

March 7, 1933.

C. A. MOORE

1,900,580

VENTILATED REFRIGERATOR

Filed Feb. 2, 1931

2 Sheets-Sheet 1

Fig. 1

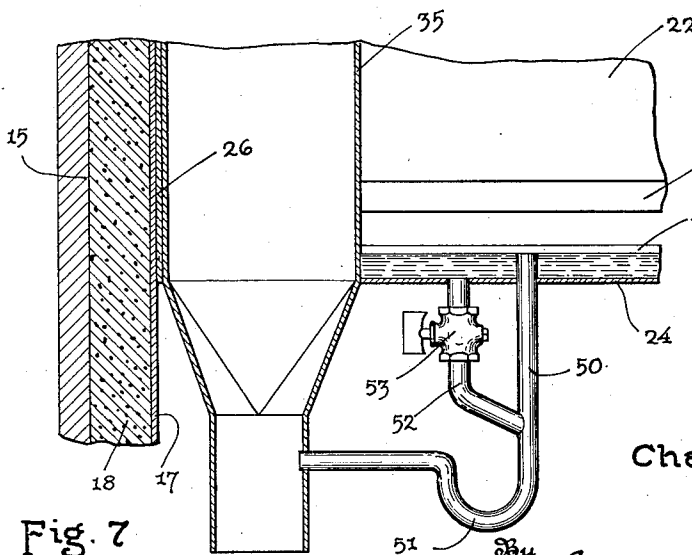
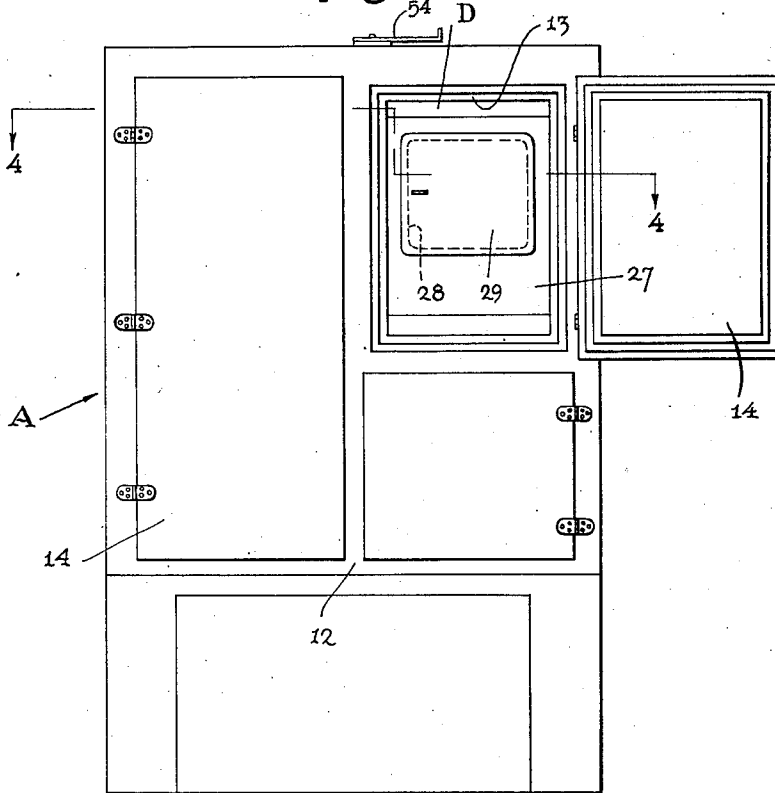


