No. 621,497. Patented Mar. 21, 1899.

W. B. KEYSER.

REFRIGERATOR.

(Application filed Dec. 6, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

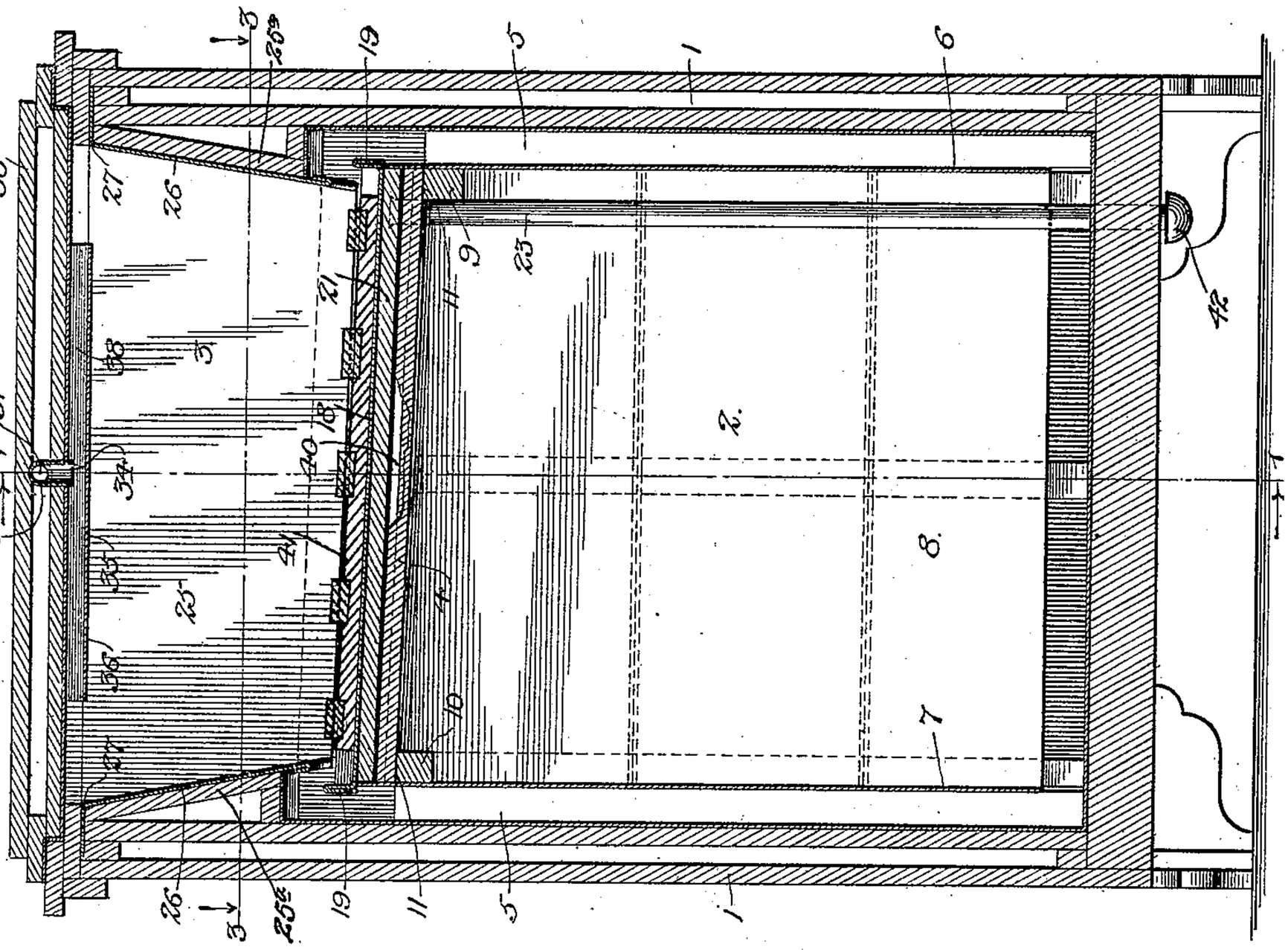
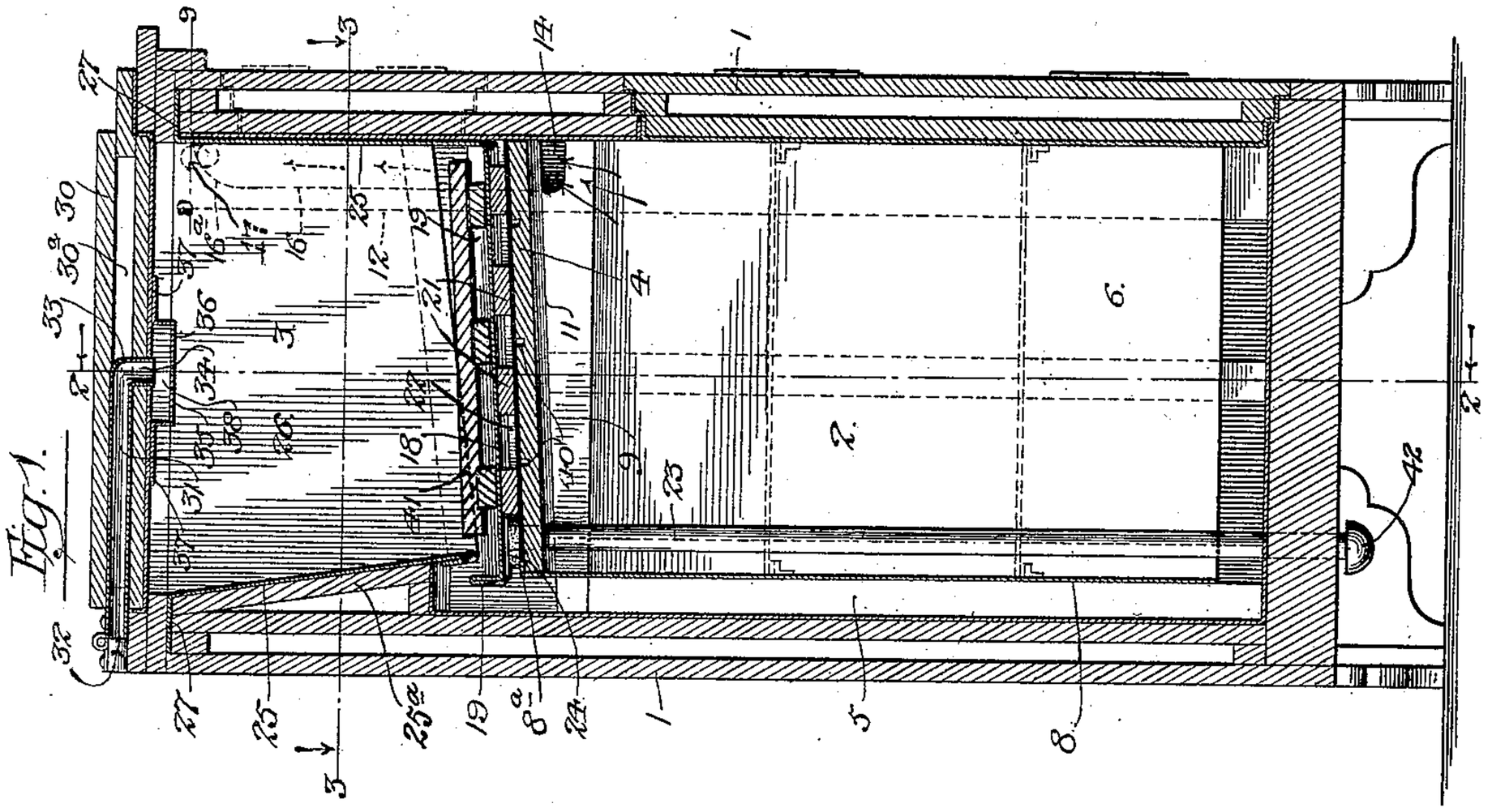


