June 20, 1939. P. C. WARREN ET AL 2,163,182

REFRIGERATOR

Filed May 23, 1936 3 Sheets-Sheet 1

Fig 1.

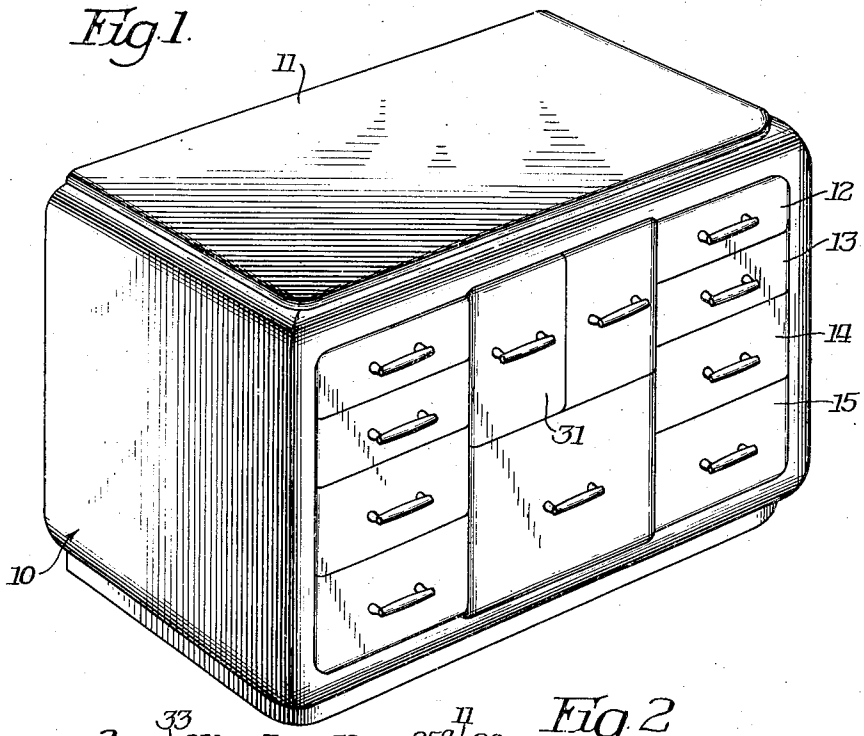
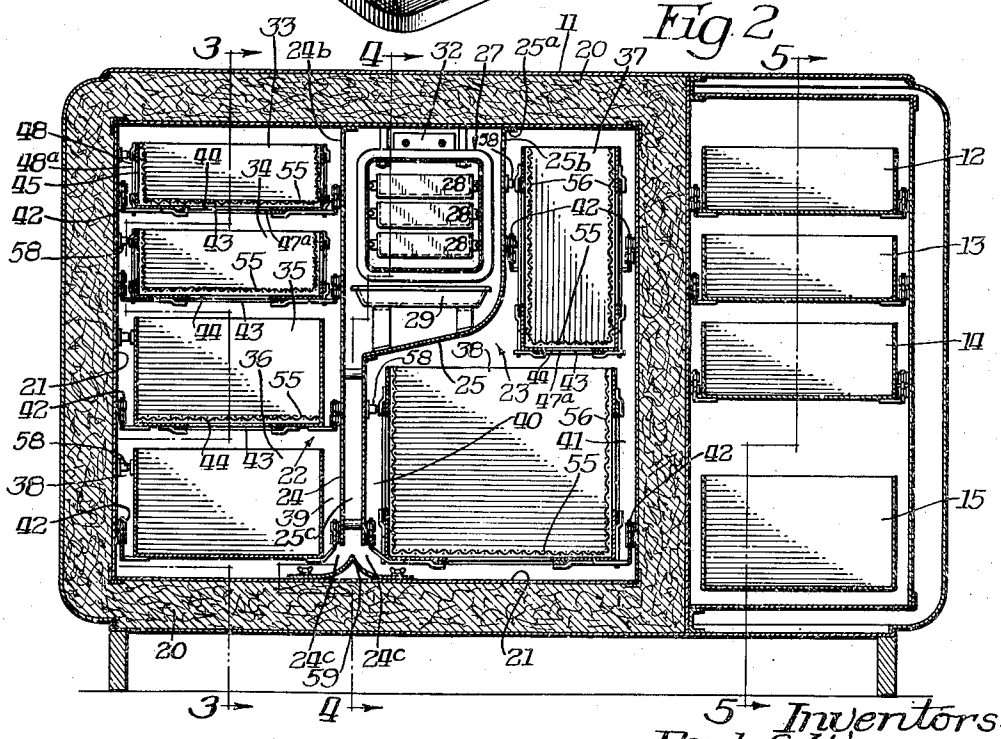


