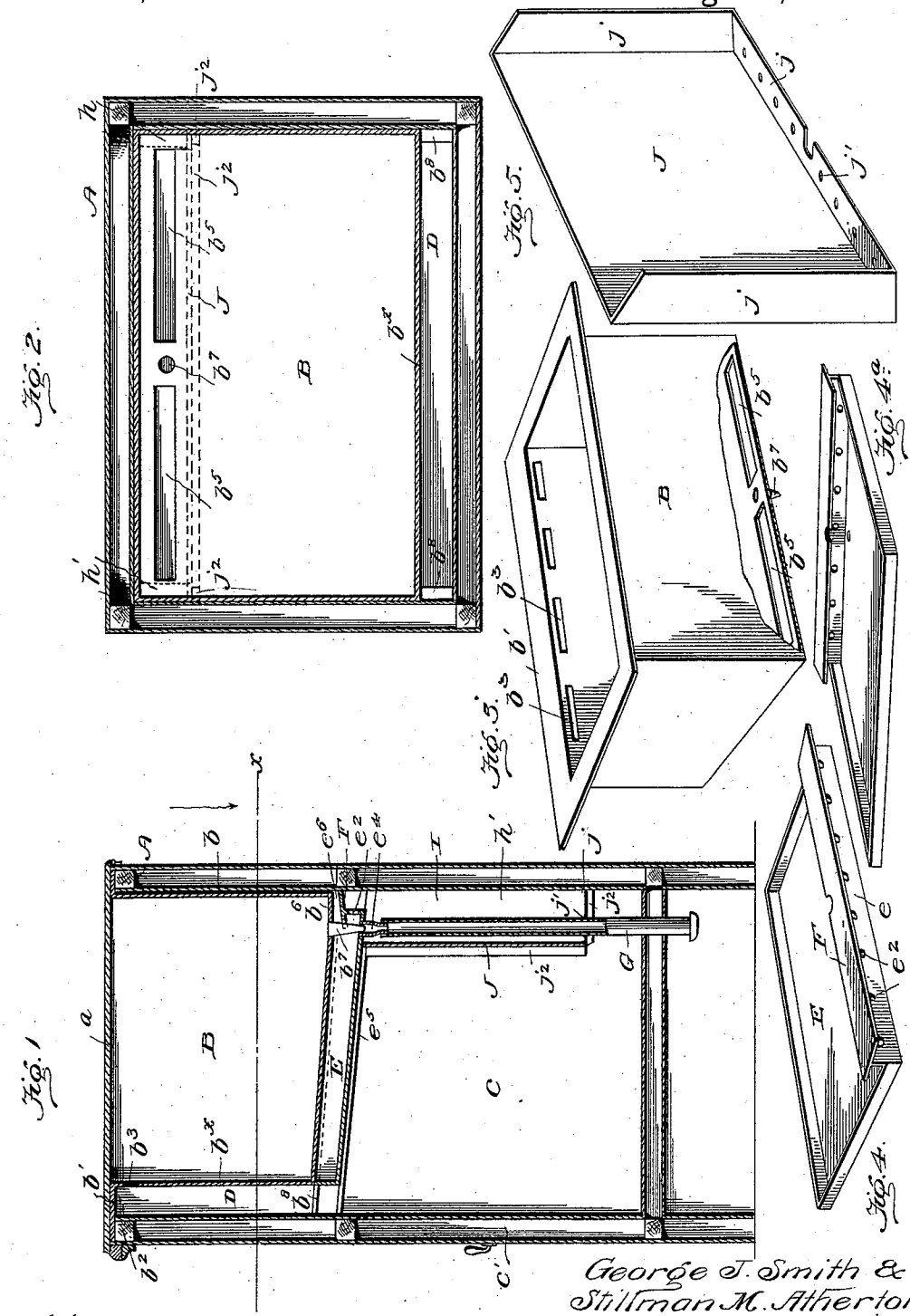
(No Model.) 2 Sheets—Sheet 1.

G. J. SMITH & S. M. ATHERTON.

CLEANABLE REFRIGERATOR.

No. 588,664. Patented Aug. 24, 1897.



Witnesses
W. C. Dashiell
J. Mothershead

George J. Smith &
Stillman M. Atherton.
Inventors.
By Edson Bros,
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 6.