Fig. 1.



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W. B. KEYSER.

REFRIGERATOR.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 2.

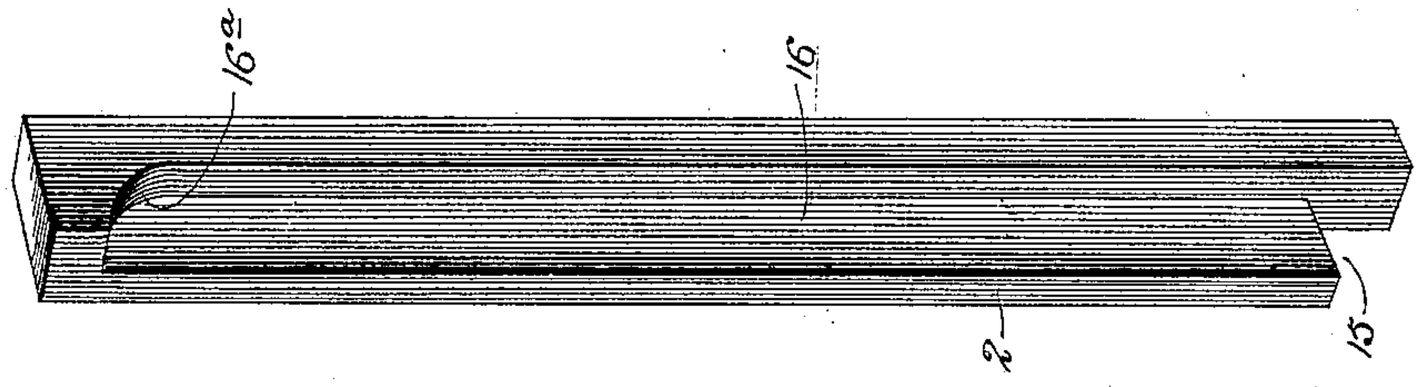

Fig. 4.