Fig. 7

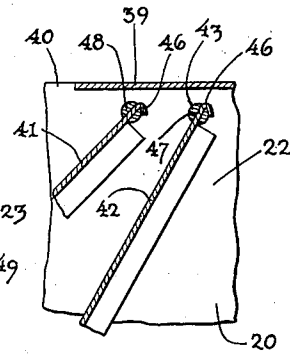


Fig. 6

Inventor
Charles A. Moore

Carroll & Lazard
Attorneys

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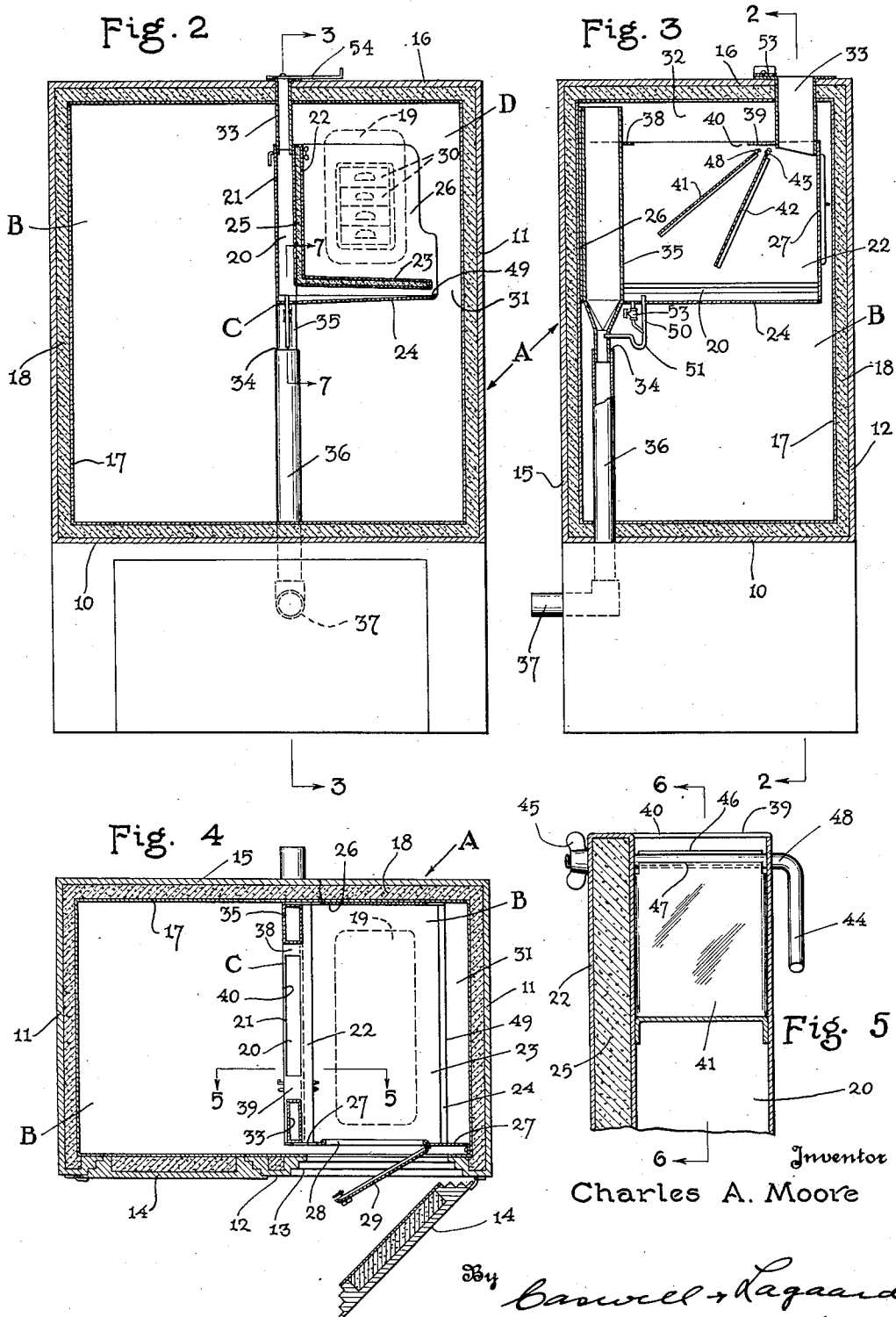
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

CHARLES A. MOORE, OF EDINA, MINNESOTA

VENTILATED REFRIGERATOR

Application filed February 2, 1931. Serial No. 512,842.

