May 8, 1928.

1,668,781

E. F. PIERCE

REFRIGERATOR

Filed Feb. 10, 1926

4 Sheets-Sheet 1

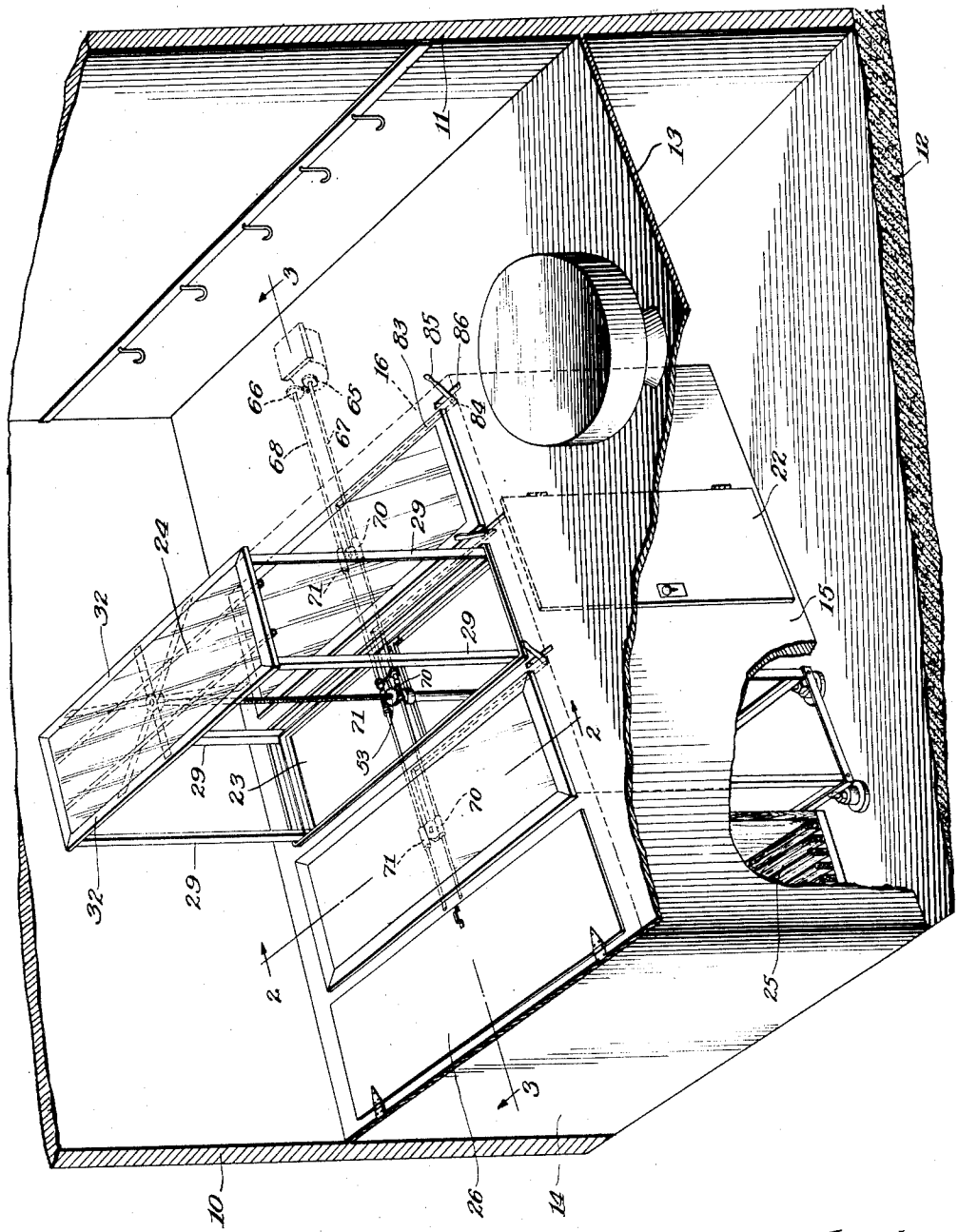


Fig. 1.