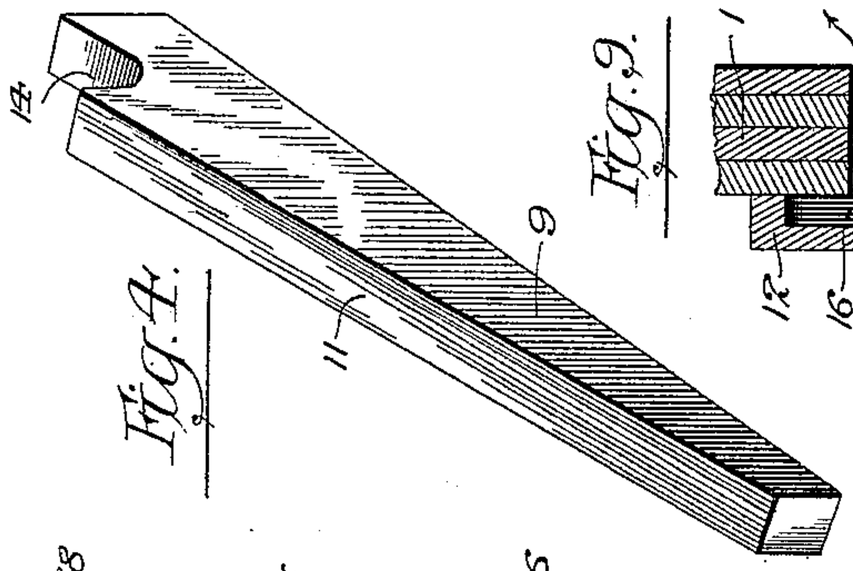

Fig. 9.

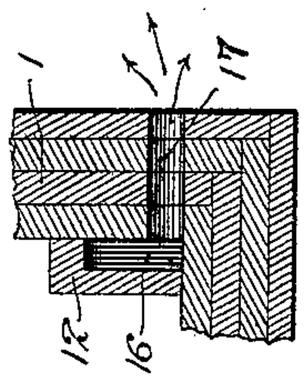

Fig. 6.

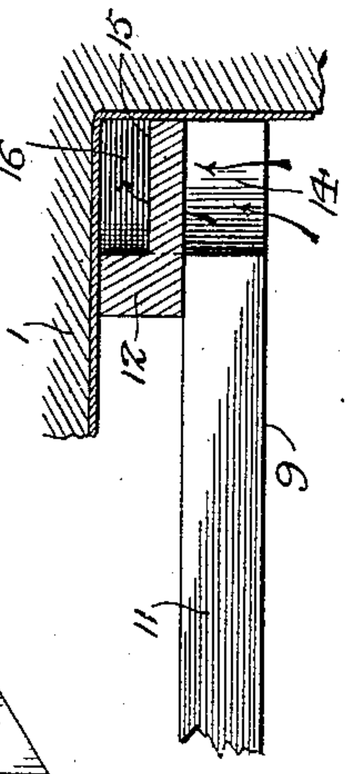

Fig. 3.