My invention relates to improvements in ventilated refrigerators of the general character disclosed in Letters Patent of the United States No. 1,661,671 issued to me March 6, 1928.

An object of the invention is to provide an improved refrigerator of the present character in which ventilation is accomplished by gravity and in which the incoming fresh air and the recirculating air may be conditioned, as desired, under the various external atmospheric conditions.

Another object of the invention is to provide an efficient refrigerator of the present character, wherein various percentages of relative humidity may be established and maintained therein, as desired.

More specifically, it is an object of my invention to provide in a ventilated refrigerator, a hollow structure for partitioning off a refrigerant compartment therein and which forms about said compartment a passageway for recirculating air within the refrigerator and also for the ingress of fresh air thereto.

Another object of the invention is to provide in such partitioning structure, means for varying the area thereof which contacts with the incoming fresh air.

Another object of the invention is to provide means for controlling the passage of recirculating air through the partitioning structure.

An additional object of the invention is to construct the partitioning structure in a manner to provide a reservoir for accumulated water of condensation over which air passing through said passageway may sweep.

A further object of the invention is to provide convenient means for establishing the high level of water within said reservoir and to provide for draining the water from said reservoir when desired.

With the foregoing and other objects in view, which will appear in the following description, the invention resides in the novel combination and arrangement of parts and in the details of construction hereinafter described and claimed.

In the drawings, Fig. 1 is a front elevational view of a refrigerator embodying my

invention; Figs. 2 and 3 are elevational views partly in section, the portion of Fig. 2 shown in section being taken as on the line 2—2 of Fig. 3 and the portion of Fig. 3 shown in section being taken as on the line 3—3 of Fig. 2; Fig. 4 is a plan sectional view taken as on the line 4—4 of Fig. 1, the doors at the right side of the view being differently positioned as compared with the positions occupied thereby in said Fig. 1; Figs. 5 and 6 are sectional views in detail, the former being taken as on the line 5—5 of Fig. 4 and the latter as on the line 6—6 of Fig. 5; and Fig. 7 is an enlarged sectional view in detail taken as on the line 7—7 of Fig. 2.

Referring to the drawings, it will be seen that my invention includes a box-like cabinet A comprising a bottom 10, ends 11, front 12 with doorways 13 therein having doors 14 therefor, back 15 and top 16, said cabinet being provided with an inner lining 17, insulated as at 18, said cabinet enclosing a chamber B for provisions.

Within the chamber B is a hollow partitioning structure, L-shaped in vertical cross section, the same being indicated in its entirety by the reference letter C. This partitioning structure C, consisting of an upright branch and a horizontal branch, is placed in an upper corner of the chamber B and provides therein a refrigerant compartment D in which a conventional refrigerating unit is disposed, such a unit being illustrated diagrammatically in dotted lines at 19. Said partitioning structure C consists essentially of double walls spaced from each other to form an air passageway 20, the upright branch of said structure including an outer wall 21 and an inner wall 22 and the horizontal branch including an upper wall 23 and a lower wall 24, the upper wall 23 comprising an angular extension of the inner wall 22 and the lower wall 24 comprising an angular extension of the outer wall 21. The outer and lower walls 21, 24 are formed of sheet metal. The inner and upper walls 22, 23 consist of spaced metallic sheets between which insulating material 25 is placed, such construction serving to insulate the air passageway 20 from the refrigerant compartment D. A back plate

26, applied to the L-shaped partitioning structure C, constitutes a back wall for the passageway 20 and provides a bracket for securing said structure to the back 15 of the cabinet. Similarly, a front plate 27 constitutes a front wall for said passageway 20 and provides a bracket for securing the partitioning structure to the adjacent end wall 11 of the cabinet. This front plate 27 extends across one of the doorways 13 of the cabinet and is itself provided with a doorway 28 fitted with a door 29, said doorway 28 providing access to the interior of the refrigerant compartment D and particularly to the ice trays 30 in the unit 19 therein.