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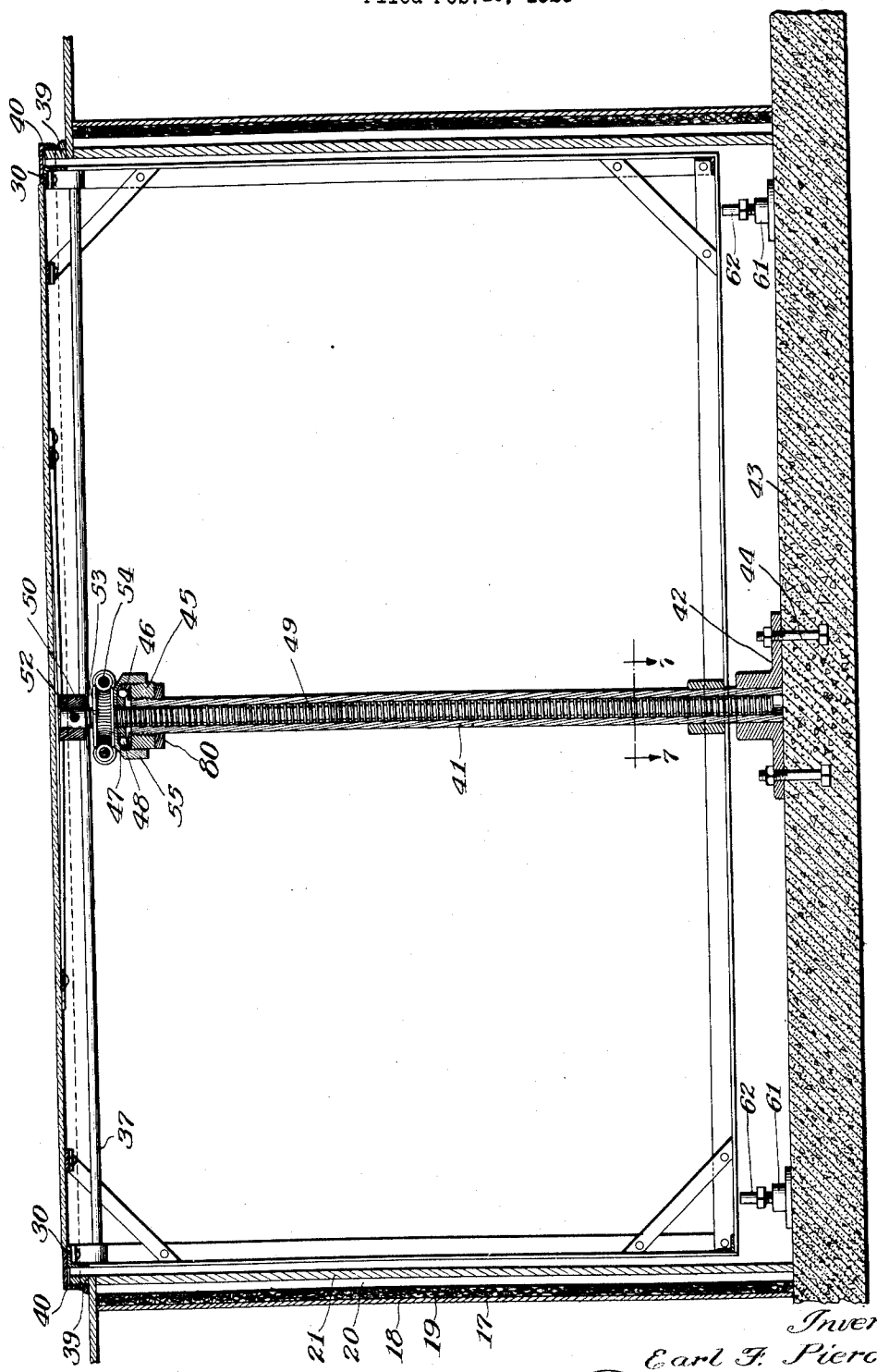


Fig. 2.