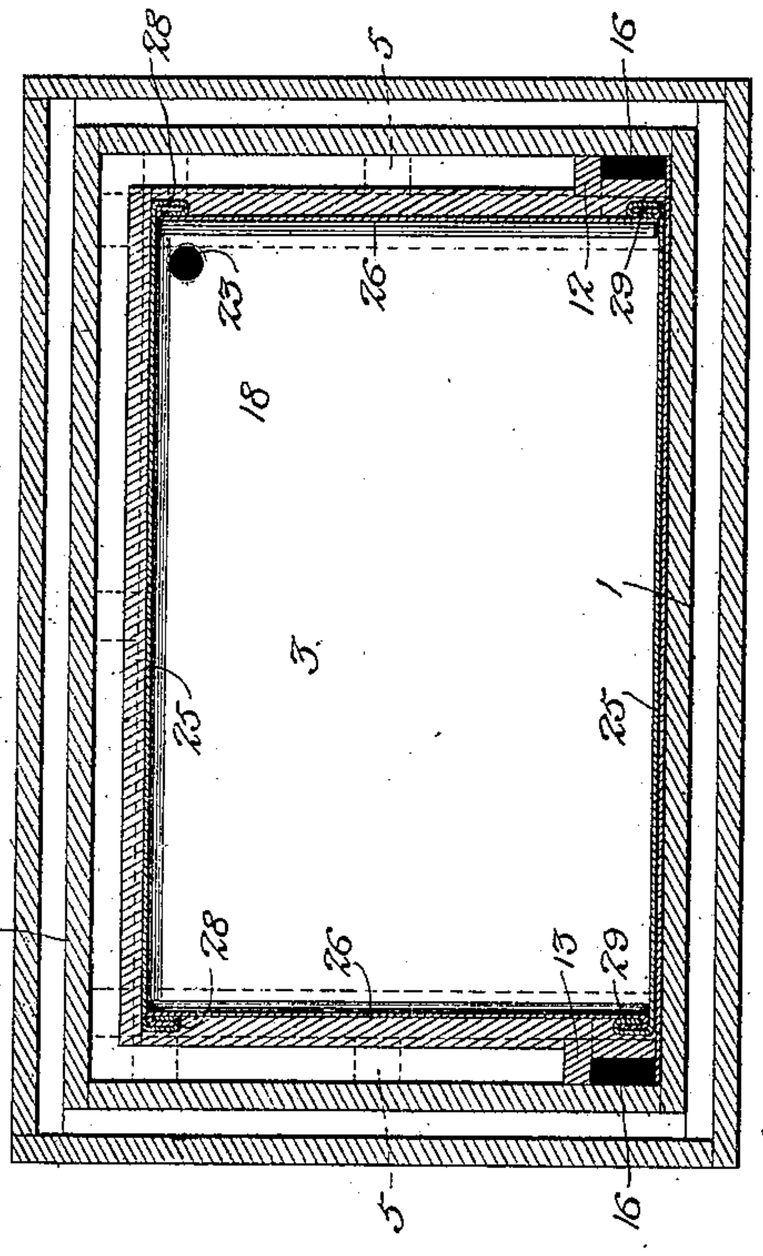

Fig. 7.

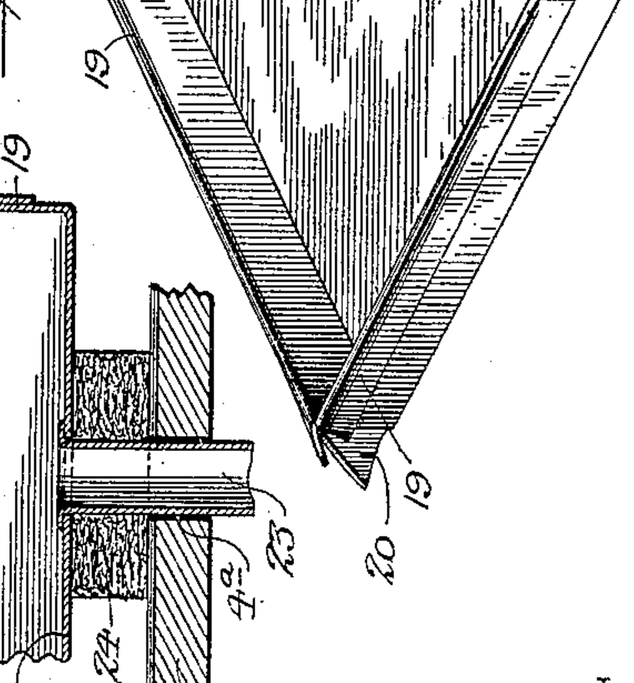

Fig. 8.

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UNITED STATES PATENT OFFICE.

WILLIAM B. KEYSER, OF CHATTANOOGA, TENNESSEE, ASSIGNOR TO THE KEYSER MANUFACTURING COMPANY, OF SAME PLACE.

REFRIGERATOR.

SPECIFICATION forming part of Letters Patent No. 621,497, dated March 21, 1899.

Application filed December 6, 1897. Serial No. 660,864. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM B. KEYSER, a citizen of the United States, residing at Chattanooga, in the county of Hamilton and State of Tennessee, have invented a new and useful Refrigerator, of which the following is a specification.

My invention relates to improvements in refrigerators of that class which employ an upper ice-chamber and a lower provision-chamber so connected together as to insure a circulation of air from the upper to the lower chamber; and the object that I have in view is to provide an improved construction of refrigerator by which the odor-laden current of air from the provision-chamber is discharged from the refrigerator without passing into the ice-chamber and at the same time provision is made for the circulation of air by drawing in fresh air from the atmosphere outside of the refrigerator to replace the warm odor-laden air, which is discharged outside of the structure.