Fig 2



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June 20, 1939. P. C. WARREN ET AL 2,163,182

REFRIGERATOR

Filed May 23, 1936 3 Sheets-Sheet 2

Fig. 3

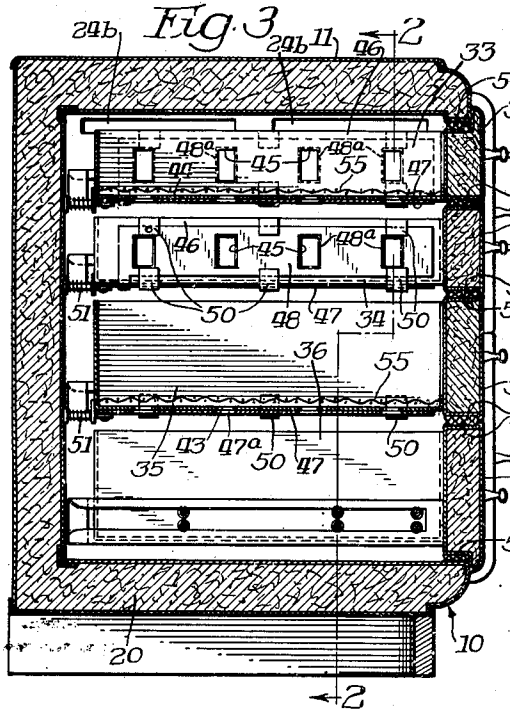


Fig. 6

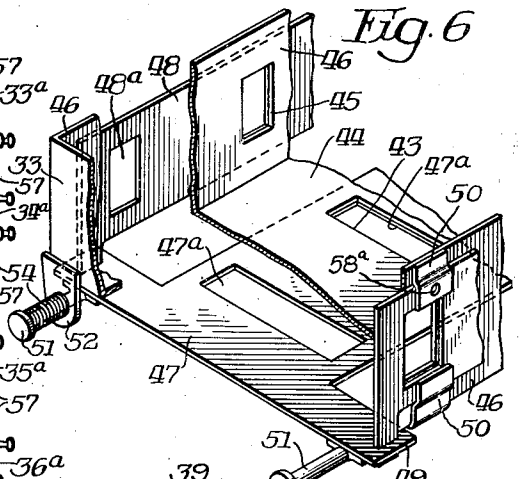


Fig. 7

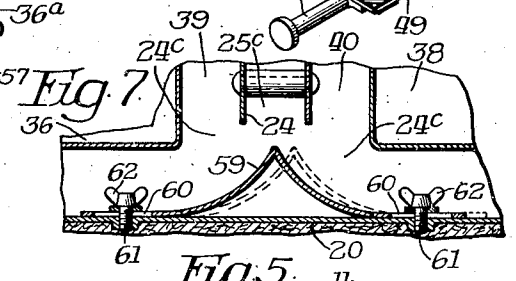


Fig. 4

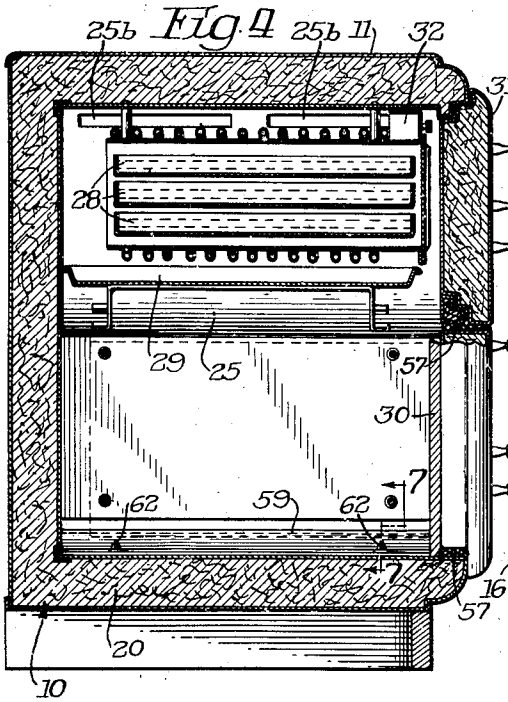
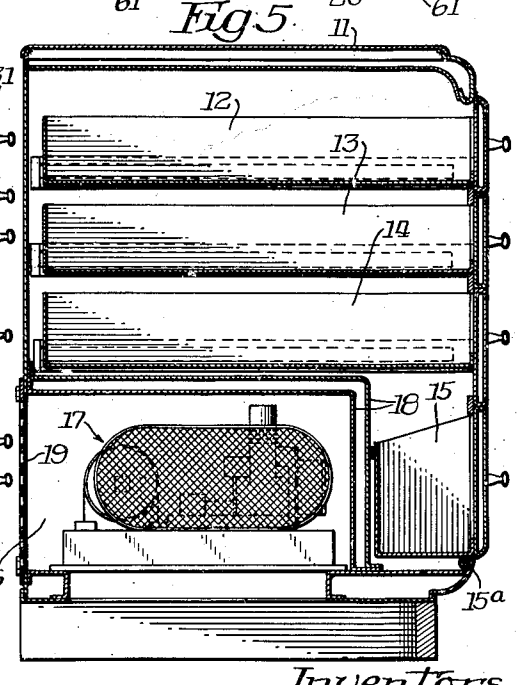


Fig. 5



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June 20, 1939. P. C. WARREN ET AL 2,163,182