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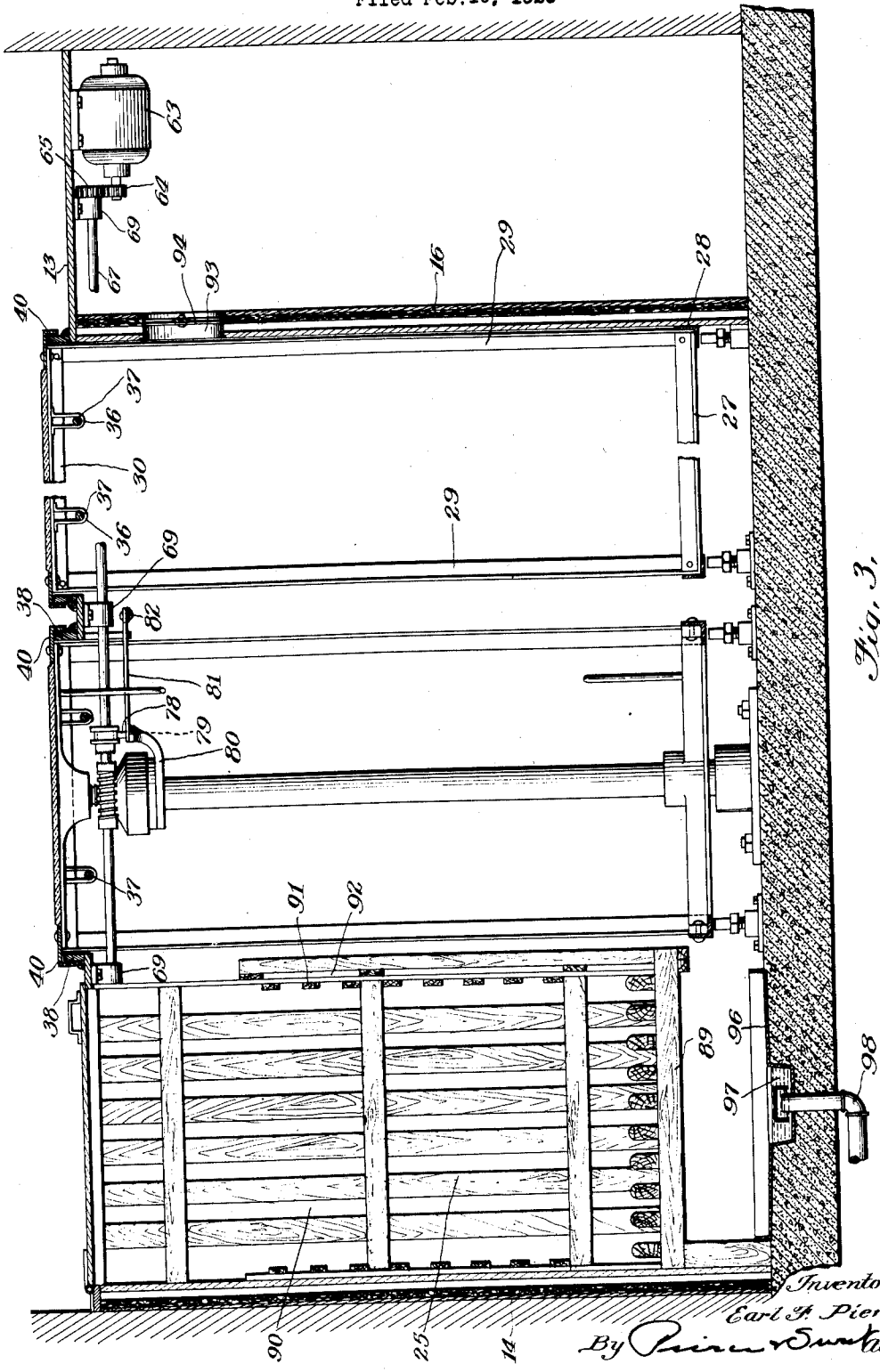


Fig. 3.