A further object of the invention is to thoroughly and gradually cool the incoming fresh air previous to its admission to the ice-chamber, and thereby prevent rapid melting of the ice, which would be due to the impact of the warm air directly against the ice.

A further object of the invention is to simplify the construction of parts and to increase their durability and strength.

With these ends in view the invention consists in the novel combination of elements and in the construction and arrangement of parts, which will be hereinafter fully described and claimed.

To enable others to understand my invention, I have illustrated the preferred embodiment thereof in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a vertical sectional elevation, taken on the plane indicated by the dotted line 1 1 of Fig. 2, from front to rear of a refrigerator constructed in accordance with my invention. Fig. 2 is a vertical sectional elevation on the plane indicated by the dotted line 2 2 of Fig. 1. Fig. 3 is a transverse horizontal sectional view through the ice-chamber of the refrigerator on the plane indicated by the dotted line 3 3 of Fig. 1. Fig. 4 is an enlarged detail view of one of the rafters constructed to provide for the passage of the odor-laden air to the foul-air flue. Fig. 5 is a detail perspective view of an upright or post of peculiar construction to constitute one of the foul-air flues. Fig. 6 is a detail cross-sectional view through the joint between one end of the rafter, a corresponding end of the foul-air-flue upright, and a corner-post to show the opening or passage leading to the foul-air flue. Fig. 7 is a detail view of the metallic tray in the bottom of the ice-chamber, illustrating the construction by which water-tight joints are secured at the corners of the tray without soldering the tray-flanges together. Fig. 8 is an enlarged detail sectional view illustrating the packing for the drip-pipe as it passes through the horizontal partition or diaphragm. Fig. 9 is an enlarged detail sectional view on the plane indicated by the dotted line 9 9 of Fig. 1, illustrating the port in the casing which communicates with one of the foul-air flues for the exit of the warm odor-laden current of air from the refrigerator.

Like numerals of reference denote like and corresponding parts in each of the several figures of the drawings.

The numeral 1 designates a casing, which is similar in general outline to any preferred type of casing used in the construction of refrigerators. I prefer to construct the refrigerator-casing with an outer wall or shell, an inner wall or shell arranged parallel to the outer wall and at a suitable distance therefrom, and an intermediate chamber or space between said shells and constituting a dead-air chamber to increase the non-conductivity of the refrigerator-casing.

The lower part of the casing constitutes the provision-chamber 2, and the upper part of said casing forms the ice-chamber 3. These two chambers are isolated from each other by the employment of an intermediate non-conducting partition or diaphragm 4, preferably constructed of wood and secured in place in a manner which will be hereinafter described to cut off direct communication from the upper to the lower chamber; but the interior of the refrigerator-casing is constructed with

novel appliances by which pure cold air from the upper ice-chamber is conducted through the provision-chamber and discharged to the bottom thereof, and also to provide for the discharge into the outer atmosphere of the warm odor-laden current from said provision-chamber without permitting said odor-laden current to pass through the ice-chamber or into contact with the ice therein.

The refrigerator is constructed, as hereinafter described, with appliances by which pure fresh air is supplied to the ice-chamber to replace the warm odor-laden air discharged from the provision-chamber, and by discharging foul air from one chamber and feeding fresh air to another chamber, which fresh air is subsequently conveyed to the chamber from which the foul air is discharged, a constant circulation of air is maintained within the structure and pure fresh air is supplied to the provision-chamber, whereby edibles placed within said provision-chamber may be preserved without contamination.

Within the lower provision-chamber 2 is erected a series of uprights or posts 5, which are arranged at suitable intervals from each other and are placed across the rear and two ends of the refrigerator-casing. By spacing these uprights or posts 5 at intervals around the rear and two ends of the refrigerator-casing and employing flue-plates 6, 7, and 8 at the ends and rear of the provision-chamber I provide a series of downdraft cold-air flues by which the cold air from the ice-chamber is conducted to the bottom of the provision-chamber, said flue-plates terminating a suitable distance above the floor of the provision-chamber to provide for the discharge of cold air to the lower part of said provision-chamber.