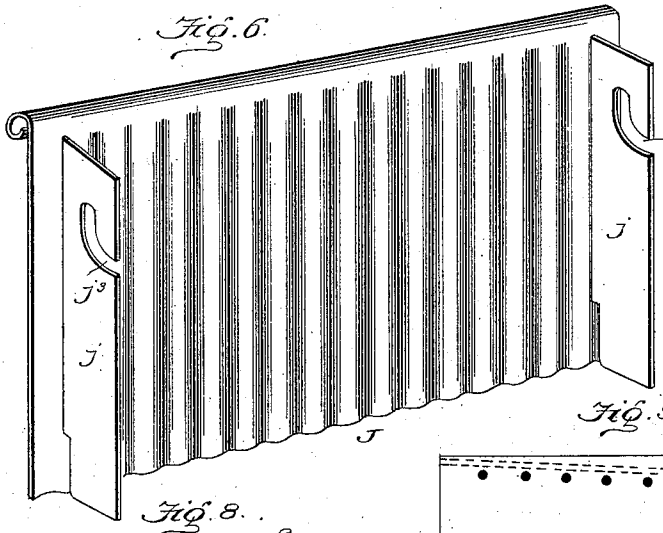


Fig. 7.

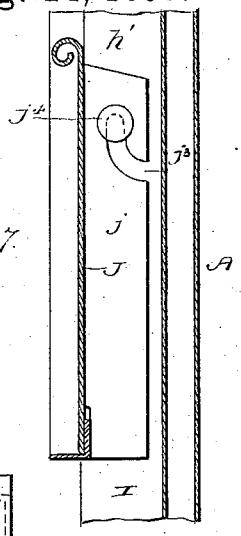


Fig. 9.

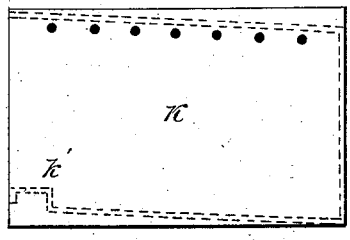


Fig. 8.

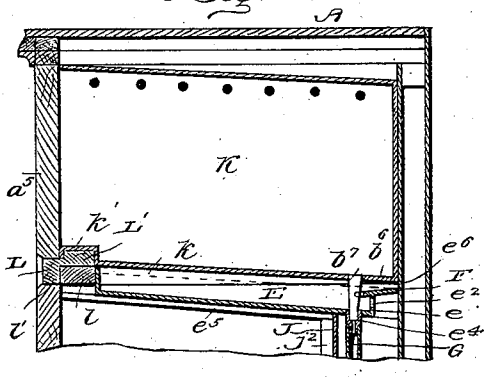
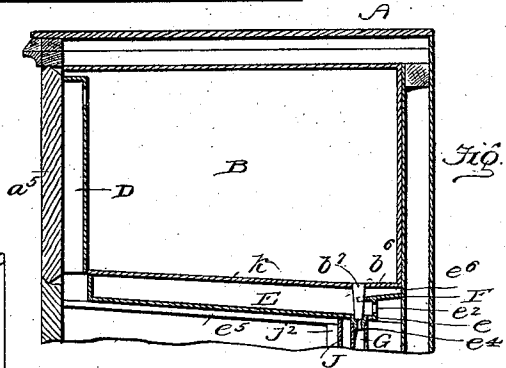


Fig. 8a.



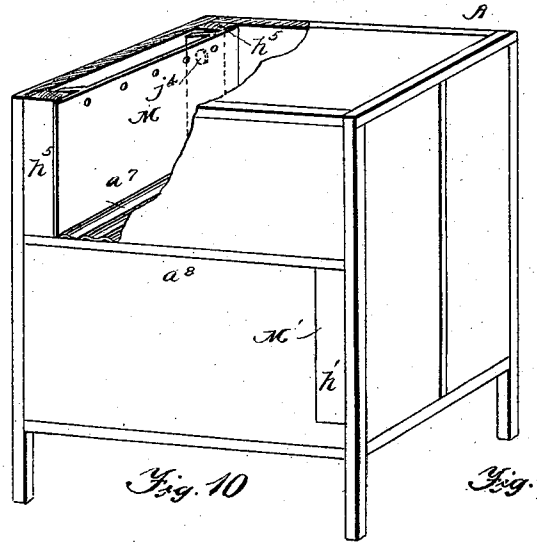
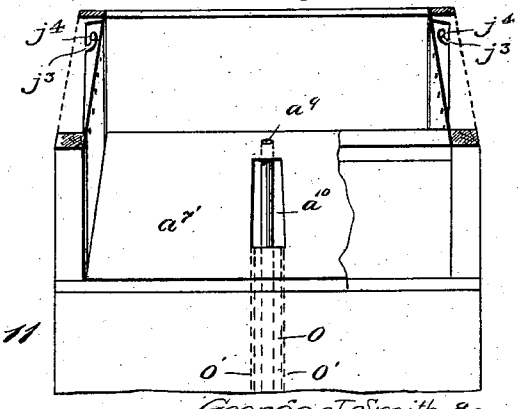


Fig. 10.