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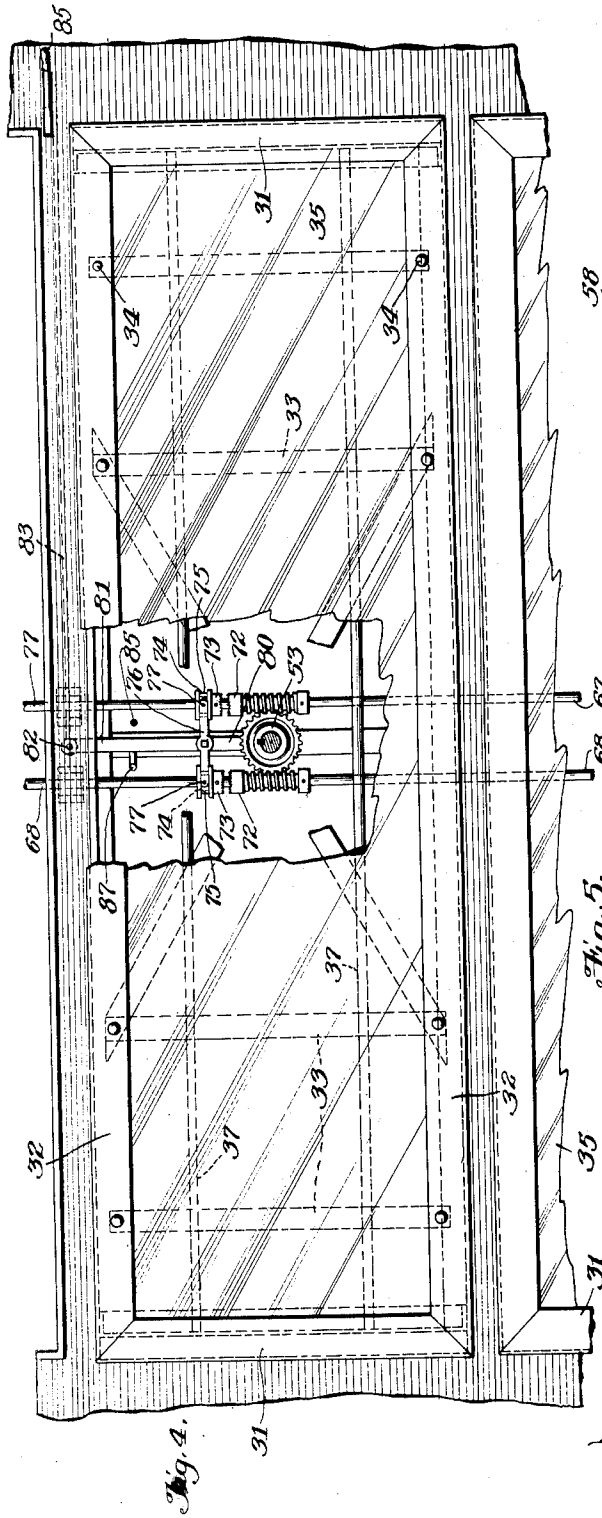


Fig. 4.

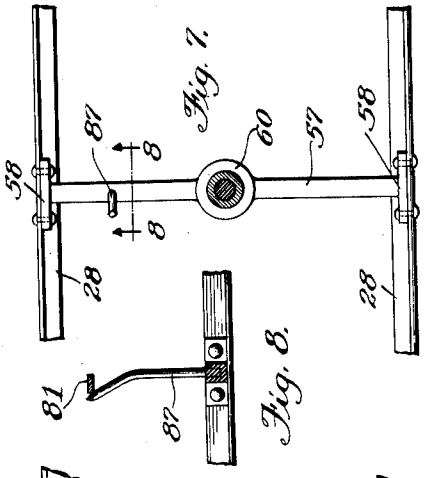


Fig. 7.

Fig. 8.

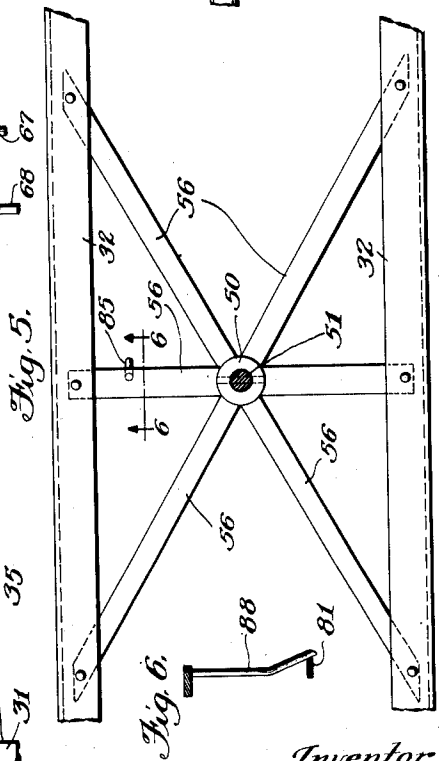


Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

EARL F. PIERCE, OF WINNETKA, ILLINOIS; CENTRAL TRUST COMPANY OF ILLINOIS, ADMINISTRATOR OF SAID EARL F. PIERCE, DECEASED, ASSIGNOR TO FLORENCE M. PIERCE.