The passageway 20 in the partitioning structure C opens at the extremity of the horizontal branch into a narrow port or passageway 31 left between said extremity of said horizontal branch and the adjacent end wall 11 of the cabinet, which port 31 brings the lower portion of the refrigerant compartment D into communication with the chamber B. The upper extremity of the upright branch of the partitioning structure C falls short of the ceiling of the chamber B, thus providing a port 32 affording communication between the upper portion of said chamber and the upper portion of the refrigerant compartment D.

A fresh air ingress conduit 33, extending downwardly through the top 16 of the cabinet A, opens into the upper portion of the passageway 20 in the upright branch of the partitioning structure C, said conduit being oblong in horizontal cross-section and fitted snugly at its lower end between the walls 21 and 22 and against the front plate 27. A pivoted cover plate 54, adapted to be swung across the mouth of the conduit 33, controls the ingress of air thereto. An upright air egress conduit 34 is provided within the chamber B, said conduit including an upper reach 35 fitted snugly between the walls 21 and 22 and against the back plate 26. The upper extremity of said reach 35 falls slightly short of the ceiling of said chamber, the lower end thereof having a funnel-like extremity to which is connected a tubular reach 36 which extends through the bottom 10 of the cabinet. A shoe 37, fitted to the lower extremity of this tubular reach 36 and extending through the back of the cabinet, may be employed, if desired, to direct the discharge from said reach to the rear of the cabinet structure.

At the top of the upright branch of the partitioning structure C are two spaced top plates 38 and 39, the former closing a portion of the space between the walls 21 and 22 adjacent to the egress conduit reach 35 and the latter closing a portion of the space between said walls adjacent to the ingress conduit 33. The opening between these top plates 38 and 39 constitutes a port 40, which provides communication between the upper

portion of the passageway 20 and the upper portion of the chamber B at the port 32 between said chamber and the refrigerant compartment D. The admission of air through said port 40 to the passageway 20 is regulated and, if desired, completely arrested by means of a damper or gate 41, a similar gate 42 being employed for a purpose hereinafter to be explained. These gates are similar in construction, each consisting of a strip of channel shaped sheet metal, the opposite flanges of which fit closely against the opposing faces of the walls 21 and 22. The gate 41 is hung on a pintle 48 journaled horizontally in the walls 21 and 22 beneath the top plate 39, the outer end of said pintle being bent at right angles to the body thereof to form a handle 44, the inner end of the pintle being threaded and fitted with a wing nut 45 adapted to be turned against the wall 22. The connection between the gate 41 and pintle 48 is made, as shown in Figs. 5 and 6, by inserting a projecting end 46 of the web of said gate through a slot 47 in the body of the pintle and bending the extremity of said web over the pintle. With the connection thus made between gate and pintle, the inner flange of the gate is clamped against the wall 22 upon the tightening of the wing nut 45 with the result that the gate is securely held in any position of adjustment in which it may be placed. The gate 42 is swung from a pintle 43 disposed beneath the top plate 39, the construction of said gate and pintle and the manner of the connection between the same being identical with that of the previously described gate 41 and pintle 48.

The upper wall 23 of the horizontal branch of the partitioning structure C slopes downwardly from the inner wall 22 of the upright branch of said structure, while the lower wall 24 of said horizontal branch slopes upwardly from the outer wall 21 of the upright branch. This lower wall 24 extends slightly beyond the extremity of said upper wall and is formed at its edge with an upturned lip 49 in order that said lower wall may catch and retain any drip from said upper wall. Sloping as described, the lower wall 24, together with other parts of the partitioning structure C, forms a reservoir for water against the surface of which the air in passageway 20 sweeps in its passage along the horizontal branch of the partitioning structure. The accumulation of water in said reservoir is limited, the high level thereof being established by means of an overflow pipe 50 which is formed as best shown in Fig. 7, with a bend therein to provide a trap 51 and which empties into the egress conduit 34. Connecting with said pipe 50 in advance of the trapping bend therein is a pipe 52 for draining said water reservoir, said pipe being fitted with a valve 53 for cutting off the drainage flow therethrough.

