(No Model.) 2 Sheets—Sheet 1.

M. S. MILLARD.

REFRIGERATOR.

No. 348,855. Patented Sept. 7, 1886.

Fig. 1.

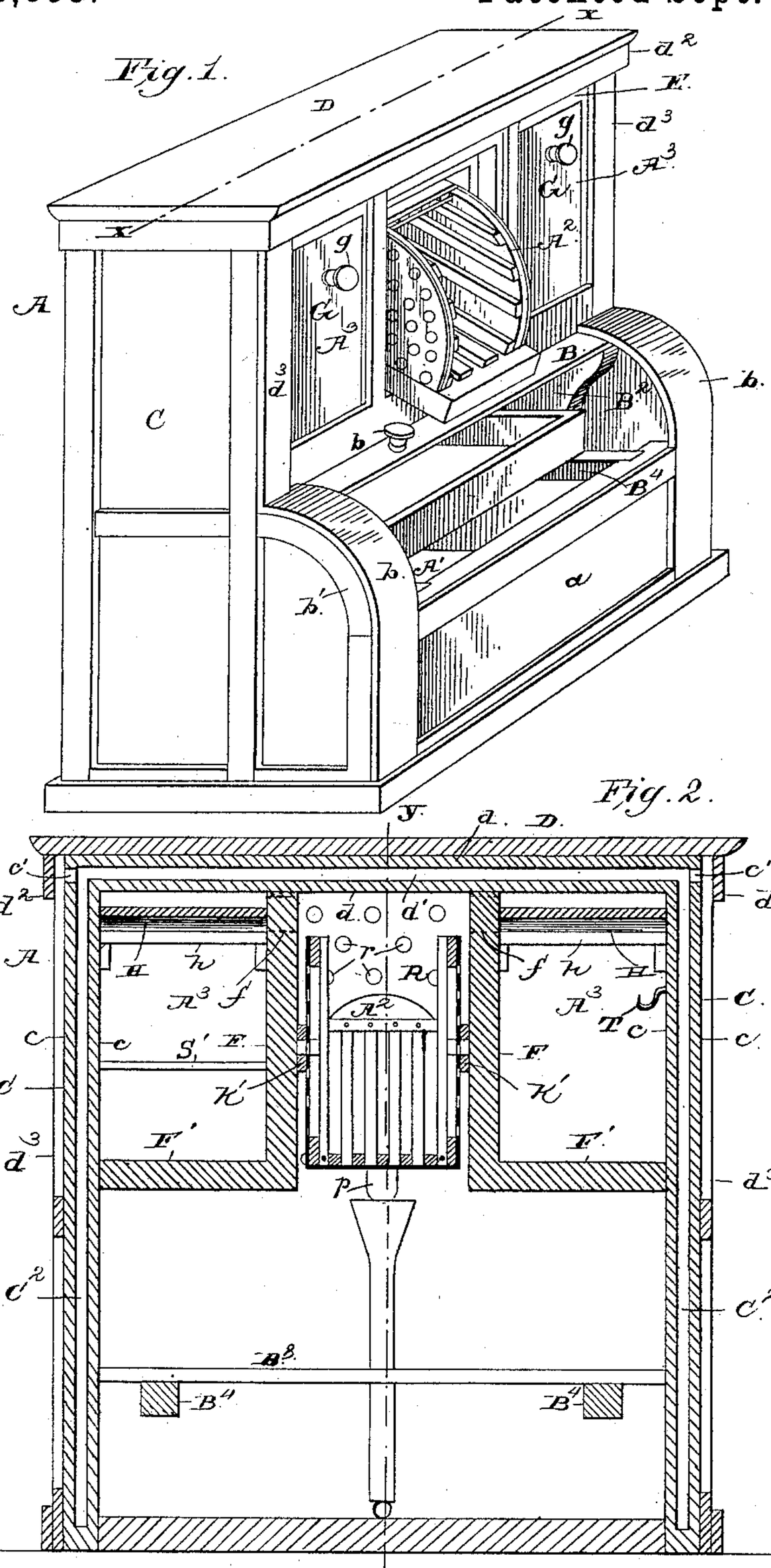

Fig. 2.

WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

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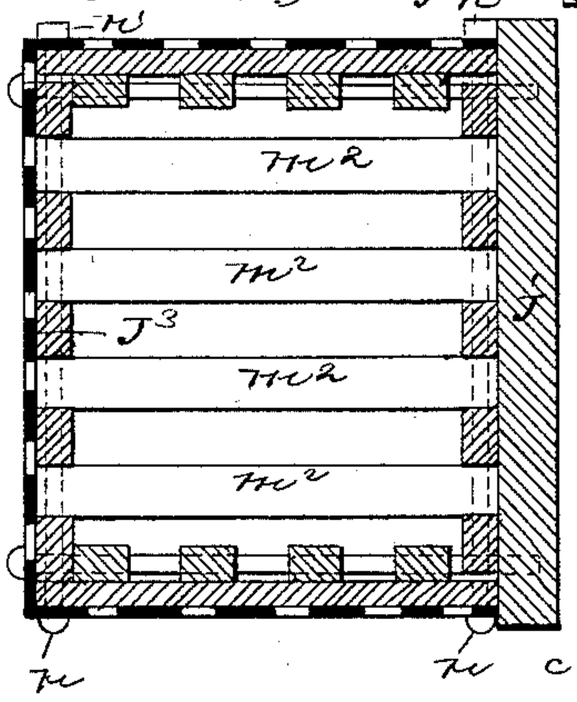
Fig. 7.