Fig. 11.



Witnesses:
Wm. E. Cashine
J. P. Mothershead.

George J. Smith &
Stillman M. Atherton.
Inventors
By Edson Bros.
Atty's

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

GEORGE J. SMITH AND STILLMAN M. ATHERTON, OF BURLINGTON, VERMONT.

CLEANABLE REFRIGERATOR.

SPECIFICATION forming part of Letters Patent No. 588,664, dated August 24, 1897.

Application filed October 17, 1896. Serial No. 609,235. (No model.)

To all whom it may concern:

Be it known that we, GEORGE J. SMITH and STILLMAN M. ATHERTON, citizens of the United States, residing at Burlington, in the county of Chittenden and State of Vermont, have invented certain new and useful Improvements in Cleanable Refrigerators; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to improvements in refrigerators in which the elements are so constructed and combined as to secure the essential features of a positive circulation of air between the ice and provision chambers and the removability of the various parts in an easy and expeditious manner for the purpose of cleaning them thoroughly.

Various devices have heretofore been adopted to meet the demand for cleanable refrigerators, the majority of which are objectionable from a practical standpoint because of the lack of positive circulation of air between the ice and provision chambers, which feature of positive circulation experience has shown to be necessary for the proper preservation of perishable articles. Some of the prior devices employ a metal ice-tank set in the top of an open casing, but they are minus circulating-flues to secure the proper circulation of air over and in contact with the ice and to conduct the cold air to the bottom of the provision-chamber. Such ice-tanks have no bottom, the ice resting on a rack attached to sides of the tank, or the bottom of the ice-tank has openings through which the cold air falls into the provision-chamber, thus displacing the warm air from the last-mentioned chamber and creating an upward current of air laden with odors by reason of the contact of air with perishable substances in the provision-chamber. The upward currents of warm air strike the cold walls of the ice-tank, and thus moisture and impurities are condensed on the tank instead of the warm-air currents striking the ice to have the impurities condensed by contact with the ice and being carried off with the water resulting from melting of the ice. The condensation of moisture and impurities on the cold walls of the ice-tank in some types of refrigerators renders it necessary to employ two pans under the ice-tank, one of which pans catches the water resulting from condensation of moisture on the tank-walls and the other tray catches and carries off the ordinary waste water from the ice.

It is desirable in refrigerators to secure a positive circulation of air by the employment of flues or ducts, the cold air passing from the ice-chamber into a flue which conducts it to the bottom of the provision-chamber, while the warm currents bearing the odors from perishable matter in the provision-chamber should be carried upward through and by a separate flue arranged to discharge the warm laden or charged currents, so that they impinge directly upon the ice, which, being the coldest object, naturally attracts and condenses such objectionable matters in the warm currents and causes the objectionable matter to pass, with the ice-meltings, out of the refrigerator.

The object that we have in view in the present invention is to provide a simple and inexpensive construction in which the necessary positive circulation of air and removability of flues, tray, and ice-tank are attained in a satisfactory manner.

A further object of our invention is to provide for rigid locking or fastening of parts in position within the casing, to enable them to be taken out and replaced without manipulating troublesome fasteners, and to discharge the water resulting from ice-meltings in a simple manner.

Our invention consists in improvements in refrigerators using a casing or inclosure having an ice-chamber in its upper part and a provision-chamber in its lower part, a warm-air flue or flues situated in the horizontal plane of the ice-chamber, at the side or front thereof, and having its lower end connected with the provision-chamber and its upper end opening into the ice-chamber, and a cold-air flue situated below the ice-chamber and in the horizontal plane of said provision-chamber, said cold-air flue connected at its upper end with the ice-chamber at a point on the opposite side thereof from where the warm-air flue discharges to the ice-chamber and the

lower end of said cold-air flue being open or provided with ports to discharge cold air into the bottom part of the provision-chamber.