The gate 42, previously mentioned, constitutes a barrier, the adjustment whereof increases or diminishes the wall area in passageway 20 with which the incoming air contacts, a further purpose of said gate 42 being to control or entirely interrupt the ingress, through conduit 33, of fresh air to said passageway 20.

In operation, with gate 41 closed and with gate 42 and/or closure plate 54 closed, ventilation is arrested, an internal circulation of air taking place within the refrigerator as follows: The air in compartment D, being cooled by the unit 19, descends through port 31 into the chamber B, thence passes along the lower portion of said chamber toward the opposite end wall, thence rises to the upper portion of the chamber and thence passes through the port 32 back into the compartment D where the cycle is begun anew.

Ventilation in the chamber B is established in the desired degree by opening the closure plate 54 and also gate 42 and regulating one or the other thereof to control the entry of fresh air to passageway 20 through the ingress conduit 33. The air in said passageway 20, cooled by contact with the relatively cold walls of the partitioning structure C, gravitates through said structure to port 31 between the refrigerant compartment D and the chamber B, through which port refrigerated air is gravitating from said compartment. Thus, the incoming fresh air is reduced in temperature and admitted to the circulating flow of air within the refrigerator at the point where the refrigerated air from compartment C enters the provision chamber B. Compensating for the ingress of fresh air to the refrigerator and for the pressure which would otherwise be built up within the cabinet, due to the respiration of the contained products, is an escaping flow of gravitating air from the upper portion of chamber B, which takes place through the egress conduit 34.

If the conditions are such that it is desirable to dehumidify the air within the cabinet, gate 42 is opened wide. The air then entering passageway 20 is brought into contact with a relatively large area of the cold walls thereof, with the result that a substantial quantity of moisture in the air is eliminated therefrom through condensation which accumulates on said walls and flows into the reservoir at the bottom of the partitioning structure C and from said reservoir to the outside through pipe 52 and air egress conduit 34. The reduction of moisture in the air is further effected by keeping the port 40 closed by means of the gate 41 and thus subjecting the entire flow of recirculating air to the unit 19 in the refrigerant compartment D. Dehumidification in lesser degree may be effected by shifting the gate 42 toward its closing position and/or shifting gate 41 away

from its closing position. In such event, the incoming fresh air contacts with a smaller wall area in the upright branch of the partitioning structure C and, if gate 41 is opened more or less, air, in more or less measure, from the upper portion of chamber B, is shunted around the refrigerant chamber D through passageway 20.

When it is desired to increase the percentage of relative humidity in the air within the refrigerator, the gate 42 is swung into a substantially vertical position, whereby the wall area of the upright branch of the partitioning structure C, which comes in contact with the fresh incoming air is limited. The gate 41 is also swung down from port 40 into substantially vertical position. With these adjustments made, a limited amount of moisture is given up by the incoming fresh air in the upright branch of the partitioning structure C and the maximum flow of recirculating air is directed through passageway 20. Thus, by eliminating a relatively small part of the moisture from the incoming fresh air and shunting a substantial quantity of the recirculating air past the refrigerant compartment D, a relatively high percentage of humidity in the air within the refrigerator may be acquired. By closing the valve 53 in drain pipe 52, a limited quantity of the condensed moisture, accumulating in the partitioning structure C, is trapped in the water reservoir. In passing between the moist walls of said structure and over the surface of the water in the reservoir, the incoming and recirculating air is cleansed in appreciable measure.