REFRIGERATOR.

Application filed February 10, 1926. Serial No. 87,248.

My invention relates to improvements in refrigerators and is particularly concerned with improvements in refrigerators of comparatively large capacity such as are used in hotels, ships, butcher shops, etc.

The principal objects of my invention are:

First, to provide a refrigerator that is more efficient in its consumption of refrigerant than the refrigerators at present in use in places such as mentioned above.

Second, to provide a refrigerator having the same storage and cooling capacity but occupying much less space than the conventional type of refrigerator.

Third, to provide a refrigerator, such as described, of such construction that the exterior thereof need not be finished with the same degree of care required with the present construction.

Fourth, to provide a refrigerator comprising a cold air chamber, a plurality of food racks movably mounted in the cold air chamber, and selective means for moving any or all of the food racks to a position outside of the chamber to permit the food to be placed thereon, or removed therefrom, as the case may be.

Fifth, to provide a self-contained unit in the shape of a food rack, forming a part of my improved refrigerator.

Sixth, to provide a refrigerator containing one or more units such as described, in which the means for raising and lowering the units, or moving them in and out of the cold air chamber, is located below the plane of the top of the unit, or units.

Seventh, to provide a refrigerator in which the lifting force is applied to the food rack at a single point.

And finally, to provide a refrigerator such as described, that is simple in construction and economical to manufacture.

The subject matter herein is disclosed in part in my co-pending application for patent on refrigerators, filed December 19, 1925, and bearing Serial No. 76,357.

Other objects of my invention will appear as this description progresses, reference being had to the accompanying drawings, in which:

Figure 1 is a perspective of a butcher shop embodying a refrigerator built in accordance with my invention, portions thereof being broken away for the purpose of better illustration;

Figure 2 is a transverse section on an enlarged scale taken on a line corresponding to line 2—2 of Figure 1;

Figure 3 is a longitudinal section on an enlarged scale taken on a line corresponding to line 3—3 of Figure 1, portions thereof being broken away for the purpose of better illustration;

Figure 4 is a plan view of a portion of my improved refrigerator, portions thereof being broken away;

Figure 5 is a sectional detail showing the means for attaching the lift-screw to the food rack, the top panel of the rack being removed;

Figure 6 is a section taken on line 6—6 of Figure 5;

Figure 7 is a transverse section taken on line 7—7 of Figure 2; and

Figure 8 is a vertical section taken on line 8—8 of Figure 7.

Throughout the several figures, similar reference characters are used for referring to similar parts, and the several sections are taken looking in the directions of the small arrows.

The conventional type of refrigerator used in butcher shops, hotels, etc., is provided with one or more doors in a vertical wall which must be opened to permit the attendant to enter the refrigerator for the purpose of removing or replacing the food. When such doors are opened, the air in the interior of the refrigerator, being much heavier than the air in the room surrounding the refrigerator, flows out through the open door at an extremely rapid rate. Hot air flows into the upper portion of the refrigerator and when the door is again closed this hot air must be cooled. It results that the larger portion of the ice used in such a refrigerator is consumed in cooling the hot air that enters the refrigerator while the door, or doors, are open.

Furthermore, in the refrigerator of conventional design, space must be left between adjacent racks to permit the attendant to

enter the refrigerator and pass between the racks. This requirement very considerably increases the size and cost of the refrigerator. In my improved construction, the racks for supporting the food can be placed in almost contiguous relation, thereby very considerably decreasing the volumetric capacity of the refrigerator and correspondingly decreasing its cost.

With the present practice of placing the refrigerator on the floor of the building or structure where it is desired to deliver the contents of the refrigerator, the exteriors of such refrigerators are usually finished in hard wood, varnished, etc., to make them attractive in appearance. With my improved construction the chamber forming the refrigerating chamber can be placed below the floor where the food is to be delivered and need not, therefore, be finished in such an elaborate way. The cost of the refrigerator can thus be very materially reduced.

In the embodiment of my invention disclosed herein, I have shown in Figure 1, the interior of a butcher shop comprising the end and side walls 10 and 11, respectively, the basement or cellar floor 12 and an upper floor 13 that forms the ceiling for the basement or cellar. The walls 14, 15, 16 and 17 of the refrigerator may be insulated in any desired manner, such, for instance, as through the use of a wooden outer wall 18, a layer 19 of cork or mineral wool, or any other suitable heat insulating material, an air chamber 20, an inner lining 21 that may be of wood, tile, glass, or any material desired. The wall 15, or any other wall, is preferably provided with a door 22 to insure easy access to the interior of the cold air chamber. Preferably, the door 22 is insulated in the same manner as the walls of the cold air chamber.