REFRIGERATOR

Filed May 23, 1936 3 Sheets-Sheet 3

Fig. 8

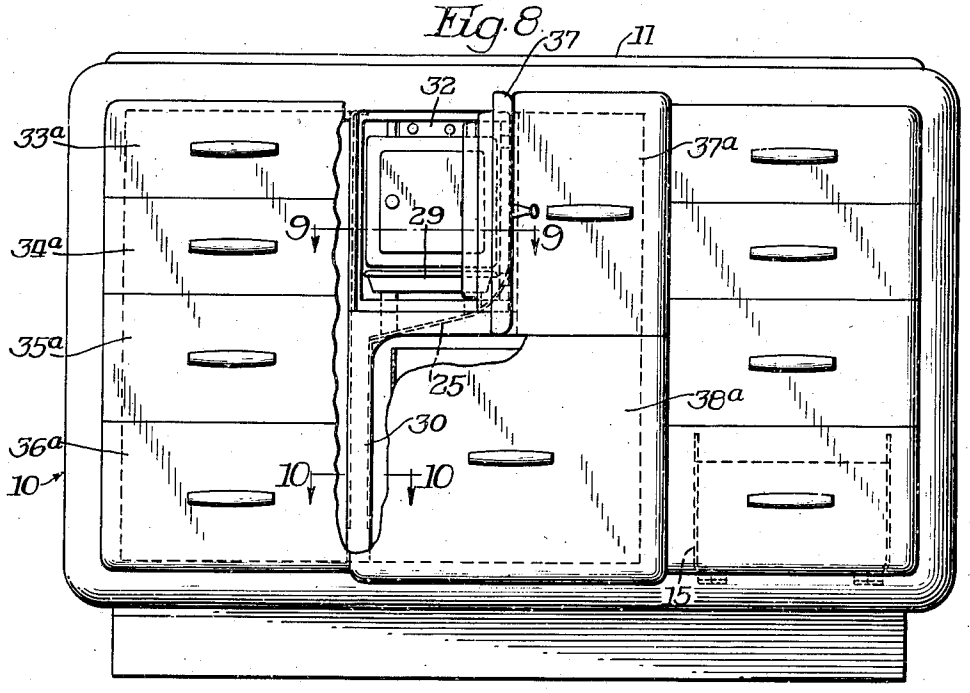


Fig. 9

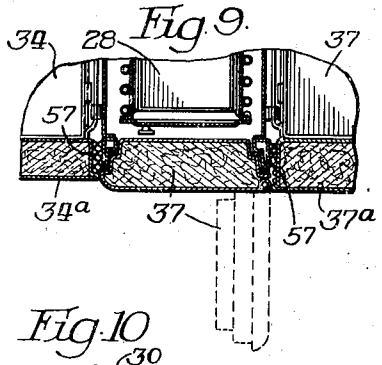


Fig. 12

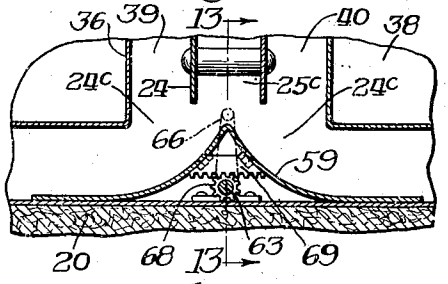


Fig. 10

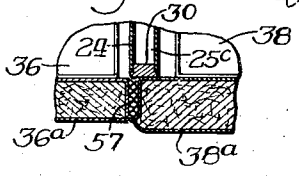


Fig. 13

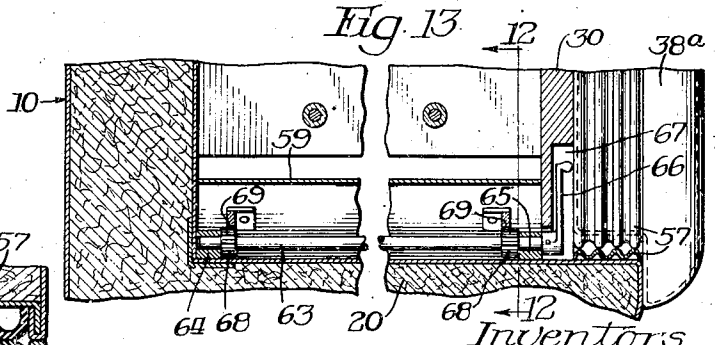
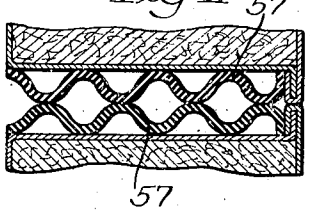


Fig. 11



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2,163,182

REFRIGERATOR

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Application May 23, 1936, Serial No. 81,462

3 Claims. (Cl. 62—89)

This invention relates to improvements in refrigerators.

One object of the invention is to provide a refrigerator, the circulation of cold air within which can be controlled for delivering the air to all of several food holding compartments to procure a more uniform or a selected refrigerating action. In conventional refrigerators the cold air from the evaporator units descends by gravity through or around the shelves in circuits determined more or less by the arrangement of the dishes, containers etc., on the shelves, with the result that the circulation may be impeded in a particular portion of the storage space and accentuated in another, and substantial variations in refrigerating action obtained. With the present improvements the cold air from the evaporator unit is conducted to the bottom of the storage space by a duct, the walls of which separate the descending cold air current from the ascending currents of warmer air to prevent deflection and diffusion of the former by the latter, and facilitating the air circulation as a whole.

It is a further object of the invention to arrange the food holding compartments in tiers on opposite sides of the cold air duct whereby the cold air stream can be apportioned to each tier as varying refrigerating requirements may dictate.

Another object of the invention is to provide a refrigerator having food compartments which are in the form of drawers having heat insulated forward end walls which constitute the front of the refrigerator, the adjacent edges of contiguous drawers having gaskets which mutually cooperate to provide a tight construction therebetween when the drawers are closed.

A further object of the invention is to provide drawer compartments which have the bottoms, and preferably the side walls, provided with openings or vents to permit the circulation of air therethrough when the drawers are closed, and improved automatically operable shutter or closure members for said openings of the type disclosed in the Paul C. Warren Patent No. 1,943,643, granted January 16, 1934, whereby loss of cold air from the opened drawers is avoided and excessive rise in temperature within the refrigerator is prevented during opening and closing of the drawers.

Other objects relate to various features of construction and arrangement of parts which will be apparent from a consideration of the following specification and accompanying drawings, wherein:

Figure 1 is a perspective view of a refrigerator embodying the present improvements.