One of our improvements consists in the cold-air flue, which is formed by a plate that is secured in place removably within the refrigerator-casing to enable it to be taken out for cleaning the same, and as the means for holding said cold-air flue in place we make it in the form of a flat or corrugated plate having flanges at its sides, which flanges fit between cleats or posts and are provided with irregularly-formed slots adapted to receive headed studs or pins attached to the cleats or posts, whereby the metallic flue-plate may be slipped into place and locked by the pins or slipped out of position, and the cleats or posts serve to grip and assist in holding the flue-plate steadily and firmly in position.

Our invention may be embodied in different forms in various styles of refrigerators, such as those which employ a removable ice-tank in the upper part of the refrigerator-casing and with the top thereof hinged so as to fold upward and backward to expose the ice tank and chamber, but it may also be embodied in refrigerators which use an ice-tank open at the front and a front door in the casing, as well as in refrigerators which have simply an ice-chamber without a tank and in refrigerators which employ a central cold-air flue in connection with a tankless ice-chamber with warm-air flues at the sides.

We prefer to embody our improvements in connection with an ice-tank which is placed and held in the upper part of the casing, so that one of the walls of the ice-tank leaves a space between itself and the refrigerator-casing to constitute the warm-air flue, and in connection with this tank we provide a closed pan or tray which is situated below the tank and is provided at one end or side with a vertical flange and with an inclined shelf or ledge on the flange, said pan or tray arranged with relation to the bottom of the tank to leave a space between the tank and tray, which space or chamber is closed all around, except to the passage of cold air from the tank to the down cold-air flue, for the purpose of forming a shield against the upward current of warm moisture-laden air from the provision-chamber, and thereby preventing said warm current from striking the bottom of the cold tank and being condensed thereon, as well as to assist in conducting the cold purified air falling from the ice-tank to the lower circulating-flue.

The invention further consists in the novel combination of devices and in the construction and arrangement of parts, which will be hereinafter fully described and claimed.

To enable others to understand our invention, we have illustrated the same in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a sectional elevation, taken from front to rear, through a refrigerator having a foldable hinged top, an ice-tank, drip tray or pan, and flues, as contemplated by our invention. Fig. 2 is a horizontal sectional view showing parts in plan on the plane indicated by the dotted line $x\,x$ of Fig. 1. Fig. 3 is a perspective view of the ice-tank removed from the refrigerator of Fig. 1. Figs. 4 and 4^a are perspective views of the drip tray or pan. Fig. 5 is a detail perspective view of one type of the removable flue-plate. Figs. 6 and 7 are a perspective view and a sectional elevation, respectively, illustrating our preferred form of flue-plate and the means for fastening the same in place. Figs. 8, 8^a, and 9 are views in sectional elevation and detail elevation, respectively, of a refrigerator with an ice-tank open at the front to permit ice to be introduced through a door in the front wall of the casing. Fig. 10 is a perspective view, partly in section, showing the removable flue-plates for the warm and cold air flues in connection with a circulating-refrigerator having an ice-chamber without an ice-tank. Fig. 11 is a view similar to Fig. 10 of a refrigerator with warm-air flues at two sides thereof and a central cold-air flue.

Like letters of reference denote corresponding parts in all the figures of the drawings.

We will first describe our invention in its preferred embodiment as illustrated by Figs. 1 to 7, inclusive, of the drawings, referring to which A designates the casing of the refrigerator, which may be of the ordinary or any preferred construction suited to the purpose.

The type of casing shown in Fig. 1 has a hinged lid or cover a, arranged to open upwardly and backwardly to expose the ice-chamber b and the ice-tank B therein, while in the lower front part of the casing are the usual doors c', which provide for ready access to the provision-chamber c. The ice-tank B is a metallic structure. (Shown by Fig. 3 of the drawings.) It is simply a box open at the top and provided with a continuous horizontal flange b' around its top edge. Said flange b' around its top edge is designed to rest upon a ledge b^2 in the casing A to assist in holding it in place, and the tank is so shaped and proportioned that three of its walls fit snugly up to or against the casing-walls, but the other wall $b^\times$ is arranged to lie a short distance away from the casing-wall adjacent thereto, thus forming a flue D between the front walls of the casing and ice-tank, (see Fig. 1,) through which flue the ascending currents of warm air pass from the provision-chamber c to the ice-tank. This front wall $b^\times$ of the ice-tank has near or at its top edge a series of holes or slots b^3 to permit the warm-air current to pass from the flue D into the upper part of the ice-tank chamber, and said tank is also provided with cold-air-eduction ports b^5, formed by holes or slots in the bottom of the tank, near the rear side thereof, whereby the warm-air current laden with odors from the provision-chamber is conducted by the flue D up to the upper part of the ice-tank, caused to impinge upon the ice in said tank

and be condensed by contact with the ice and have its impurities attracted by and condensed on the ice, and from thence permitted to escape through the ports b^5 on the opposite side of the ice-tank from whence it entered said tank.