At the ends of the provision-chamber I arrange the substantially horizontal rafters 9 10, one at each end of said chamber 2. These rafters rest upon and are secured to the uprights or posts 5 at the ends of the refrigerator-casing and each rafter has its upper edge inclined, as at 11, such inclination extending from the front to the rear of the casing 1. The horizontal diaphragm or partition 4, of wood, rests upon and is secured to said rafters 9 10 in a suitable way, and the front edge of said partition or diaphragm 4 is secured to the front of the casing 1, while the rear edge of said diaphragm or partition terminates short of the rear wall of the casing to enable the upper edge of the back flue-plate 8 to be bent or turned over the rear edge of said partition 4, said bent or folded edge of the flue-plate 8 being indicated at 8^a in the drawings. The described construction provides for the proper support in fixed positions of the rafters within the provision-chamber, and said rafters in turn support the non-conducting partition or diaphragm 4, the latter constituting the roof of the provision-chamber and the floor of the ice-chamber. Said partition or diaphragm is joined or secured with the rafters and the refrigerator-casing in a manner to effectually prevent direct communication from the provision-chamber to the ice-chamber, and in this connection I desire to state that the rafters 9 10 are constructed in a peculiar way to enable them to be used in connection with uprights 12 13, which are themselves peculiarly formed to constitute the foul-air flues, by which the odor-laden current of air from the provision-chamber is discharged outside of the structure. At the wide front end of each rafter is produced a transverse cut or notch 14, which is formed in the upper corner of said rafter. Each upright 12 or 13 rests upon one of the corner-posts in the provision-chamber and lies alongside of the notched or recessed end 14 of the companion rafter, and said lower end of the upright is also notched or recessed, as at 15.

The upright or post is rabbeted to provide a longitudinal passage 16, which extends nearly the entire length of the upright, and the upper extremity of this passage terminates in a laterally curved or inclined wall 16^a, which extends to one edge of the rabbeted upright. This upright is placed in position in an angle or corner of the refrigerator-casing to have one edge and face thereof abut against the angles formed by the inner shell of such refrigerator-casing, and the vertical passage 16, which constitutes one foul-air flue of the refrigerator, is thus formed by and between the rabbeted upright and the corner of the inner shell of the refrigerator-casing. The front upright is so arranged with relation to the corner-post, the casing and the rafter that the notch or recess 15 in said upright is coincident with the notch or recess 14 at the wide end of the rafter, and as the rafter is situated within the provision-chamber, so as to be exposed laterally to view therein, the coincident notches or recesses 14 15 in the rafter and the upright form a horizontal or transverse passage, which connects the foul-air flue 16 with the provision-chamber of the refrigerator. The upper end of the foul-air flue 16 is in communication with the exit-ports 17, formed coincidently in the inner and outer shells of the refrigerator-casing at the upper part of the sides, as clearly shown by Fig. 9. It will be understood that I employ the described construction of rafters and uprights at both ends of the refrigerator-casing, and as each foul-air flue is in communication at its lower end with the provision-chamber and with the exit-ports 17 at their upper ends provision is thus made for the exit of the warm odor-laden currents of air from said provision-chamber 2 to and through the exit-ports 17 in the casing 1.

The ice-chamber 3 is provided in its bottom with an ice pan or tray 18, which is preferably constructed of sheet metal. Said ice pan or tray is formed, preferably, from a single piece, with upturned flanges 19 at its sides and ends, which are joined together to provide water-tight joints without the employment of

solder or its equivalent to secure said water-tight joints. In the manufacture of this sheet-metal tray or pan I stamp a blank of proper contour from the sheet metal and then proceed to bend up the edges of the blank to form the side and end flanges 19 of said tray. In the process of bending up the blank to form the flanges the angles or corners are bent to form the tongues 20, which are lapped around the end flanges, and thus produce the joints without the employment of solder. This tray or pan is arranged above the horizontal diaphragm or partition 4, and between said tray and said partition are the spacing-cleats 21. The space between the tray and the horizontal partition constitues a dead-air chamber or space 22, which reduces to a minimum the liability of the conduction of cold from the ice-chamber 3 to the provision-chamber. As the partition 4 is secured within the refrigerator-casing by practically air-tight joints and as the tray or pan 18 fits snugly within the ice-chamber of said casing and lies parallel to the partition 4, the production of the dead-air chamber or space 22 is made possible. The upper edges of the rafters 9 10 being inclined from front to rear of the casing 1, the partition 4 and ice-tray 18 are given a corresponding inclination in order to conduct the drip-water toward the rear part of said casing 1. The drip is discharged from the ice-tray by the drip tube or pipe 23, which is suitably attached to the tray or pan 18 and which passes through the dead-air space or chamber, a suitable hole 4^a in the partition 4, the provision-chamber 2, and the bottom of the refrigerator-casing.

I prefer to make the hole 4^a in the partition 4 somewhat larger in diameter than the drip-pipe 23; but to preserve the integrity of the dead-air chamber 22 and prevent the ingress thereto of warm air from the provision-chamber a non-conducting packing 24 is fitted around the upper part of the drip tube or pipe 23 where it passes through the dead-air chamber 22.