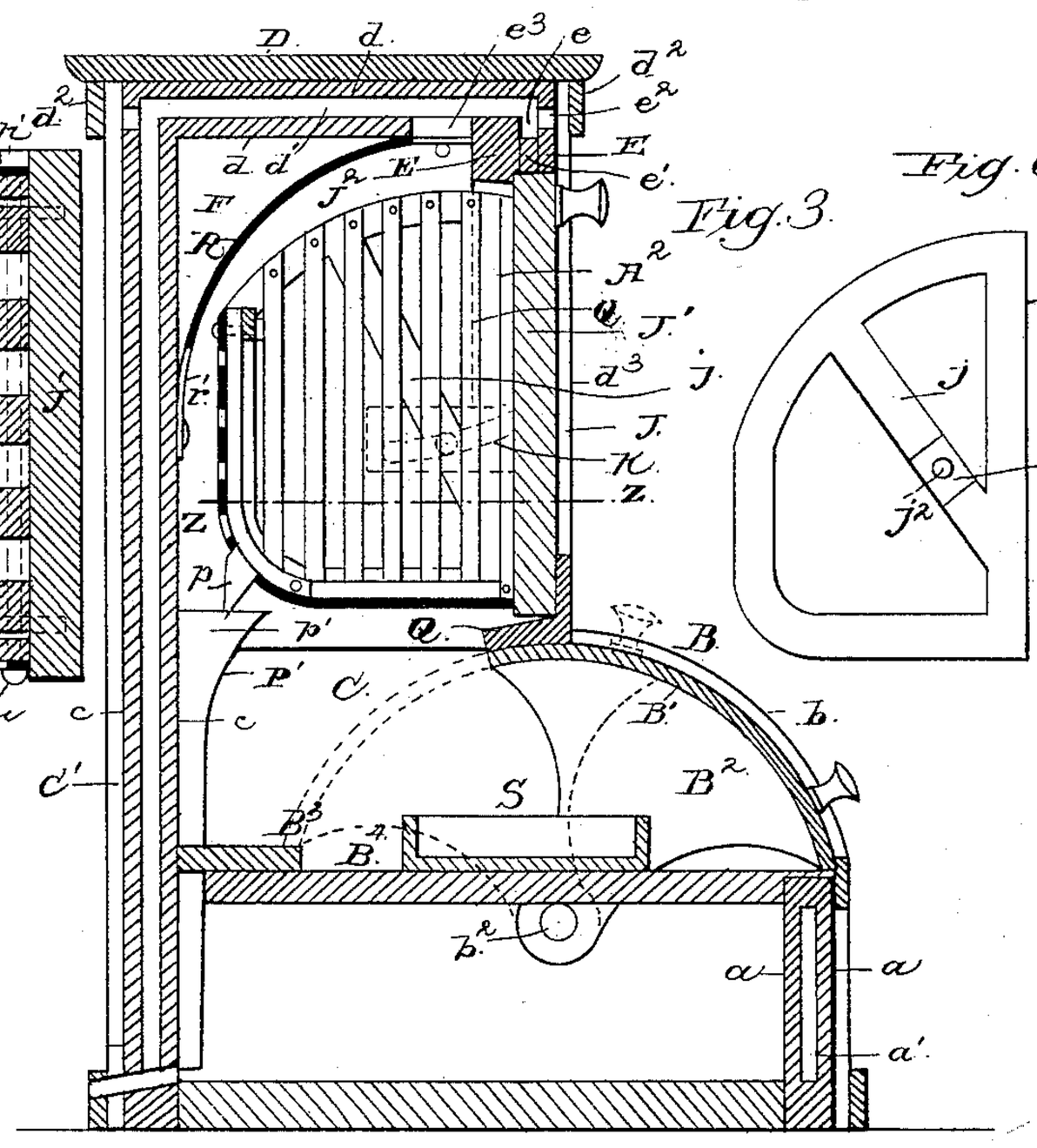


Fig. 6.

Fig. 3.

Fig. 4.

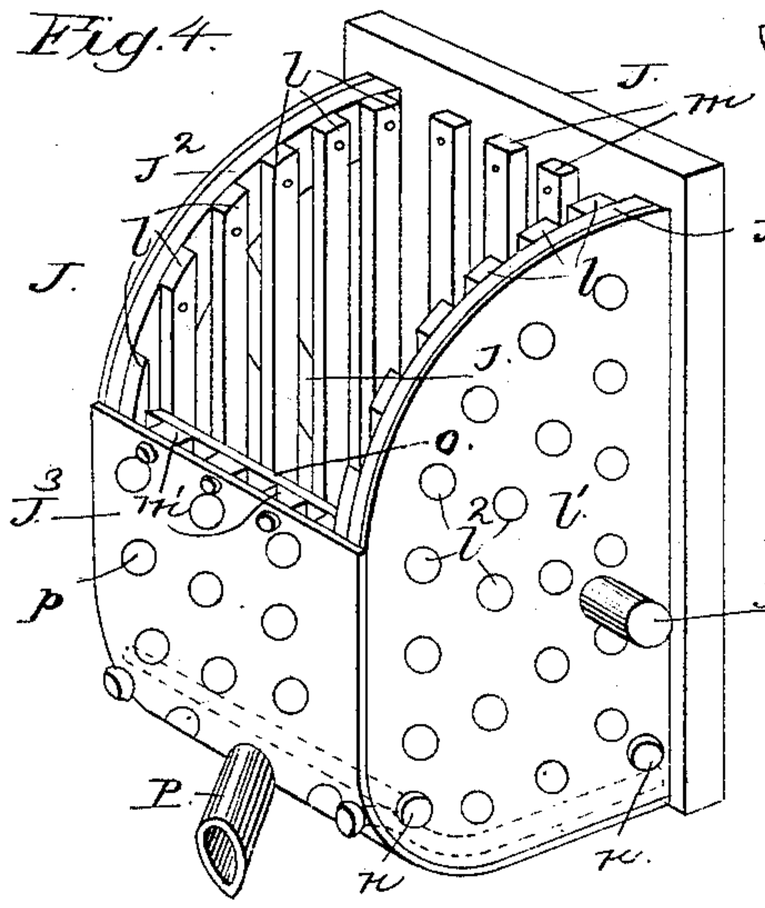
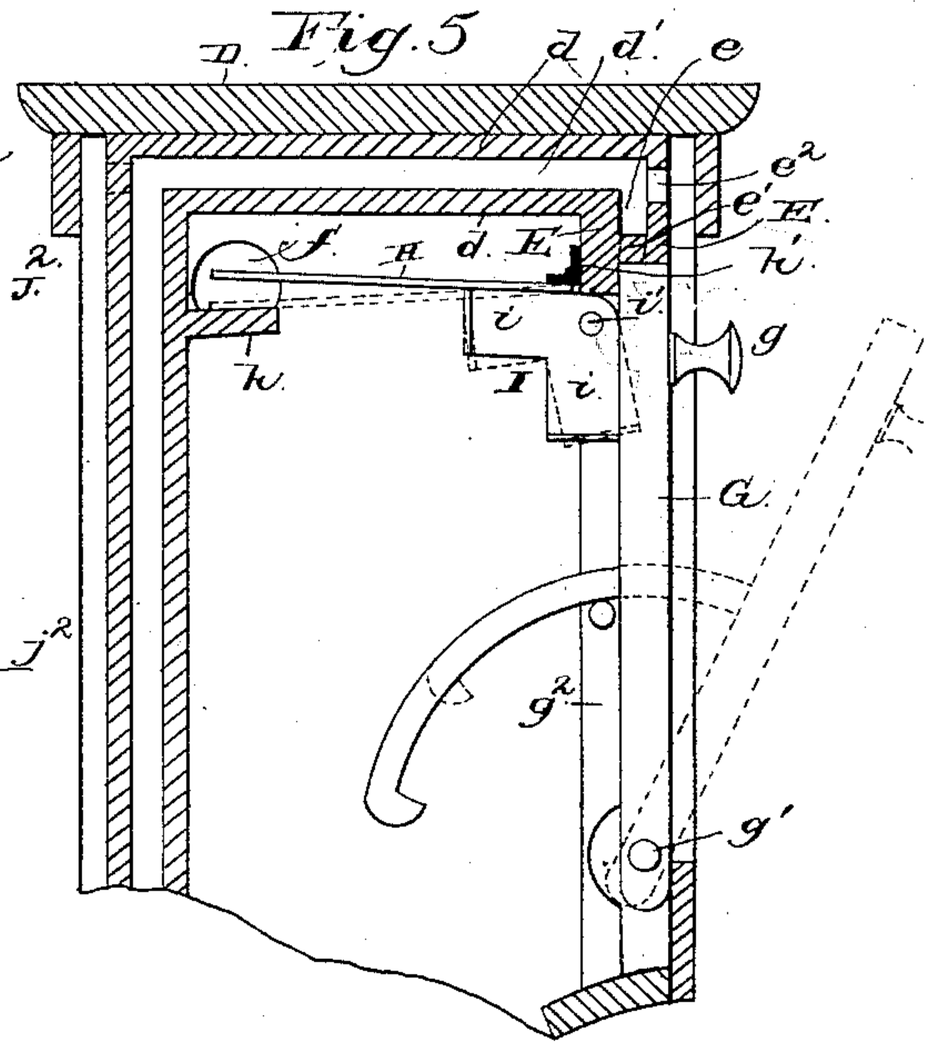


