

May 31, 1938.

C. WHITE

2,118,910

HOLLOW SHELF

Filed July 22, 1933

3 Sheets-Sheet 1

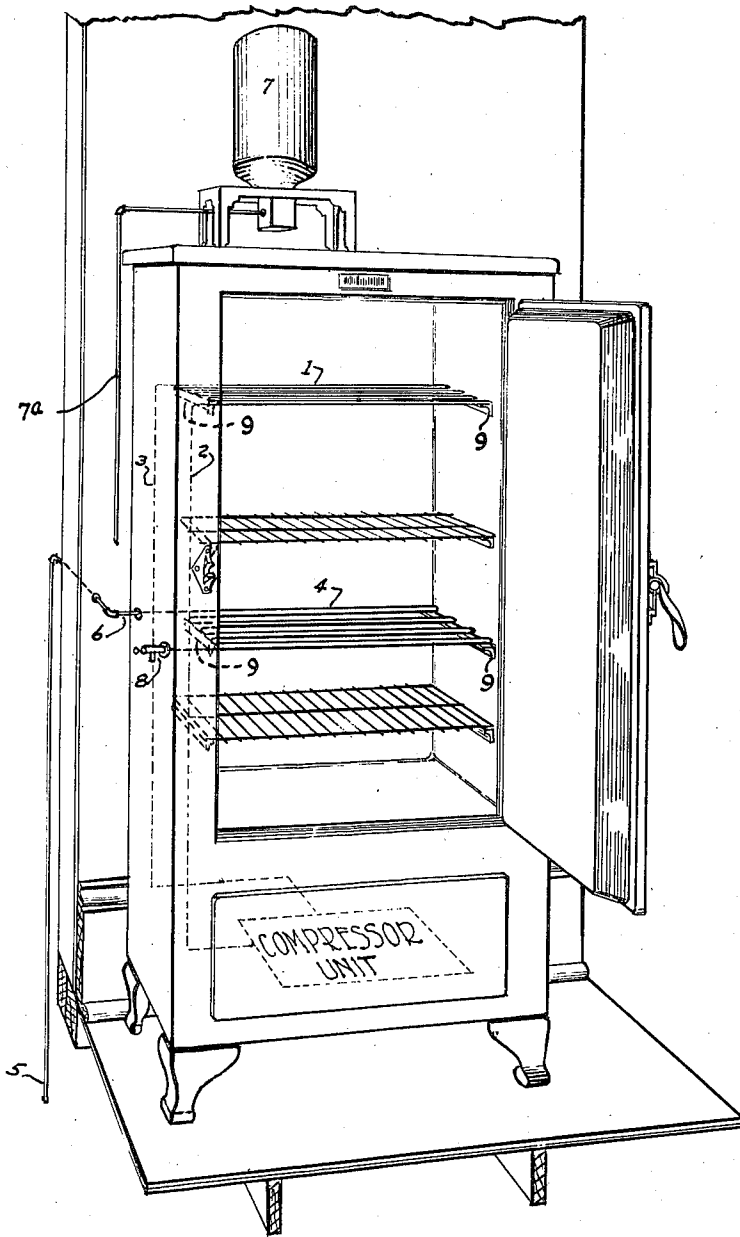


Fig. 1

Carl White INVENTOR.