I prefer to employ a packing of hair felt, which is a non-conductor of heat, in order that the heat in the provision-chamber may not be conveyed to the bottom of the ice tray or pan in the ice-chamber, and said packing is confined in place by and between the partition 4 and the ice-tray 18, which latter rests firmly or solidly upon the hair and felt packing in order to compress said packing and tightly close the joint between the drip-tube 23 and the partition 4.

The ice-chamber 3 is lined by the employment of metallic plates 25 26, which are arranged at the sides and ends of said chamber, the upper ends of the metallic plates or linings being flanged, as at 27, and seated upon suitable ledges on the inner shell of the refrigerator-casing.

One of the improvements which I have made in the details of construction of the refrigerator is the interlocking of the side and end plates or linings of the ice-chamber 3. It has been customary heretofore to unite the parts of the lining together in a permanent manner—as, for instance, by soldering the same together; but in my improved construction I join the end and side plates together detachably by interlocking joints.

As shown by the drawings, particularly by Fig. 3, the side plates 25 have right-angled flanges 28, and the end plates have corresponding flanges 29. These parts are assembled together to have the flanges thereof fit into and interlock with each other, and the described construction provides for the secure interlocking of the parts of the lining together in a detachable manner, thus dispensing with the necessity for soldering the plates together.

The walls of the refrigerator-casing around the ice-chamber 3 are inclined, or they may be provided with inclined strips or battens 25^a, against which the linings or plates 25 26 are fitted in a manner to cause the lower edges of said plates or linings to occupy positions within the flanges 19 of the ice-tray 18, and thus the side plates or linings are arranged to discharge any moisture of condensation directly within the tray 18, from whence the water of condensation, as well as the drip resulting from the melting of the ice, is discharged through the drip tube or pipe 23.

The top or cover 30 of my refrigerator is constructed in a peculiar manner to provide for the ingress of pure fresh air to the ice-chamber 3. The air-supply pipe 31 is arranged in a dead-air space or chamber 30^a, provided within the top or cover 30, and one end of this air-supply pipe 31 opens through said cover 30 at the rear side of the casing 1, thus forming an air-inlet port 32. The other end of this pipe 31 has an elbow 33, which extends through the inner part of said cover 30 and forms a port 34. The air drawn in the port 32 and discharged from the port 34 is gradually cooled during its passage through the pipe 31; but if the air in this condition were allowed to come into immediate contact with the ice contained within the chamber 3 the current of inflowing air would rapidly melt the ice. I have therefore provided means by which the inflowing current of air is disseminated through the ice-chamber 3 and is gradually cooled before its admission to said ice-chamber. This means consists in the provision of a flanged baffle-plate 35, which extends longitudinally of the top or cover 30 and is rigidly fastened thereto in any approved manner. The baffle-plate is a piece of metal struck up at its center to form the offset 36 and the flanges 37. The flanges are applied laterally against the top or cover 30 in a manner to bring the offset 36 parallel to but at a suitable distance from said top or cover, thereby forming a flue or passage 38, which extends longitudinally of the cover, but terminates within the ends thereof and at a suitable distance from the walls of the refrigerator-casing. This flue is arranged to discharge di-

rectly into the ice-chamber 3, near the walls of the refrigerator-casing and above the ice contained within said chamber, and as said baffle-plate which forms the flue is situated immediately within the ice-chamber it is exposed to the intense cold therein, so that the baffle-plate itself is of a very low temperature. The inflowing current of air supplied by the pipe 31 is discharged directly against the offset part of the baffle-plate, and as the air flows in both directions through the flue formed by the offset in said baffle-plate the air is brought into contact with the cold metallic plate, and its temperature is thereby lowered or reduced to substantially the temperature of the chamber 3.

The flue-plates 6 7 in the provision-chamber 2 of the refrigerator extend up to and above the rafters, as shown by Fig. 1, and are arranged with relation to the posts 5 to form the cold-air flues. The partition and the ice-tray are so arranged within the refrigerator-casing that spaces are left between said parts and the casing for the passage of the cold air from the ice-chamber to said downdraft cold-air flues, thus providing for the egress of pure cold air from the chamber 3 to the flues and thence to the bottom of the provision-chamber.

In the practical operation of my refrigerator pure fresh air is supplied by the tube or pipe 31 to the flue formed by the baffle-plate 35, the air being cooled gradually as it passes through said pipe and in contact with the baffle-plate. The air is discharged toward the sides of the ice-chamber 3 and further cooled in its passage through said chamber by contact with the ice therein. The cold heavy air from the ice-chamber passes through the downdraft cold-air flues and is discharged into the provision-chamber at the bottom thereof, and as the air comes in contact with objects such as food or edibles within said provision-chamber it is warmed and ascends through the provision-chamber. This warm air takes up or absorbs odors from the edibles within the provision-chamber, and as the warm air is displaced by the ingress of cold air the warmed odor-laden current passes through the passages formed by the coincident recesses 14 15 in the rafters and the uprights and eventually emerges from the refrigerator through the exit-ports 17.

