser is provided with a chamber 8^a forming a reser-

voir for the condensate and into which the active element of thermostat 14^a extends through a connection 14^b.

With the arrangement shown in Fig. 1 thermostat 14 responds in general to the mean temperature of condenser 8 since it is not in direct contact or connection with the latter. With the arrangement shown in Figs. 2 and 3 the thermostat responds to the temperature at the discharge end of the condenser which corresponds to the temperature of the condensate as it passes to feeding device 9. In both of the illustrated forms of the invention, it is obvious that the control of fan motor 13 is responsive to the operating conditions of the refrigerating system itself, with the result that the system operates at its highest efficiency and consequently with the greatest degree of economy.

The refrigerating system may operate on the conventional straight pumping cycle or upon the vapor-gas principle disclosed in my patent No. 1,619,196. Pump 6 and its driving motor 10 need not be disposed in apparatus compartment C if this is undesirable but may be placed at a remote point, as in the basement, in which case it is possible entirely to eliminate the compartment C. Fan 12 and its motor 13 would then be disposed in the lower end of flue 11 and the bottom of the latter would be cut away or opened up to provide an inlet for the column of air induced by the natural draft arrangement or forced upwardly over condenser 8 by fan 12.

When the apparatus is put into operation the thermostat which controls the fan motor is set so that the cooling of the condenser is by natural draft so long as the temperature of the condenser is within a predetermined range of efficient and economical operation. When the predetermined range is exceeded for any cause so that there is a tendency for the condensate to be fed back in a warm state to the evaporator, the thermostat is actuated to start the fan motor which continues to operate until turned off by the thermostat after the temperature of the condenser has been reduced below the critical setting of the thermostat.

While preferred forms of the invention have been herein shown and described, it is to be understood that the invention is not limited to the specific details thereof but covers all changes, modifications and adaptations within the scope of the appended claims.

I claim as my invention:

1. A self contained refrigerator comprising a cabinet having a refrigerating chamber and an apparatus compartment, means including a flue for inducing a natural draft of air through said compartment for cooling purposes, means for augmenting the draft therethrough, and automatic control means for said augmenting means disposed in said flue.

2. The combination with refrigerating apparatus of the evaporator-compressor-condenser type of a cabinet having a refrigerating chamber, an evaporator within said chamber for removing heat therefrom, a condenser adjacent the exterior of said cabinet arranged to have heat removed therefrom by natural draft, means for producing a forced draft over said condenser, and means responsive to variations of temperature in said condenser for controlling said forced draft means.

3. The combination with refrigerating apparatus of the evaporator-compressor-condenser type of a cabinet having a refrigerating chamber, an evaporator within said chamber for removing heat therefrom, a condenser adjacent the exterior of said cabinet, a flue on said cabinet enclosing said condenser for causing a natural draft of air over said condenser to remove heat therefrom, means for producing a forced draft over said condenser, and means disposed within said flue in thermal contact with said condenser for controlling said forced draft means.

4. A self contained refrigerator comprising a cabinet having a refrigerating chamber and an apparatus compartment, means including a flue for inducing a natural draft of air through said compartment for cooling purposes, a heat ejecting member in said flue, a fan for augmenting the draft through said compartment and up said flue, and means for controlling the operation of said fan in response to variations in the temperature of said member.

5. A self contained refrigerator of the closed cycle type comprising a cabinet having a refrigerating chamber and an apparatus compartment, means including a flue for inducing a natural draft through said compartment, an evaporator in said chamber, a compressor and a motor for driving the latter in said compartment, a condenser disposed in said flue, forced draft means for augmenting said natural draft comprising a fan, a motor therefor, and automatic means responsive to variations in the temperature of said condenser for controlling the operation of said fan motor.

6. A self contained refrigerator of the closed cycle type comprising a cabinet having a refrigerating chamber and an apparatus compartment, means including a flue for inducing a natural draft through said compartment, an evaporator in said chamber, a compressor and a motor for driving the latter in said compartment, a condenser disposed in said flue, forced draft means for augmenting said natural draft comprising a fan, a motor therefor, and thermally actuated control means for said fan motor disposed in said flue for operating said fan motor when the temperature of said condenser exceeds a predetermined point.

7. A self contained refrigerator of the

closed cycle type comprising a cabinet having a refrigerating chamber and an apparatus compartment, means including a flue for inducing a natural draft through said compartment, an evaporator in said chamber, a compressor and a motor for driving the latter in said compartment, a condenser disposed in said flue, forced draft means for augmenting said natural draft comprising a fan, a motor therefor, and thermally actuated control means for said fan motor in direct contact with said condenser.

8. A self contained refrigerator of the closed cycle type comprising a cabinet having a refrigerating chamber and an apparatus compartment, means including a flue for inducing a natural draft through said compartment, an evaporator in said chamber, a compressor and a motor for driving the latter in said compartment, a condenser disposed in said flue, forced draft means for augmenting said natural draft comprising a fan, a motor therefor, and a thermostat within said flue in direct as well as thermal contact with said condenser and with the condensate discharged therefrom for operating said fan motor when the temperature of said condenser exceeds a predetermined range.

Signed by me at Detroit, in the county of Wayne, and State of Michigan this 16th day of May, 1928.

RANSOM W. DAVENPORT.