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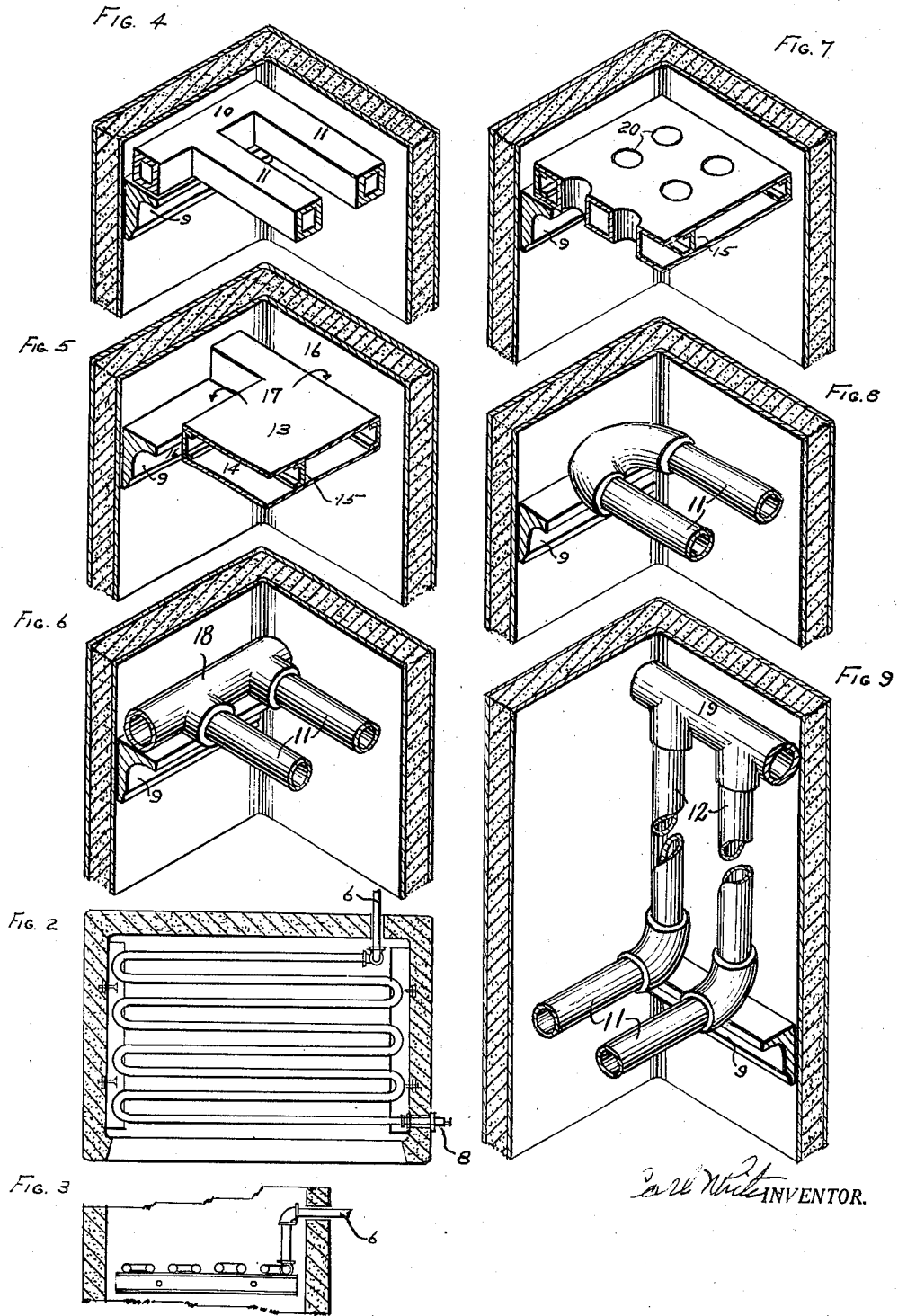
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C. White
INVENTOR.