The horizontal partition or diaphragm 4 is provided in its upper face with a series of parallel grooves or kerfs 40, which prevent warpage and shrinkage of the partition which would take place in the partition in the absence of such grooves.

The refrigerator-casing is constructed with a suitable door, by which access may be obtained to the provision-chamber, and to enable access to be had to the ice-chamber the casing is further provided with a door, which may be located either in the side or in the top of said refrigerator-casing. In the drawings I have shown the ice-door in the top of the casing; but as this ice-door is an immaterial feature so far as my present improvements are concerned it may be located at any convenient place, either in the side or top, as may be preferred by the skilled constructor.

As is usual in the construction of refrigerators, the ice-chamber is provided with an ice-rack or ice-racks, (indicated generally by the numeral 41 in the drawings.)

It is customary in this class of devices to provide the drip-tube that discharges the water from the ice-chamber with a trap to prevent the free entrance of dirt to the lower extremity of the drip-tube, and such a drip-trap is indicated by the numeral 42 in Fig. 1 of the drawings. The drip-trap is an ordinary cup-shaped receptacle fitted over the lower open end of the drip-tube or waste-pipe and attached by any suitable means for the water to have uninterrupted discharge from the tube or pipe into said cup-like receptacle.

It is evident that slight changes in the form and proportion of parts and in the details of construction may be made without departing from the spirit or sacrificing the advantages of the invention.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. In a refrigerator, the combination with a casing, of horizontal rafters fixed within said casing and each having a transverse notch which communicates with the provision-chamber, a horizontal partition supported by said rafters and dividing the casing into provision and ice chambers, and grooved uprights fitted in the angles or corners of the casing on the horizontal plane of the ice-chamber to have the grooved sides thereof closed by said casing and thereby form the foul-air flues; the lower end of each upright resting on the notched end of one rafter to communicate through said notch with the provision-chamber and the upper end of said upright discharging through a port in the casing, substantially as described,

2. In a refrigerator, the combination with a casing having the isolated ice and provision chambers, the fresh-air inlet to the ice-chamber, and cold-air flues, of horizontal rafters each having at one end a transverse notch which opens into the provision-chamber and said rafters supporting a horizontal partition, liners or plates within the ice-box, an ice-tray resting upon the partition, the grooved uprights fitted between the casing and said liners or plates, and arranged in the angles or corners of the casing for the wall or walls of the latter to close the grooves and form the foul-air flues, and each upright having a notched lower end resting on the notched rafter to communicate through said notch in the rafter with the provision-chamber, and exit-ports in the casing to communicate with the flues of the uprights, substantially as described.

3. In a refrigerator, the combination with a

casing, and a fresh-air inlet to the ice-chamber thereof, of the ports within the provision-chamber, the horizontal notched rafters, a horizontal dividing-partition resting on the rafters, a flanged ice-tray supported by the partition and arranged in the bottom of an ice-chamber, the liners or plates within the ice-chamber and having their lower ends terminating within the flanges of the ice-tray, the grooved uprights fitted in the angles or corners of the casing, outside of the liners or plates, to form with the casing the foul-air flues and having their lower ends fitted to the rafters to establish communication through the notches therein between the provision-chamber and the warm-air flues, the flue-plates attached to the posts within the provision-chamber and forming the cold-air flues which communicate with the ice-chamber, and exit-ports in the upper part of the casing and in communication with the flues formed by the grooved uprights, substantially as described.

4. A refrigerator provided with a non-conducting horizontal partition arranged to divide the refrigerator-casing into provision and ice chambers, a flanged ice-tray above said partition, battens or cleats between the partition and ice-tray and forming therewith an intermediate dead-air space or chamber, a drip-pipe attached to the tray and extending through the dead-air chamber and the partition, and a packing fitted around the drip-pipe within the dead-air space or chamber and interposed between the partition and ice-tray for compression thereby and to form a tight joint between the pipe-openings and the dead-air chamber, substantially as described.

5. A refrigerator having its casing divided by a horizontal partition into ice and provision chambers, an ice-tray provided at some of its edges with turned-up flanges having lips at its corners which are bent into interlocking engagement and said tray supported by the partition for one edge thereof to lie in the plane of one of the ice-chamber walls, and the plates or liners within the ice-chamber; one of the plates being continuous with one edge of the ice-tray and the other plates terminating within the flanges at the remaining edges of the tray, substantially as described.

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

WILLIAM B. KEYSER.

Witnesses:

A. M. THOMPSON,

A. E. KEYSER.