Fig. 5.



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UNITED STATES PATENT OFFICE.

MARTIN SANFORD MILLARD, OF KANSAS CITY, MISSOURI, ASSIGNOR TO WILLIAM H. H. TAINTER, OF SAME PLACE.

REFRIGERATOR.

SPECIFICATION forming part of Letters Patent No. 348,855, dated September 7, 1886.

Application filed July 24, 1885. Serial No. 172,578. (No model.)

To all whom it may concern:

Be it known that I, MARTIN SANFORD MILLARD, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented a new and useful Improvement in Refrigerators, of which the following is a specification, reference being had to the accompanying drawings.

My invention has relation to improvements in refrigerators; and the novelty consists in the construction, combination, and arrangement of the various parts for service, substantially as hereinafter fully set forth, and particularly pointed out in the claims.

My invention has for its object to provide for a constant circulation of warm air from the provision-chambers to the ice-chamber, where it is condensed and its place supplied by cold air; to provide for the automatic cutting off of the circulation of air to one or more of the provision-chambers when the doors thereof are opened, and to combine simplicity, strength, and durability of construction with effectiveness of operation.

In the drawings hereto annexed, and which form a part of this specification, Figure 1 is a perspective view of a refrigerator embodying my invention. Fig. 2 is a longitudinal section thereof on the line *x x* of Fig. 1. Fig. 3 is a cross-section on the line *y y* of Fig. 2 through the ice-chamber. Fig. 4 is a detail view of the removable pivoted ice-receptacle. Fig. 5 is a detail view of one of the upper provision-chambers, showing the means for automatically cutting off the circulation of air when the door thereof is opened. Fig. 6 is a detail side view of one of the side pieces of the removable ice-receptacle. Fig. 7 is a horizontal sectional view of the same.

Like letters of reference indicate like parts in all the figures of the drawings.