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3 Sheets-Sheet 3

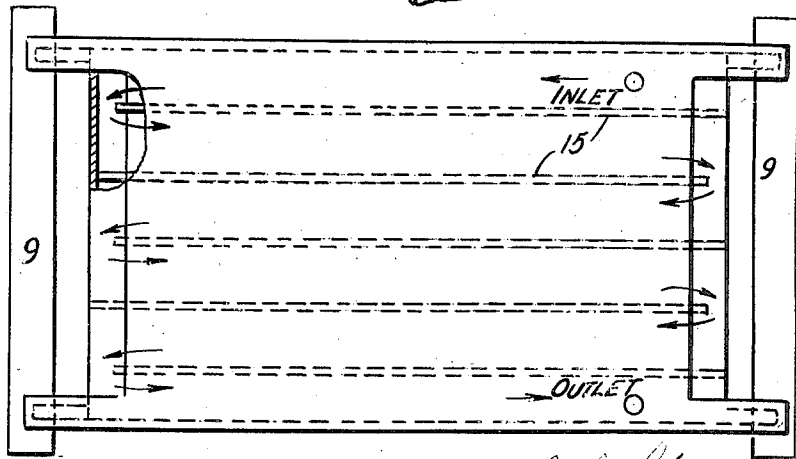
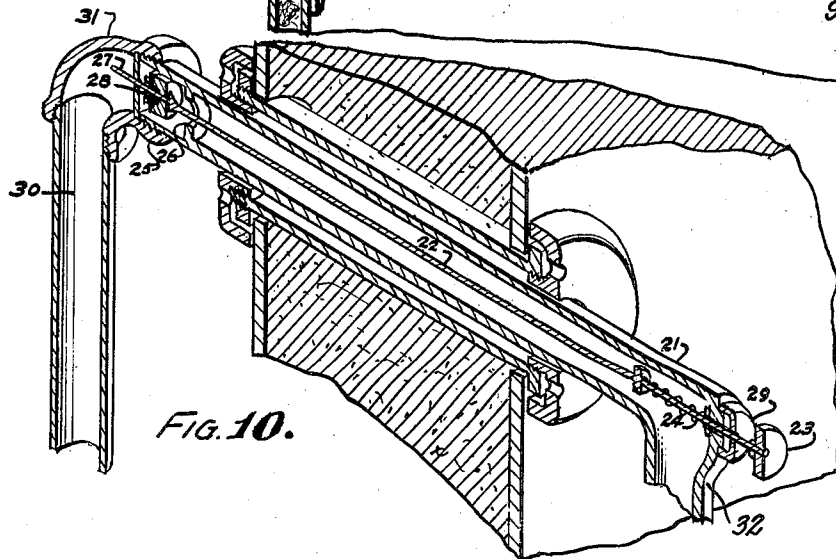
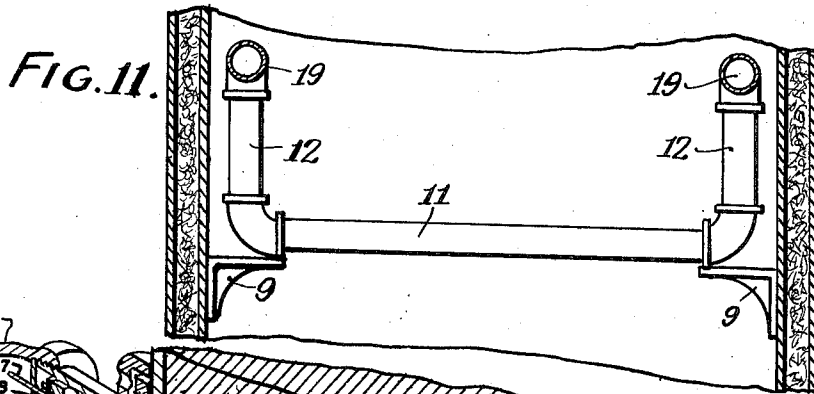


FIG. 12.

Carl White - INVENTOR.

UNITED STATES PATENT OFFICE

2,118,910

HOLLOW SHELF

Carl White, Brooklyn, N. Y.

Application July 22, 1933, Serial No. 681,766

4 Claims. (Cl. 62-99)

This invention relates to refrigerating apparatus and particularly to a novel form of a refrigerator shelf of hollow design.

One of the objects of the present invention is to provide an improved form of heat exchange unit which is cheaply and easily constructed, is capable of serving the dual purposes of a food shelf and a heat exchange unit, thus effecting a great saving of space.

More specifically, it is an object of this invention to provide a heat exchange unit which can be used as an evaporator, or cooling unit, or can be used as an apparatus for cooling drinking water, beverages or other fluids.

It is a further object of my invention to provide, as accessory to the hollow food shelf when used for chilling water, beverages or other fluids, a valve of remote control design which will restrain the fluid at a point inside the chamber of the refrigerator, while providing a direct connected, mechanically operated control device located at a point outside the refrigerator.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of this invention is clearly shown.

In the drawings:

Fig. 1 is a perspective view of a refrigerator which are incorporated heat exchange units in accordance with this invention;

Fig. 2 is a plan view of one of the elements shown in Fig. 1;

Fig. 3 is an elevation of the element shown in Fig. 2;

Figs. 4 to 9 are isometric views, partly in section, showing certain structural features constituting part of my invention;

Fig. 10 is a sectional view of an outlet means utilized in combination with the heat exchange unit of Figs. 1-9;

Fig. 11 is an elevational view partially in section showing one method of supporting the shelf with respect to the refrigerator; and

Fig. 12 is a plan view partially broken away and illustrated in section to show the path of the water through the ducts.