The ice-tank has its bottom made sloping or inclined from its front to a line near the back thereof, and from the line where the slope terminates to the back of the tank the bottom is horizontal, as at b^6. To the horizontal part b^6 of the bottom is attached a short drip-tube b^7, into which flows the ice-meltings and impurities condensed by the ice. Said ice-tank rests upon and is partly supported by cleats and partly suspended by its top flange in the casing A, and a cleat or cleats b^8 is provided on the sides of the casing to impinge against the front wall of the ice-tank for the purpose of wedging said tank when it it is placed in position toward the rear of the casing, thereby effecting the warm-air flue D in the refrigerator.

It will be noticed that the ice-tank may be easily lifted out of the casing A for the purpose of cleaning the tank thoroughly by washing the same, after which the tank may be dropped back into place.

E is the pan or tray, which is placed below the ice-tank in a position to shield the bottom of the ice-tank from contact with the ascending current of warm air from the provision-chamber and prevent the condensation of moisture on the bottom of the tank, but this tray is so constructed that while it shields the ice-tank it does not in any way interfere with the descent of the cold air from the ice-tank to the cold-air flue in the provision-chamber. The pan or tray is a shallow metallic structure with an inclined bottom and a surrounding upright flange, as shown by Figs. 4 and 4^a, and at the rear edge of the tray the flange e serves as a means for supporting the shelf or baffle-plate F, which is inclined in a reverse direction to the inclination of the tray-bottom and extends forward and backward beyond the flange e in order to make it deflect and throw into the tray any drip-water that may through any contingency escape through the air-ports in the bottom of the ice-tank or to throw into the tray moisture which accumulates on the baffle-plate. This baffle-plate lies close to but not in contact with the bottom of the ice-tank to leave an opening or space e^6, and it lies near the places where the cold-air ports b^5 are formed in the tank, and said baffle-plate prevents the contingency of drip-water and moisture escaping into the cold-air flue in the provision-chamber, but at the same time it does not interfere with the passage of cold air from the ice-tank to said provision-chamber cold-air flue, because egress-ports e^2 for the cold air are provided in the flange e above the bottom of the pan or tray. Said tray has a waste-pipe connection e^4, which communicates with the waste-pipe G, that passes down through and out of the casing, to which casing the waste-pipe G may be attached in any suitable way, and the waste connection b^6 from the ice-tank discharges to the waste-pipe e^4 in a manner not to interfere with the free escape of the drip-water from the tray E to the waste connection e^4 to the pipe G.

The shallow tray which serves to shield the bottom of the metallic ice-tank against the warm odor-laden current of air may be set between the cleats b^8, which support the ice-tank, or said cleats may be made removable for the purpose of withdrawing them when it is desired to remove the shallow tray.

At the rear of the provision-chamber c we erect the posts or cleats $h\,h'$, (shown by dotted lines in Fig. 2,) which lie close to or against the sides of the casing A, and these cleats or posts rise from the floor of the provision-compartment c to the bottom of the drip pan or tray E, so that said tray rests upon the posts and is partially supported thereby. Said tray also rests upon swages or cleats e^5, provided on the sides of the casing A in front of the posts $h\,h'$, and thus the tray is supported fixedly in the casing and in a manner to permit its removal and cleaning when the ice-tank is lifted out of the casing.

The vertical cold-air flue I is arranged in the rear of the provision-chamber transversely across the casing and in the same horizontal plane as said provision-chamber, the upper end of said flue being open and communicating with the ice-tank through the ports b^5 and the ports e^2, while the lower end of said flue I is open or provided with egress-ports to admit of the passage of cold air to the bottom part of the provision-chamber. This cold-air flue I is formed by arranging the flue-plate J adjacent to and parallel with the rear wall of the casing A, so as to form the flue-space between said baffle-plate and casing-wall.