Figure 2 is a sectional view taken on line 2—2 of Figure 3.

Figure 3 is a sectional view taken on line 3—3 of Figure 2.

Figure 4 is a sectional view taken on line 4—4 of Figure 2.

Figure 5 is a sectional view taken on line 5—5 of Figure 2.

Figure 6 is a broken perspective of one of the slidable food holding drawers or compartments.

Figure 7 is a broken sectional view taken on line 7—7 of Figure 4, illustrating an adjustable baffle.

Figure 8 is a front elevation of the refrigerator, showing a door of the air cooling duct in which the evaporator coils are located in open position and portions of adjacent drawer ends broken away.

Figure 9 is a broken sectional view taken on line 9—9 of Figure 8.

Figure 10 is a sectional view taken on line 10—10 of Figure 8.

Figure 11 is an enlarged broken sectional view through the abutting edges of two drawers.

Figure 12 is a sectional view corresponding to Figure 7 but illustrating a modification of the adjusting means for the baffle or deflector.

Figure 13 is a section taken on line 13—13 of Figure 12.

The refrigerator illustrated in the drawings has a casing 10 designed to resemble a cabinet and is provided with a top 11 preferably corresponding in height to a conventional table. The top may be of vitreous enamel and constitutes a table top for use in performing the usual kitchen or culinary duties. The casing 10 is designed to accommodate a number of drawers 12, 13 and 14 and a bin 15 at the right hand side for the accommodation of cutlery, silver ware or food which does not require refrigeration.

The bin 15 is pivoted at 15a as shown in Figure 5 to enable the same to be tilted outwardly. The bin is relatively short from front to rear to provide a chamber 16 at the rear thereof for the accommodation of a refrigerator power and compressor-condenser unit indicated generally by the numeral 17, the chamber being separated from the bin and drawers by a double walled partition 18. The rear wall of the chamber 16 is provided with a detachable aperture closure 19. The refrigerating unit 17 may be of conventional construction and per se forms no part of the present improvements.

As shown in Figure 2, the drawer and bin portion above described is not heat insulated while the remainder of the interior is provided with insulating material 20 confined between the outer casing 10 and top 11 and an interior shell or lining 21 which defines the refrigerating portion of the refrigerator. The refrigerating portion of the interior is divided into two sections 22 and 23 by two spaced partitions 24 and 25 which define therebetween a cold air circulation duct 26.

The partitions 24 and 25 extend throughout the depth of the interior of the refrigerating portion and are shown as attached by flanges 24a, 25a at the upper ends thereof to the ceiling or roof of the lining 21. The partitions are adequately spaced apart at their upper portions to accommodate a conventional evaporator-coil unit therebetween, the unit being indicated by numeral 27. Ice trays 28 and drip pan 29 of conventional forms are illustrated in association with the unit in Figures 2 and 8. Condensed refrigerant is conducted to the evaporator from the unit 17 by conduits now shown.

The partition 24 and 25 are provided with air inlet ports 24b, 25b respectively adjacent the upper ends thereof and with outlet ports 24c, 25c at the lower ends. The forward face of the air duct 26 in the upper portion of which the evaporator unit is located, is closed at the lower portion by a plate or post 30 while the upper portion is closed normally by a door 31 adapted to be opened to provide access to the evaporator unit, the trays 28, pan 29 and a control 32.

In the two refrigerating sections 22 and 23 are located food compartments preferably in the form of drawers, compartments designated 33, 34, 35 and 36 being in section 22 and compartments 37 and 38 in section 23. The drawers are somewhat narrower than the respective sections to provide vertical passages 38 and 39 in section 22 and passages 40, 41 in section 23 as shown in Figure 2. The drawers are provided with suitable slides 42 by means of which they can readily be drawn outwardly of the respective sections to provide access to the contents.

All the drawers of the two sections except drawer 36 are shown as having openings 43 in the bottoms 44 and openings 45 in the side walls 46 to admit the passage of air currents into and through the drawers to refrigerate the contents thereof. The vented drawers mentioned are provided with shutters or closure members which are arranged to close the openings automatically to entrap the cold air therein when the respective drawers are drawn outwardly, and thus reduce the amount of air of room temperature which is carried into the refrigerator when the drawers are returned to closed position.