The floor 13 above the cold air chamber is provided with a plurality of openings 23 that are preferably rectangular in shape, for receiving the vertically, reciprocating food racks indicated as a whole by reference character 24, and which will later be described in detail. There may be any desired number of these food racks, and they are preferably arranged as closely together as is convenient in order to conserve floor space, and for the further purpose of reducing the volumetric capacity of the cold air chamber.

Any suitable means may be used for cooling the air in the cold air chamber, such, for instance, as ice, brine, or any other refrigerant. In the embodiment of my invention disclosed herein, I have shown an ice compartment 25 that extends across the cold air chamber and the upper end of which opens through the floor 13, a trap door 26 being provided for closing the upper end of this chamber.

Each food rack comprises a lower rectangular frame formed of the end pieces 27 and the side pieces 28, and the four vertically extending corner members, or posts, 29, one of which extends upwardly from each corner of the lower rectangular frame. The upper ends of the corner members 29 are connected by means of an angle iron 30. It should be noted that the members 27, 28 and 29 are also formed of angle irons suitably riveted together at their junction points. A rectangular frame formed of the end members 31 and the side members 32, each L-shaped in cross section, rests on the end pieces 30, that connect the upper ends of the corner members 29, with the short flange extending downwardly. Flat bars 33 extend between the side members 32 and are riveted, or otherwise secured thereto, as shown at 34, and form a support for the panel 35 which is here indicated as being made of glass, but which may be made of any suitable material.

One or more loops 36 may be secured to the end pieces 30 at each end of the food rack and extend downwardly to form supports for the rods 37 that extend from one end of the food rack to the other end, upon which the food may be hung by means of hooks, or other suitable means. In order to prevent dirt, water or other objectionable matter from falling into the cold air chamber when the food racks are elevated, I prefer to surround each of the openings 23 with a rectangular frame formed of the side pieces 38 and the end pieces 39. It will be noticed from an inspection of Figures 2 and 3 that the flanges 40 of the upper rectangular frame extend downwardly outside the frame formed by the members 38 and 30, so as effectually to exclude dirt, dust, etc., and form more or less of a seal to prevent any possible flow of air either to or from the cold air chamber, although it will be readily understood that inasmuch as the openings for the racks are in the upper side of the cold air chamber, there is practically no opportunity for the cold air to escape, or for the relatively warm air to enter, because the air in the cold air chamber is colder than the surrounding air and, therefore, has a greater specific gravity than the surrounding air.

For lifting each of the food racks described above, I provide a tubular standard 41 that is carried by a base plate 42 secured to the floor 43 of the basement by means of the bolts 44. A collar 45 is screwed on to the upper end of the standard 41 so as to be adjustable vertically relatively to the standard and supports the thrust bearing comprising the lower race 46, the upper race 47 and the interposed ball bearings 48. A threaded rod 49 is mounted to reciprocate in the tubular standard 41 and the upper

end of this rod is secured to the hub 50 of a spider 51 (see Figure 5) by means of the pin 52.

A nut 53, the exterior of which has worm-gear teeth 54 cut therein, rests upon the upper race 47 of the thrust bearing and has formed integrally therewith the downwardly extending flange 55 that is machined to fit more or less closely the periphery of the collar 45. The nut 53 is provided with a threaded opening for co-acting with the threads on the rod 49. From the above description it will be clear that when the nut 53 is rotated in one direction the rod will be elevated, and when rotated in the opposite direction the rod 49 will be lowered. The free ends of the arms 56 of the spider 51 are riveted, or otherwise secured, to the horizontal portions of the side members 32, as shown in Figures 2, 3 and 4, so that the food rack moves up and down with the rod 49.