The flue-plate J may be simply a flat plate flanged at its two sides and lower end, as shown at j, or it may be a corrugated plate having the flanges j at its sides only, the bottom edge of said plate being free, while the top edge has an outward roll or flange, as shown in Fig. 6. In case the bottom edge of the flue-plate is flanged we provide egress-ports j' for the passage of cold air. By providing the flue-plate with flanges the strength and durability of the plate are increased, and the flanges serve as a means for fastening the flue-plate in position, because the plate and flanges are formed to fit snugly or tightly between the posts or cleats $h\,h'$, whereby the cleats serve the twofold purpose of holding the tray or pan E and the flue-plate J.

The flanged flue-plate may be forced between the posts and be held in place thereby and by the assistance of cleats j^2 at the front and bottom side of said plate, which cleats j^2 are indicated in Fig. 1 of the drawings, and they may be attached removably to the sides of the casing, but we prefer to provide means

for positively locking the flue-plate in place, as shown by Figs. 6 and 7. In this embodiment of our invention we provide the vertical offstanding flanges j of the flue-plate with the slots j^3, which open through the rear edge of the flanges and which curve upwardly and forwardly toward the flue-plate, and these slots are adaped to receive the pins or studs j^4 j^4, which are fastened to the inner opposing faces of the cleats or posts h h' at suitable points to enter the slots when the flanged flue-plate is adjusted between the cleats or posts h h'.

The pins or studs j^4 are headed, as shown, and they serve to draw or wedge the slotted flanges inward when the flue-plate is adjusted, so that the plate is drawn close up to the posts h h' and is sustained rigidly in place, the headed studs preventing any sidewise deflection of the flanges. It will be observed that the flue-plate is removable easily from the posts h h' by simply lifting it up and forward to withdraw the flanges from the studs and that the flue-plate is locked in place when in the act of adjusting it between the posts.

In the embodiment of our invention shown by Figs. 8 and 9 the top of the casing A is permanent and fixed, while the front of said casing has in addition to the doors to the provision-chamber a doorway and door a^5 to permit access to the ice-chamber through the front upper part of the casing. To accommodate an ice-tank to a casing of this style, we provide a novel form of ice-tank K, in which the top, bottom, sides, and rear are closed; but its front end adjacent to the front door is open, as shown. In this type of ice-tank with an open front end provision for the warm-air flue D can be made in either of two ways. In one embodiment of a tank of this style we construct the tank somewhat less in width than the width of the casing, so that when the tank is fitted in the casing it will leave spaces between its side walls and the casing, as will be readily understood by those skilled in the art, which spaces serve the purpose of warm-air flues to conduct the warm air from the provision-compartment to the tank in the same manner as the flue D in the construction shown by Figs. 1 and 2. This open-front tank is perforated near its top edge to provide for the passage of warm air from said flues into the tank, and the bottom of said tank rests upon the side rails k, (shown by dotted lines in Fig. 8,) or we may provide the warm-air flue on the inner side of the front door, as shown in Fig. 8^a of the drawings, in which case the tank may be made the full width of the casing and short from front to rear, as in Fig. 1.

The tank is removable bodily from the casing A, through the front door a^5 thereof, and to provide for locking the tank in place within the casing we construct the tank in a novel way and provide a removable means for fastening the tank.

The top of the tank is sloped downward and rearward, as shown by Fig. 9, and the bottom of said tank has its front portion bent upward in angular form to provide the recess or seat k', from which recess the bottom slopes downward to the rear end of the tank, (see Fig. 9,) the sloping top and bottom of the tank being parallel to each other, or substantially so.

Near the open end of the ice-chamber we provide a fixed or permanent rail l and a recess or space l' in advance of said rail, and in this recess and on this permanent rail is adapted to fit the stepped locking-rail L L', the member L' of which rests upon the permanent rail l and in the seat k' of the tank-bottom, while the rail member L fits the space l' substantially flush with casing and door a^5.

The construction of the sloping top and bottom of the tank enables the tank to be lifted in the ice-chamber sufficiently for the rail L L' to be removed, after which the tank can be drawn through the front of the casing. Below this removable tank is arranged the drip-pan, contructed and arranged as hereinbefore described, and the tank and tray have the waste connections with the waste-pipe, while the tank and tray are connected with the cold-air flue in the manner before indicated.