Referring to the drawings, A designates the refrigerator, preferably of cabinet form shown herein, and comprising a lower provision-chamber, A′, an ice-chamber, A^2, arranged above the provision-chamber A′, and two other provision-chambers, A^3 A^3, one arranged on each side of the ice-chamber A^2, and in the same plane thereof, above the lower provision-chamber, A′, the chamber A′ being of larger size than the chambers A^2 A^3 and extending beyond the same, as shown, and covered by a sliding door, B. The bottom or base board of the chamber A′ is solid and in one piece, while the side and rear vertical walls, C C C′, respectively, are made "double" or in two parts, *c c*, arranged parallel with and a short distance from each other to provide an intermediate non-conducting air-space, C^2, the upper ends of the outer side walls having air-vents *c′ c′* formed therein for the escape of heated air between the walls *c c*, as is obvious. The cap or cover D, arranged over the tops of the upper chambers, A^2 A^3, is also provided with double parallel walls *d d*, having an intermediate air-space, *d′*, between them, which communicates at the front end of the refrigerator with an air-space, *e*, formed by parallel strips or pieces E E, secured in any suitable manner to the vertical walls, said strips E having a closed bottom, *e′*, and a series of air-exit apertures, e^2, arranged near the upper edge of the exterior strip for the escape of heated air and any gases that may arise from the ice-chamber, with which the air-space of the top communicates by means of an opening, e^3, formed in the lower horizontal wall near the front end of the chamber A^2 and closed by a slide.

The cap or cover D may be finished in any suitable or preferred manner or design to suit the demands of the trade and purchaser, and cleats d^2 d^2 may be secured by nails or otherwise upon vertical strips d^3 d^3 to hide the air-exit apertures *c′* e^2 from view, while permitting of the escape of heated air or gases from the ice-chamber and intermediate air-spaces of the vertical and upper horizontal walls.

The front wall of the lower chamber, A′, comprises a vertical double-walled portion, *a a*, and an intermediate air-space, *a′*, and a curved sliding door, B, which is adapted to move between cleats *b b*, secured upon curved portions *b′* of the side walls, *c c*, the door B comprising a curved section, B′, which may be made of a series of longitudinal strips, and two end plates, B^2 B^2, reduced at their lower ends and pivoted to the side walls of the chamber, as at b^2. The front lower edge of the section B′ has handles or knobs b^3 for its convenient manipulation, and said edge is adapted to rest upon the upper sur-

face of the front wall, *a a*, when the door is closed; but when it is thrown open or slid back the rear edge of said door rests against a strip or cleat, B^3, arranged at the rear end of the chamber A′ against the rear wall thereof and in the plane of the upper edge of the walls *a a*. The cleat B^3 may be secured directly to the rear wall of the chamber A′, or upon transverse pieces B^4, arranged at each side of the chamber A′, and secured in any preferable manner upon the front and rear walls thereof. When the door of the provision-chamber A′ rests against the cleat B^3, the circulation of air from the said chamber to the upper ice-chamber is cut off, the door serving as an efficient slide or valve; but when it is closed against the admission of warm air to the said chamber A′ a current of hot air passes to the ice-chamber above, which is bottomless, and its place supplied by cold air, which has been cooled and condensed by contact with the ice in said chamber.

The air-space in the front, side, rear, and top walls of the refrigerator-case may be in communication with each other, or separated or insulated from each other, and may be lined with paper or any other suitable material to serve as a non-conductor for the cold air from the chambers.

The upper provision and ice chambers, A^2 A^2 A^3, are separated from each other by vertical transverse partitions F F, suitably held in position and arranged at proper distances from each other, the two side provision-chambers, A^2 A^2, each having a bottom wall, F′, which separates them from the lower provision-chamber, A′, while the middle ice-chamber, A^3, is bottomless and in communication with the said provision-chamber A′.

Each of the chambers A^2 has a door, G, having a knob or handle, *g*, at its upper end for convenient operation, and pivoted at its lower end by means of studs *g′ g′*, bearing in the partitions F and side walls of the refrigerator-case, the inner surface of the said door abutting at its edges against cleats g^2, secured upon the side and upper walls of each of said chambers near the front ends thereof.

Each partition F F is provided with an opening or air-inlet, *f*, at the rear upper edge thereof, by means of which warm air from the provision-chambers A^2 passes to the ice-chamber A^3, and is condensed or cooled therein, while its place in the provision-chambers is supplied by cold air.