Owing to the inclination of the wall 23 in the horizontal branch of the partitioning structure, no pocketing of the air is experienced, the gravitating flow through the compartment D being enhanced. The walls 22 and 23 of the partitioning structure C being well insulated, the air passing through the passage 20 is only slightly affected directly by the unit 19 within the compartment D.

In refrigerators of greater capacity than that shown, a partitioning structure such as that illustrated, may be employed together with a similar structure reversed in form. In such case, the two structures are placed lip to lip centrally of the chamber B, a space being left between the lips to provide a port which is equivalent to port 31 in the drawings.

From the foregoing, it will be understood that my invention provides for a ventilated internal, convective and diffused circulation of air within a refrigerator and provides for the establishment and maintenance of such relative percentages of humidity in the air, under the various external atmospheric conditions, as may be necessary in properly conditioning and preserving the perishable contents of the refrigerator.

Changes in the specific form of my invention, as herein disclosed, may be made within the scope of what is claimed without departing from the spirit of my invention.

5 Having described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In a refrigerator, a cabinet enclosing a chamber for provisions, a double walled partitioning structure within said chamber, L-shaped in cross-section, providing a compartment for a refrigerating medium, said compartment communicating at its upper portion with the upper portion of the provision chamber and at its lower portion with a lower portion of said chamber, the inner wall of the upright branch of said structure and the upper wall of the horizontal branch thereof being insulated from the refrigerating medium within said compartment, said partitioning structure forming an air passageway between the walls thereof opening at the upper portion of said structure for the ingress of air thereto at the upper portion of said chamber and opening at the lower portion of said structure for the egress of air therefrom into the provision chamber, means for the ingress of fresh outer air into said passageway at the upper portion of said structure, a barrier adjustable between the walls of the upper branch of the partitioning structure to vary the wall area thereof contacting with the incoming fresh air, a conduit for the egress of air from said chamber, the upper and lower walls of the horizontal branch of the partitioning structure sloping from the upright branch downwardly and upwardly, respectively, the upper wall draining to the lower wall, said lower wall forming the bottom of a reservoir within the passageway for water accumulating on the partitioning structure therein, an overflow pipe leading to said conduit for establishing the high level of water in said reservoir, and valved means for draining the water from said reservoir into said conduit.

2. In a refrigerator, a cabinet enclosing a chamber for provisions, a double walled partitioning structure within said chamber, L-shaped in cross-section, providing a compartment for a refrigerating medium, said compartment communicating at its upper portion with the upper portion of the provision chamber and at its lower portion with a lower portion of said chamber, the inner wall of the upright branch of said structure and the upper wall of the horizontal branch thereof being insulated from the refrigerating medium within said compartment, said partitioning structure forming an air passageway between the walls thereof opening at the upper portion of said structure for the ingress of air thereto at the upper portion of said chamber and opening at the lower portion of said structure for the egress of air there-

from into the provision chamber, means for the ingress of fresh outer air into said passageway at the upper portion of said structure, means for the egress of air from said chamber, the upper wall of the horizontal branch of the partitioning structure being sloped to drain to the lower wall, said lower wall forming the bottom of a reservoir for water drained from said upper wall and for water accumulating on the partitioning structure within said passageway, and an overflow pipe for establishing the high level of water in said reservoir.

3. In a refrigerator, a cabinet enclosing a chamber for provisions, a double walled partitioning structure within said chamber, L-shaped in cross-section, providing a compartment for a refrigerating medium, said compartment communicating at its upper portion with the upper portion of the provision chamber and at its lower portion with a lower portion of said chamber, the inner wall of the upright branch of said structure and the upper wall of the horizontal branch thereof being insulated from the refrigerating medium within said compartment, said partitioning structure forming an air passageway between the walls thereof opening at the upper portion of said structure for the ingress of air thereto at the upper portion of said chamber and opening at the lower portion of said structure for the egress of air therefrom into the provision chamber, means for the ingress of fresh outer air into said passageway at the upper portion of said structure, means for the egress of air from said chamber, the upper wall of the horizontal branch of the partitioning structure draining to the lower wall, said lower wall forming the bottom of a reservoir for water drained from said upper wall and for water accumulating on the partitioning structure within said passageway, and valved means for draining the water from said reservoir.