Referring now in detail to the drawings, the disclosure of this invention is indicated in Fig. 1 in which a hollow shelf 1 displaces the usual evaporator. This evaporator shelf will be suitably connected to a compressor unit by means of pipe lines 2 and 3. Automatic operation of compressor and evaporator shelf will be accomplished by means of suitable thermostatic control apparatus,

not detailed here, as being immaterial to the disclosure of this invention.

If, however, it is desired to make use of this invention to serve as a means for cooling drinking water, beverages or other fluids, it may be installed as indicated at 4. Here it displaces one of the usual wire shelves in a refrigerator. Water to be chilled for drinking purposes may be obtained from domestic water supply piping located in basement, through branch pipe line 5, thence through inlet pipe 6, or, if desired, water, beverages or other fluids may be obtained from another source such as an inverted bottle 7 through pipe line 7a to inlet pipe 6. Fluids introduced in this manner to the hollow shelf will quickly acquire the temperature of the surrounding medium and may be withdrawn from valve 8 as desired.

The heat exchange member shown at 1 and 4 of Fig. 1, and also in Figs. 2 and 3, comprises a plurality of passes of a duct member which may be constructed of a unitary piece of bent tubing or may be built of a plurality of parts similarly arranged or constructed in accordance with the disclosure of Figs. 4-9 as herein further set forth.

Figs. 4-9 illustrate a number of structural features which constitute part of my invention. In these figures the numeral 9 represents generally a support member for the heat exchange unit.

In Fig. 4 is shown such unit constructed from rectangular ducts 10 and 11.

A further modification of the heat exchange unit is shown in Fig. 5 which comprises a plate-like structure fabricated from parallel plate members 13 and 14 which are separated by spacers 15 to achieve desired capacity. These spacers serve the further purpose of maintaining structural rigidity and also providing a sinuous path for the confined fluid by means of alternate shortened ends of the spacers. In structures of this kind ample space will be provided at back and sides of shelf, as 16, for circulation of the surrounding medium as shown by arrows 17.

In Fig. 6 is depicted a form of this invention in which two tubular headers lying in the same plane on opposite sides of the chamber are connected by transverse tubular members 11. These transverse members are suitably screwed, or otherwise fastened in the header members. I may employ a combination of the structural features disclosed in Fig. 4 in connection with those in Fig. 6, as for example, rectangular headers with tubular transverse members, or vice versa.

The unit shown in Fig. 7 differs from that of Fig. 5 in that no provision is made for spacing of

such unit from the walls of the surrounding chamber. In lieu of such spacing there are provided perforations 20 which serve to furnish adequate circulation.

5 The design shown in Fig. 8 is similar to that of Fig. 2 and Fig. 3, except that the bent portions of the unit are commercial return bend castings.

The modification shown in Fig. 9 is that of placing one or both of the header members, as 10 19, in a plane other than that of the principal plane of the unit. A header so located is connected suitably through members 12 to the main portion, or transverse members 11 of the unit.

It is here indicated that I contemplate that the 15 transverse members of any type of hollow shelf may lie in the position indicated in this, the preferred embodiment of my invention, or if desired, may lie in a direction at right angle to that shown. It is to be understood that the com- 20 ponent parts of the unit as disclosed in Figs. 4-9 will be interconnected suitably through such mechanical means as is deemed expedient as, for example by threaded, brazed, soldered, welded or other joints. It is further to be understood that 25 such baffles may be provided as will effect a sinuous path, or a plurality of parallel paths for the confined fluids as is well understood in the arts. The shelf, if deemed expedient, may be made as a unit by casting, or moulding.

30 Fig. 11 shows more clearly the arrangement of header members 19 at opposite ends of the shelf and above the plane thereof connected to the transverse members 11 through members 12 as shown. The shelf portion constituted by mem- 35 bers 11 may be supported by members 9 with respect to the side walls of the refrigerator.