To prevent the food rack from tilting either longitudinally or transversely, when unevenly loaded, I provide the cross strut 57, the ends 58 of which are riveted, or otherwise secured, to the vertical flanges of the side members 28 of the lower rectangular frame, and the center of which is in the form of a hub 60 that slides freely upon the exterior of the tubular standard 41. From the above description, it will be seen that the food rack is connected with the tubular standard 41 at two points spaced from each other so that there can be practically no tilting of the food rack relative to the support 41. This makes the standard 41, the lifting-rod 49 and the food rack substantially a unit, because it can be installed without the necessity of providing an external means for insuring alignment between the standard, lifting-rod and the direction of movement of the food rack.

To prevent any sagging of the frame, or food rack, when it is in its lowered position, I prefer to provide suitable adjustable supports for the opposite sides and ends of the food rack comprising the base plates 61 having the stud screws 62 threaded therein. These screws can be adjusted so that any tendency of the food rack to sag at either end will result in portions of the lower frame contacting with the upper ends of the screws 62.

While any suitable means may be employed for rotating the nut 54, such, for instance, as an electric motor that might be supported by the standard 41 and have a suitably geared connection with the nut, I prefer to make use of a single motor 63 preferably located outside of the cold air chamber. A pinion 64 is mounted on one end of the shaft of the motor 63 and engages with two gears 65 and 66. These gears are mounted on the adjacent ends of the shafts 67 and 68 that are carried by suitable shaft hangers 69 secured at intervals to the underside of the floor 13. The shaft 67 is provided with a plurality of worms 70 corresponding in number to the number of food racks and each meshes with one side of the nut provided for raising one of the racks. The shaft 68 is provided wth an equal number of worms 71 meshing with the opposite sides of the nuts 53.

One end of each of the worms 70 and 71 is provided with a clutch element 72, and a complementary clutch element 73 is splined upon the shafts 67 and 68 to co-act with the clutch element 72. Each of the clutch elements 73 has an annular groove 74 formed therein for receiving a clutch collar 75. A clutch bar 76 spans each pair of clutch collars and has its opposite ends secured to the corresponding clutch collars by means of pivot pins 77. The clutch bar 76 is rigidly mounted upon the upper end of a sleeve 78 carried by a pin 79 that is in turn supported by the bracket 80 secured to the upper end of the standard 41. An arm 81 is secured to the sleeve 78 and extends laterally to a point outside of the food rack where it is connected by means of the pivot pin 82 with a link 83. This link passes forwardly beneath the floor and is pivotally connected, as shown at 84 (see Figure 1) with the lower end of a hand lever 85 that is suitably pivotally supported intermediate its ends and projects upwardly through a slot 86 in the floor. From the above description, it will be apparent that when the lever 85 is moved to one of its extreme positions, one of the clutch elements 73 will be brought into engagement with the corresponding clutch element 72, whereby the power of the motor is transmitted through the corresponding shaft, worm, nut and lift-rod, thereby causing the food rack to move in one direction, and that when the lever is thrown to the other of its extreme positions the two clutch elements just referred to will disengage and the two on the other shaft will be brought into engagement, thereby causing the power of the motor to be transmitted to the lifting-rod to cause it to move in the opposite direction. It will also be apparent that when the lever 85 is in an intermediate position both clutch elements 73 will be disconnected from the clutch elements 72, and the motor will run free without causing any movement of the lifting-rod.

In order to make it unnecessary for the operator to shift the clutch elements to their neutral positions when the food rack has reached either limit of its movement, I provide the shifting-rod 87, the lower end of which is supported by the cross strut 57 and the upper end of which is bent to the left, as shown in Figure 8, and also provide the shifting rod 88 which is supported by the

arm 56 of the spider 51 that extends parallel with and lies above the arm 81 when the latter is in its neutral position. The lower end of this rod is curved to the right, as shown in Figure 6. With the construction just described, after the lever 85 has been thrown to the position to cause the food rack to rise, the operator can release his hold on this lever, and when the food rack has almost reached the end of its upward movement, the curved upper end of the rod 87 will engage the arm 81 and move it into neutral position.

Thereafter, when the operator moves the lever 85 to the position that produces downward movement of the food rack just before the latter reaches the end of its downward movement, the curved portion of the rod 88 will engage the lever 81 and move it to its neutral position.

From the description thus far given, it will be seen that by moving the proper lever 85 into the proper positions, the operator can elevate and depress any one of the food racks, or he may by shifting more than one of the levers 85 raise or lower two or more of the food racks, and that the directions of travel of the food racks are independent of each other, that is, one food rack may be moving upwardly while the other is moving downwardly.