4. In a refrigerator, a cabinet enclosing a chamber for provisions, a double walled partitioning structure within said chamber, L-shaped in cross-section, providing a compartment for a refrigerating medium, said compartment communicating at its upper portion with the upper portion of the provision chamber and at its lower portion with a lower portion of said chamber, the inner wall of the upright branch of said structure and the upper wall of the horizontal branch thereof being insulated from the refrigerating medium within said compartment, said partitioning structure forming an air passageway between the walls thereof opening at the upper portion of said structure for the ingress of air thereto at the upper portion of said chamber and opening at the extremity of the horizontal branch of said structure for the egress of air therefrom into the provision chamber, means for the ingress

of fresh outer air into said passageway at the upper portion of said structure, a barrier adjustable between the walls of the upper branch of the partitioning structure to vary the wall area thereof contacting with the incoming fresh air, the lower wall of the horizontal branch of the partitioning structure confining within said passageway the water of condensation accumulating therein on the partitioning structure, and means for the egress of air from the chamber.

5. In a refrigerator, a cabinet enclosing a chamber for provisions, a double walled partitioning structure within said chamber, L-shaped in cross-section, providing a compartment for a refrigerating medium, said compartment communicating at its upper portion with the upper portion of the provision chamber and at its lower portion with a lower portion of said chamber, the inner wall of the upright branch of said structure and the upper wall of the horizontal branch thereof being insulated from the refrigerating medium within said compartment, said partitioning structure forming an air passageway between the walls thereof opening at the upper portion of said structure for the ingress of air thereto at the upper portion of said chamber and opening at the lower portion of said structure for the egress of air therefrom into the provision chamber, means for the ingress of fresh outer air into said passageway at the upper portion of said structure, means for the egress of air from said chamber, the upper and lower walls of the horizontal branch of the partitioning structure sloping from the upright branch downwardly and upwardly, respectively, the upper wall draining to the lower wall, said lower wall forming the bottom of a reservoir within the passageway for water draining from the upper wall and for water accumulating on the partitioning structure within said passageway.

6. In a refrigerator, a cabinet enclosing a chamber for provisions, a partitioning structure within said chamber providing a refrigerant compartment communicating at its upper portion with the upper portion of the provision chamber and at its lower portion with a lower portion of said chamber, said partitioning structure comprising spaced walls forming an air passageway therebetween opening at the lower portion of said structure for the egress of air therefrom into the provision chamber, means for the ingress of outer air into said passageway at the upper portion of said structure, said passageway being open at the upper portion of said structure for the ingress of air thereto from the upper portion of the chamber, and means for the egress of air from said chamber.

7. In a refrigerator, a cabinet enclosing a chamber for provisions, a partitioning structure within said chamber providing a refrigerant

compartment communicating at its upper portion with the upper portion of the provision chamber and at its lower portion with a lower portion of said chamber, said partitioning structure comprising spaced inner and outer walls, the latter being insulated, said walls forming an air passageway therebetween opening at the lower portion of said structure for the egress of air therefrom into the provision chamber, means for the ingress of outer air into said passageway at the upper portion of said structure, said passageway being in valved communication at its upper portion with the upper portion of the chamber, and means for the egress of air from said chamber.

8. In a refrigerator, a cabinet enclosing a chamber for provisions, a double walled partitioning structure within said chamber, providing a compartment for a refrigerating medium, said compartment communicating at its upper portion with the upper portion of the provision chamber and at its lower portion with a lower portion of said chamber, the inner wall construction of the partitioning structure being insulated, said structure forming an air passageway between the walls thereof opening at the lower portion of said structure for the egress of air therefrom into the provision chamber, means for the ingress of outer air into said passageway at the upper portion of said structure and means for the egress of air from said chamber.