H designates a valve arranged in the upper ends of each of the provision-chambers A^2, and extending from side to side and nearly the entire length thereof, said valves being pivoted at their front ends to the ceilings or roofs of the chambers, as at *h′*, and resting at their rear ends upon transverse partitions *h*, suitably secured in position upon the side walls of the chambers. Each partition abuts against the rear wall of the provision-chamber, and extends forward therein to a point beyond the air-opening *f* in the partitions F, thus serving, in connection with the hinged-valve H, to effectually cut off the circulation of air between the provision and ice chambers when the rear end of the valve rests thereon. The valve is automatically opened when the door of its chamber is closed to maintain a circulation by being elevated at its rear end by the action of a lever, I, said lever being operated by the inner surface of the door coming in contact with one of the arms thereof. The lever I has two arms, *i i*, arranged at right angles to each other, and at their junction they are pivoted to the partition F, near the upper end, and at the front thereof, as at *i′*, the vertical arm thereof being operated upon by the door coming in contact therewith, which forces the horizontal arm against the lower surface of the valve H, and elevates the same a proper distance at its rear end, to allow a current of warm air to pass to the ice-chamber from the provision-chamber through the openings *f* in the partitions F.

J designates the ice-receptacle, removably pivoted in the side walls of the ice-chamber A^3, and constructed as presently described. The receptacle J comprises a front vertical wall, J′, two curved side walls, J^2 J^2, secured to the front wall in any preferable manner, and a bottom and rear vertical wall, J^3. The side walls, J^2 J^2, are curved on their top and rear edges, as shown, and are each cut away to provide a transverse inclined bar, *j*, on the exterior face of which is secured, in a recessed portion therein, a plate, *j′*, carrying a stud or lug, j^2, which forms the pivots for the receptacle, and which bear in the forward inner ends of the slots K K, formed in cleats K′, secured at the proper height within the chamber A^3, on the side walls thereof. The side walls of the receptacle J are provided with a series of vertical strips or cleats, *l l*, arranged a short distance from each other, and said side walls are further provided with a covering or layer of sheet metal, *l′*, secured on the exterior face thereof, outside of and next to the side walls, said covering having a series of perforations or apertures, l^2, for the passage of the cold air from the ice contained in said receptacle. The front and rear walls of the receptacle are also provided with a series of vertical strips or slats, *m m′*, respectively, while the bottom wall of the receptacle is provided with a series of horizontal strips, m^2, arranged intermediately between the lower ends of the vertical strips *l*. The lower ends of the vertical strips *l* of the side walls and the ends of the horizontal intermediately-arranged strips m^2 are bolted together at each side by means of through bolts or rods *n*, having nuts *n′*, while the lower ends of the vertical strips of the front and rear walls of the receptacle are similarly bolted together by bolts or rods. The upper ends of the vertical strips of the two side and front walls are secured against the inner face thereof by screws, nails, or in any other suitable manner, while the upper ends of the series of slats of the rear wall are

bolted to the rear wall, and a supplemental strip, O, arranged on the inner face of the upper ends of the strips, and secured in the side walls of the receptacle. The bottom and rear wall of the receptacle J are preferably formed of sheet metal—for instance, zinc—and at its side edges said sheet of metal is soldered or otherwise secured to the edges of the sheet-metal covering l' of the side walls of the ice-receptacle, the rear wall of said vessel being perforated, as at p, for the passage of air to the ice-chamber. At the rear end of the bottom of the vessel or receptacle J is provided a short tube or nozzle, P, adapted to convey and discharge the water from the receptacle caused by melting of the ice into an exit discharge-pipe, P′, having a flaring or enlarged mouth, p', and secured near the middle of the rear wall of the chamber A′, and discharge the water into a vessel placed beneath the end thereof, as is obvious.

R designates a cover to the ice-receptacle, curved, as shown, and arranged within the ice-chamber A^3, at the upper rear corner thereof, in juxtaposition to the upper edges of the receptacle when in proper position in the ice-chamber, said cover being formed from a plate of sheet metal having a series of perforations, r, and lugs r' at its lower end for securing the device in position upon the rear wall. At its front end the plate is secured, by any preferable means, upon the roof of the chamber A^3, thus bringing the said plate between the air-apertures f in the partitions F F and the pivoted ice-receptacle, causing the incoming current of warm air from the provision-chambers to be deflected downward.