The remote seat valve of Fig. 10 comprises a casting 21 of length sufficient to pass through the wall of the chamber for which it is designed, 40 providing convenient clearances at both its extremities. The valve is shown in this drawing at "open" position. The valve stem 22, lengthened to meet the requirements, is actuated by push 45 button 23 for opening and by coil spring 24 for closing. This action operates disc 25 upon valve seat 26. Concentric alignment of disc to seat is maintained by center post 27 moving in orifice 50 of guide frame 28. Packing nut 29 prevents fluid from leaking at the valve stem orifice. Pipe connection 30 allows fluid confined in the heat exchange member disclosed above to pass to elbow 31, thence through the valve seat to the body of the valve and out at the nozzle 32 to be used as required.

55 It is here indicated that I contemplate that the component parts of this invention, as disclosed in Fig. 10, is a preferred embodiment of this valve and may be fabricated and assembled as disclosed, or may be varied to special uses. For 60 example, the valve may be actuated by lever, by threaded stem, or other means, and the nozzle may be threaded to receive hose connection or other changes made not material to the significance of this invention, viz., that of a mechani- 65 cally operated valve, the body and exposed stem of which are of sufficient length so that the end of the valve containing the seat and disc or other closing device may be located at a point within an enclosed space, while the end of the valve 70 which presents the handle or operating device is located at a point outside the enclosure for which it is designed.

While the form of embodiment of the present invention as herein disclosed constitutes a preferred form, it is understood that the other forms

might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In a refrigerator, a cabinet, shelf-supporting means, a cooling unit forming a horizontal shelf and carried by said shelf-supporting means, said cooling unit comprising a plurality of parallel ducts spaced sufficiently close together to retain small articles to be stored in said cabinet, said ducts continuing in a vertical plane on one or more walls of the cabinet in an upward direction from said shelf, and means connecting the ends of said ducts above the plane of the shelf to permit flow of fluid therethrough, the horizontal portion of said cooling unit occupying substantially the entire available horizontal area of said cabinet, said shelf supporting means engaging said cooling unit substantially in the plane of said parallel ducts for supporting said cooling unit from the walls of said cabinet. 20

2. In a refrigerator, a cabinet, shelf-supporting means, a cooling unit forming a horizontal shelf and carried by said shelf-supporting means, said cooling unit comprising a plurality of parallel ducts spaced sufficiently close together to retain small articles to be stored in said cabinet, opposed header members interconnecting the ends of said ducts, one header member being disposed above the plane area of the horizontal shelf formed by said cooling unit and operating to provide a path for fluid, and fluid inlet and outlet connections for said cooling unit, said shelf supporting means engaging said cooling unit substantially in the plane of said parallel ducts for supporting said cooling unit from the walls of said cabinet. 35

3. In a refrigerator, a cabinet, shelf-supporting means, a cooling unit forming a horizontal shelf and carried by said shelf-supporting means, said cooling unit comprising a plurality of parallel ducts spaced sufficiently close together to retain small articles to be stored in said cabinet, fluid inlet and outlet pipe connections for said ducts, and means laterally coextensive with said ducts and interposed between one of said pipe connections and said ducts and extending above the plane of said shelf for increasing the external area and fluid capacity of said ducts and forming part of said cooling unit, said shelf supporting means engaging said cooling unit substantially in the plane of said parallel ducts for supporting said cooling unit from the walls of cabinet. 45

4. In the food chamber of a refrigerator, shelf-supporting means, a cooling unit in the form of a horizontal shelf, held in position by said shelf supporting means, said cooling unit comprising a plurality of parallel ducts, assembled closely in even alignment to provide by themselves alone a suitably smooth and safe surface for the retention of small articles and containers to be stored in said food chamber, the main portion of said ducts, forming said cooling unit and shelf, lying in a horizontal plane, the secondary portion, or portions thereof extending upwardly in right-angular relation thereto and terminating in headers at opposite ends thereof above the plane of the shelf, whereby the surface area of the cooling unit is augmented and the internal capacity thereof is increased, said cooling unit being provided with inlet and outlet openings, and the horizontal portion thereof occupying substantially the entire available horizontal area within said food chamber. 55 60 65 70