9. In a refrigerator, a cabinet enclosing a chamber for provisions, a double walled partitioning structure within said chamber providing a refrigerant compartment communicating at its upper portion with the upper portion of the provision chamber and at its lower portion with a lower portion of said chamber, said partitioning structure forming an air passageway between the walls thereof opening at the lower portion of said structure for the egress of air therefrom into the provision chamber, means for the ingress of outer air into said passageway at the upper portion of said structure, adjustable means for varying the wall area of said passageway contacting with the air passing therethrough, and means for the egress of air from said chamber.

10. In a refrigerator, a cabinet enclosing a chamber for provisions, a double walled partitioning structure within said chamber providing a refrigerant compartment communicating at its upper portion with the upper portion of the provision chamber and at its lower portion with a lower portion of said chamber, said partitioning structure forming an air passageway between the walls thereof opening at the lower portion of said structure for the egress of air therefrom into the provision chamber, means for the ingress of outer air into said passageway at the upper portion of said structure, a barrier in said

passageway adjustable to vary the wall area thereof contacting with the incoming outer air, and means for the egress of air from said chamber.

5 11. In a refrigerator, a cabinet enclosing a chamber for provisions, a double walled partitioning structure within said chamber providing a refrigerant compartment communicating at its upper portion with the upper portion of the provision chamber and at its lower portion with a lower portion of said chamber, said partitioning structure forming an air passageway between the walls thereof opening at the lower portion of said structure for the egress of air therefrom into the provision chamber, means for the ingress of outer air into said passageway at the upper portion of said structure, a barrier in said passageway adjustable to vary the wall area thereof contacting with the incoming outer air, said barrier also constituting a valve for regulating the ingress of outer air to said passageway, and means for the egress of air from said chamber.

25 12. In a refrigerator, a cabinet enclosing a chamber for provisions, a double walled partitioning structure within said chamber providing a refrigerant compartment communicating at its upper portion with the upper portion of the provision chamber and at its lower portion with a lower portion of said chamber, said partitioning structure being insulated at its inner walls and forming an air passageway between the walls thereof opening at the lower portion of said structure for the egress of air therefrom into the provision chamber, said passageway being in valved communication at its upper portion with the upper portion of said chamber and with the outer air, and means for the egress of air from said chamber.

13. In a refrigerator, a cabinet enclosing a chamber for provisions, a hollow, double walled partitioning structure within said chamber forming a refrigerant compartment therein and providing an air passageway about said compartment for the ingress to the chamber of fresh air from the outside of the cabinet and for air recirculating within the cabinet, said structure further providing a reservoir for water of condensation accumulating within said passageway and over which the air therein passes, and means for the egress of air from said chamber.

55 14. In a refrigerator, a cabinet enclosing a chamber, a freezing element within the chamber arranged to set up a gravitating circulation of air therein, a conduit structure affected by the freezing element and adapted, by gravity, to shunt a part of the recirculating air around said element, whereby such air is kept from direct contact therewith and thereby saved against the freezing of moisture therefrom on said element, and an adjustable barrier for regulating the flow of

the recirculating air through the conduit structure.

15. In a refrigerator, a cabinet enclosing a chamber for provisions, a refrigerating medium therein, a conduit communicating at its upper and lower portions with the interior of the provision chamber at different elevations, said conduit being affected by said refrigerating medium and affording a passage for air gravitating within said chamber, means for the ingress of outer air to said conduit, and means for the egress of air from the cabinet.

16. In a refrigerator, a cabinet enclosing a chamber for provisions, a refrigerating medium therein, a conduit communicating at its upper and lower portions with the interior of the provision chamber at different elevations, said conduit being affected by said refrigerating medium and affording a passage for air gravitating within said chamber, means for the ingress of outer air to said conduit, means for the egress of air from the cabinet, and means for draining away from the conduit structure any water of condensation accumulating therein.

In testimony whereof I affix my signature.
CHARLES A. MOORE.

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