Q designates vertical and horizontal cleats secured upon the side walls and roof of the ice-chamber, near the front edges thereof, and against which the inner edges of the receptacle J fit when in its closed position to form a tight joint.

The lower provision-chamber, A′, may be provided with a tray or receptacle, S, adapted to rest or slide on the cross-bars B^4, and may be also provided with racks or other means for supporting vessels or vegetables. One of the upper side provision-chambers is provided with one, two, or more racks or removable shelves, S′, for the reception of butter, cooked dishes of vegetables, &c., while the other chamber may have hooks T, on which meats and the like may be suspended.

The operation of my invention is as follows: The pivoted ice-receptacle is revolved or turned on its bearings to bring it to a horizontal position, when it is slid out of engagement with its supporting-cleats and removed from the chambers A^3. The ice is then placed in the receptacle, which is then replaced in the chamber A^3, as before, the lugs or pins j^2 bearing in the slots of the cleats K, or the ice may be placed in the receptacle while in its horizontal position. After the receptacle has been provided with the necessary quantity of ice or refrigerant, it is brought to its closed vertical position, and the warm air from the provision-chambers coming in contact therewith is cooled and condensed and takes the place vacated by the warm air of the chambers, thus maintaining a constant circulation throughout the entire device when the doors thereof are closed. When it is desired to remove or place a dish, vessel, or other article in the device, the door of the chamber in which it is desired to place the article is opened, admitting the warm heated outside air of the room to the chamber or compartment. Immediately upon opening the door of one of the upper chambers the hinged valve H drops into position on the partition h by gravity, and effectually prevents the warm air admitted to the chamber from the room from passing into the ice or cooling chamber, the dropping of the valve being permitted by the withdrawal of its supporting-lever I, occasioned by opening the door and permitting the weight of the valve to force the arms thereof forward. When the door is closed, the lever I is forced upward against the valve and elevates the same from engagement with its seat, thus re-establishing a circulation. When the door or lid B to the lower provision-chamber is opened, it is forced backward until its rear edge rests upon the cleat or bar B^3, thus cutting off communication between the ice and provision chambers A^3 A′, the upper front edge of said lid fitting snugly against a strip or cleat, T′, secured upon the face of the device just below the combustion-chambers.

It will be observed that by constructing the ice-receptacle as hereinbefore described it resembles a basket somewhat, the spaces and interstices formed therein by the slats and sheet-metal coverings admitting of the free entrance of the air to and escape from contact with the refrigerant or ice in said chamber, and allowing a constant circulation therein; and, further, that the ice-receptacle can be readily cleansed or washed by bringing it to a horizontal position, as is obvious.

One or more of the chambers can be cut off from communication with the cooling-chamber A^3 without affecting the communication between the remaining chamber or chambers and the cooling-chamber in the slightest degree, the operation of shutting off the circulation being accomplished simultaneously with opening the door of one of the chambers.

The gases and other foul air arising from the articles in the refrigerator chambers or compartments are carried with the outflowing current of air to the cooling or ice chamber A^3, and escape therefrom into the cap or cover D through the opening therein, from whence they pass into the outer air through the air-exit apertures e^2. The air in the chambers or spaces between the double walls of the refrigerator-case becomes warm after a time by contact with the exterior wall, and rises and escapes from the chamber through the apertures c' at the top.

I attach special importance to the ice-recep-

tacle having the perforated shields or lining on its inner walls, for the reason that when the current of warm air from the provision-chambers comes in contact with said shields or linings it is cooled or condensed in a slight degree, and is forced or thrown back by contact therewith, and is met by a counter-current of cold air flowing from said ice-receptacle through the perforations and interstices therein. The currents of warm and cold air are intermingled and produce a current of dry cold air, which is passed into the chambers and serves to preserve the articles placed therein in a good and wholesome condition. By causing the currents of warm air to reverberate or be thrown back by contact with the lining or shield of the receptacle they are more thoroughly commingled with the particles of cold air, and a great saving of ice is secured, inasmuch as the current of warm air does not come in contact directly with the ice, but only after it has been cooled to a great degree by commingling with the current of cold air.