In Fig. 10 we have shown a refrigerator without a removable tank for ice, but having an ice-chamber and removable flue-plates M M' in the ice and provision chambers, said flue-plates arranged at opposite sides or ends of the ice-chamber to form the warm and cold air flues. The bottom a^7 of the ice-chamber may be either removable or fixed, and it is supported on cleats a^8 or other supports in the casing in a manner to provide for the flues to communicate with opposite ends of the ice-chamber. From one end of the cleats a^8 rise the short posts h^5, between which is fitted the flanged flue-plate M, arranged to provide the upper or warm-air flue. In the provision-chamber is provided the posts h h', to which is fastened the lower plate M' in the manner heretofore described. These upper and lower flue-plates are flanged and slotted, and the flanges are adapted to be connected to the studs or pins fixed to the posts, substantially as shown by Figs. 6 and 7, in order that the flue-plates may be removed for cleaning purposes and to lock them in position between the pairs of posts.

The modification illustrated by Fig. 11 embodies a tankless ice-chamber with a bottom a^8 and flue-plates at two sides arranged to form warm-air flues at both ends of the ice-chamber. The bottom a^8 has a central discharge or waste connection a^9 to a central drip-pipe, and this bottom has a central slot or opening forming a cold-air port a^{10}, which

opens into a central flue O, formed by a pair of spaced flue-plates O', thus forming a central flue in the provision-chamber, said flue-plates serving to partition or divide the provision-chamber into two compartments.

It is thought that the operation and advantages of our invention will be readily understood and appreciated from the foregoing description taken in connection with the drawings.

We are aware that changes in the form and proportion of parts and in the details of construction herein shown and described as the preferred embodiment of our invention may be made by a skilled mechanic without departing from the principle or sacrificing the advantages of our invention, and we therefore reserve the right to make such modifications as fairly fall within the scope of our invention.

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

1. The combination with a refrigerator-casing and an ice-tank therein, of a flanged shield plate or tray fitted tightly to the bottom of said tank to form a space or chamber which is closed at all points except to the passage of cold air from the tank, a cold-air flue, and parts which establish communication through said closed space or chamber between the ice-tank and the cold-air flue, as and for the purposes described.

2. The combination with a refrigerator-casing, of an ice-tank fitted removably in said casing and provided near its lower part with cold-air-egress ports, a flanged shield plate or tray fitted tightly against the bottom of said ice-tank to form a space or chamber between itself and the tank, which space or chamber is closed all around except to the passage of air from the egress-ports of the tank, and the rear flange or wall of said tray provided with cold-air-egress ports, and a back flue-plate removably fastened to the casing, in the provision-chamber thereof, close up to the shield-plate, and forming with said casing a cold-air flue which communicates at its upper end with the cold-air-egress ports from the shield tray or plate, as and for the purposes described.

3. In a cleanable refrigerator, the combination with a casing, and an ice-tank having cold-air-egress ports in its bottom, of a drip-pan fitted closely to the bottom of said tank and provided with a perforated flange and with a baffle-plate, and a cold-air flue in the provision-chamber of said casing and connected through the perforated tray-flange with the ice-tank, as and for the purposes described.

4. In a cleanable refrigerator, the combination with a casing of an ice-tank having cold-air ports in its bottom and a short waste connection, a drip pan or tray provided with a perforated flange and with an inclined baffle-plate arranged close to the bottom of said tank to deflect drip-water and moisture into said tray without interfering with the circulation of cold air from the ice-tank through the ports of the tray-flange, and a flue-plate fitted close to the bottom of the tray and adjacent to a wall of the casing to form a cold-air flue, as and for the purposes described.

5. In a cleanable refrigerator, the combination with a casing having an ice-chamber, of a pair of cleats or posts adjacent to said chamber, a flue having offstanding flanges arranged to fit between said posts and said flanges provided with slots which open through the edges thereof, and studs or pins fixed to said posts and adapted to enter the slots in the flanges to draw the flue-plate close to the posts, as and for the purposes described.

6. In a cleanable refrigerator, the combination with a casing open at its front end and having a permanent rail and a recess, an open-front tank having a recessed seat in the bottom thereof, a removable locking-rail adapted to the permanent rail and the tank-seat, a drip pan or tray, and a removable flue-plate attached within the provision-chamber and forming a cold-air flue that connects through the tray with the ice-tank chamber, as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

GEO. J. SMITH.
STILLMAN M. ATHERTON.

Witnesses:
ERNEST E. SMITH,
N. O. LANE.