I have already referred to the fact that any suitable means may be used for cooling the air of the cold air chamber. In the present embodiment of my invention, I have shown an ice chamber 25 provided with a rack 89 for holding a supply of ice. This ice chamber is provided with suitable end and side racks 90 and 91, respectively and an inner side wall 92 for separating the ice chamber from the cold air chamber, this wall, or partition, 92 terminates short of the top of the ice chamber and the bottom of the ice chamber so as to permit a free circulation of the air from the cold air chamber to the top of the ice chamber and from the bottom of the latter to the bottom of the cold air chamber. In this way a continuous circulation of the air in the cold air chamber is insured and the circulating air coming in contact with the cold water produced by the melting of the ice in the ice chamber will result in effectual removal of most of the gases given off by the food products that might otherwise cause the air in the cold air chamber to become disagreeably odorous. If ice is the refrigerant used, the same supply of air can be used over a considerable period of time and will not acquire obnoxious odors, for the reason stated above, but if mechanical refrigeration is resorted to, it may be desirable to change the air in the cold air chamber from time to time. This can be done by either opening the door 22 and permitting the cold air to drain from the cold air chamber and being replaced by warm but fresher air, or if it is desired to effect a more gradual change of the air, a ventilating opening 93 may be formed in one wall of the cold air chamber and normally closed by a suitable damper 94 opened by a suitable lever which may extend upwardly through the floor. This will permit a gradual drain of the air from the top part of the cold air chamber and its replacement by other air that may gain access either through the opening 93, or through the openings 23 when the food racks are raised. I have shown the ice chamber as being provided with a conventional water pan 96, water seal 97 and drain pipe 98 for removing the water produced by the melting of the ice.

While I have described the details of construction of the preferred embodiment of my invention, it is to be clearly understood that my invention is not limited to these details but is capable of other adaptations and modifications within the scope of the appended claims.

Having thus described my invention, what I claim is:

1. A refrigerator comprising a cold air chamber having a top provided with a plurality of openings, a rack reciprocable in each opening, said rack comprising a top for making a sealed closure for said opening, and means for raising and lowering said racks independently of each other, the top of one rack being sufficiently close to the adjacent racks to form a support for a person removing the food from either or both of the adjacent racks.

2. A refrigerator comprising a cold air chamber, a plurality of racks reciprocable into and out of said cold air chamber, and selective means for moving said racks into and out of said cold air chamber either singly or in groups.

3. A refrigerator comprising a cold air chamber, a rack reciprocable vertically into and out of said cold air chamber, a motor, and means driven by said motor for lifting and lowering said rack out of and into said cold air chamber, the point of application of the power from said motor to said rack lying below the top of said rack and within the confines of said rack.

4. A refrigerator comprising a cold air chamber, a rack reciprocable vertically into and out of said cold air chamber, a motor, and means driven by said motor for lifting and lowering said rack out of and into said cold air chamber, the point of application of the power from said motor to said rack lying below the top of said rack.

5. A refrigerator comprising a cold air chamber, a rack reciprocable vertically into and out of said cold air chamber, a threaded rod connected with said rack, a nut co-acting with said threaded rod to raise or lower said

rack depending upon the direction of rotation of said nut, and means for alternatively and selectively rotating said nut in opposite directions.

6. A refrigerator comprising a cool air chamber, a plurality of racks reciprocable into and out of said cool air chamber and selective means for moving said racks into and out of said cold air chamber either singly or in groups and for moving racks simultaneously in the same direction or in opposite directions at will.

7. A refrigerator comprising a cold air chamber, the top of which is formed by a floor, said floor having a plurality of openings therefor opening into said chamber, a rack vertically reciprocable through each of said openings, each of said racks comprising a top portion making a sealed closure for the openings, said top portions having transparent windows therein and means for independently raising and lowering said racks.

8. A refrigerator comprising a cold air chamber, the top of which is formed by a floor, said floor having a plurality of openings therethrough opening into said chamber, a rack vertically reciprocable through each of said openings, each of said racks comprising a top portion making a sealed closure for said opening, and means for raising and lowering said racks comprising a motor and selective means interposed between said motor and said racks for raising and lowering each of said racks independently of the others.

In witness whereof, I hereunto subscribe my name this 8th day of February, 1926.

EARL F. PIERCE.