Each of the doors to the provision-chamber is provided with an arm or segment, U, pivotally connected thereto, and sliding through an aperture formed in one of the stop-cleats, the rear end of the segment having a lug or stop adapted to fit against the said cleats when the door is opened.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a refrigerator, the combination, with the condensing-chamber, of an ice-receptacle pivotally suspended in said chamber, and having a series of slats on which the refrigerant is adapted to rest, substantially as and for the purpose described.

2. In a refrigerator, the combination, with a condensing-chamber, of an ice-receptacle pivotally suspended in said chamber, and having skeleton side walls, perforated rear wall, and side plates, and a series of slats bolted together and adapted to receive the refrigerant and maintain a free circulation of air around the same, substantially as and for the purpose described.

3. In a refrigerator, a pivoted ice-receptacle having slats on which the refrigerant is placed, and a perforated metallic sheath arranged exteriorly to the slats, substantially as described.

4. In a refrigerator, a suspended pivoted ice-receptacle having a series of spaced-apart slats bolted together, and a perforated sheath arranged exteriorally to the slats and secured thereto, substantially as described.

5. In a refrigerator, an ice-receptacle comprising open side walls, a series of vertical spaced-apart slats at its sides, bottom, and rear walls thereof, and bolted together, and a perforated metallic sheath secured to the slats on the outer faces thereof, substantially as described.

6. In a refrigerator, the combination, with a condensing-chamber, the lower provision-chamber having an escape-pipe, p', and an ice-receptacle pivoted to the condensing-chamber, and having a nozzle adapted to register and conduct waste-water from the ice-receptacle to the escape-pipe when the receptacle is in its closed position, substantially as described.

7. In a refrigerator, the combination of a condensing-chamber, one or more provision-chambers in communication therewith, an ice-receptacle having a perforated sheath arranged in the condensing-chamber, and a deflecting-shield arranged between the ice-receptacle and port between the condensing and provision chamber or chambers, substantially as described.

8. In a refrigerator, the combination of a condensing or cooling chamber, an ice-receptacle pivotally suspended therein, one or more provision-chambers divided from condensing-chamber by a vertical partition or partitions, F, having ports f, to establish communication between the said provision and condensing chambers, a valve pivoted at one end and having a seat at its opposite end, and a pivoted lever adapted to be operated by the door of the provision-chamber to open and close the valve, substantially as described.

9. In a refrigerator having the condensing and provision chambers in communication with each other, the combination of a removable ice-receptacle having the spaced-apart slats and perforated sheath, said receptacle being pivoted in the condensing-chamber and adapted to be turned to a horizontal position for cleansing or putting the refrigerator therein, substantially as described.

10. In a refrigerator, the combination of a condensing or cooling chamber, a provision-chamber divided from the condensing-chamber by a partition having a port, f, a seat, h, arranged below the said port transversely within the provision-chamber, a gravitating valve, H, pivoted at one end near the door of the provision-chamber and normally resting at its free end on the seat h, and thereby cutting off communication between the provision and condensing chambers, and a pivoted lever adapted to be actuated by the door of the provision-chamber to move the valve, as set forth.

11. In a refrigerator, the combination of a condensing or cooling chamber, one or more provision-chambers arranged in the plane of and isolated from the said condensing-chamber by vertical partition or partitions, each having a port, f, in communication at all times with the condensing-chamber, a seat, h, arranged beneath the port of each chamber transversely across the latter, a valve, H, pivoted at its outer end near the door of the provision-chamber, and arranged in a horizontal plane in the upper part of said chamber, and a right-angled pivoted lever, I, arranged to act upon the pivoted end of the valve to hold the latter elevated out of contact with its seat when the door of the provision-chamber is closed, and when the door is opened to allow the valve to

close by gravity and rest on its seat, substantially as described.

12. A refrigerator provided with the double walls, having an intermediate non-conducting air-space provided with ports, a hollow cap, D, having an air-space, and an opening, e^3, which opens communication between said air-space and the condensing-chamber of the refrigerator, said cap having an outlet, e^2, at one end, and a valve arranged to close the opening e^3 between the air-space of the cap and the condensing-chamber, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

MARTIN SANFORD MILLARD.

Witnesses:

EDW. G. SIGGERS,

WM. N. MOORE.