In Figure 6 a slidable closure member 47 in the form of a plate provided with openings 47a is illustrated as disposed beneath a bottom 44 and closure members 48 disposed on the outer vertical sides of the side walls 46 and provided with openings 48a. The closure members 48 are shown as secured to the bottom closure member 47 by inter-connected tongues 49 to enable the closure members to be operated longitudinally of the drawer by the same operating means. The closure members are slidably secured to the drawers by ears 50.

The operating means for the closure members comprise a pair of headed studs 51 extending rearwardly from the rear of the bottom closure member 47 through apertured depending ears 52 carried by the rear wall 53 of the drawer. The studs are arranged to abut the rear wall of the refrigerator lining when the respective drawers are closed, which effects the forward shifting of the closure members to cause the apertures 47a, 48a thereof to register respectively with the openings 43 and 45 of the bottom and side walls. Currents of air can thus pass through the openings into the drawers and around the contents thereof when the drawers are closed. When the drawers are moved outwardly, springs 54, disposed on the studs 51 between the heads thereof and the ears 52, shift the closure members rearwardly relatively to the drawer thereby moving the apertures 47a, 48a out of registration with the respective openings 43 and 45 and thus closing the latter and preventing gravitation of cold air through the openings.

The lower drawer 36 of section 22 is illustrated as a hydrator compartment for fresh vegetables and preferably has no openings in the bottom and side walls. The drawer 37, which is relatively deep from top to bottom may be used for bottled beverages or the like.

All the drawer compartments except drawer 36 preferably are provided with reticulated false bottoms 55 and may have similar side walls 56 which prevent articles of food or dishes being so placed as to obstruct the passage of air through the drawer openings and thus impairing circulation of cold air through the drawers.

The door 31 and the fronts of the drawers of the respective refrigerating compartments are insulated as illustrated in Figures 3 and 4, the fronts of the drawers 33 to 38 inclusive being designated 33a, to 38a respectively.

As illustrated in Figure 3 the lower edge of each drawer front and the upper edge of the subjacent drawer is provided with gaskets to provide a tight seal therebetween when the drawers are closed. In Figure 11 an enlarged section of the contacting gaskets is illustrated. The gaskets 47 are preferably of flexible material and are provided with convolutions which extend longitudinally of the edges of the drawer front and are so arranged that the crests of the convolutions of the lower gaskets contact with the corresponding portions of the upper adjacent gaskets when the drawers are closed, thus providing a series of air spaces which insulate and seal the space between the respective drawer fronts. The gaskets, being flexible, do not bind one upon the other to materially resist opening movement of a drawer. To prevent the opening movement of one drawer causing an adjacent drawer to be pulled outwardly also due to the slight friction between the same and due to the action of the springs 54, the drawers preferably are provided with ball catches 58 of conventional form which tend to retain the drawers in closed position. Sockets 58a (see Fig. 6) in which the catches seat when the drawers are in closed position, may be provided in one or more of the clips 59 of each drawer.

Similar gaskets are provided on the vertical edges of the drawer fronts for cooperation with corresponding gaskets carried by abutting edges of adjacent drawers, as illustrated in Figure 10 or for cooperation with like gaskets on the margins of the door openings as illustrated in Figures 9 and 13 to prevent air leakage or heat transfer around the drawers when closed.

It will be seen that the air in the circulating air duct 26 will be cooled by the unit 27 and being confined by the partitions 24, 25, the air will gravitate and pass laterally from the duct

through the outlets **24c**, **25c** and displace warmer air in the upper portions of the sections **22**, **23** through the respective intake ports **24b**, **25b**, which air, on becoming cooled by the unit, descends through the duct. The air thus moves upwardly, through the sections **22**, **23** and in so doing passes through the openings in the bottoms and side walls of the drawers and thence around the content thereof and also along the side walls in the passages **38** and **39**. Short circuiting of the air currents resulting in excessive refrigeration of a portion of the storage space at the expense of another portion or portions due to improper arrangement of dishes or packages is precluded by the described arrangement since all the air cooled by the unit must descend to the bottom of the storage space and produces its major refrigerating effect during the forced upward passage through and around the food compartments.

In order to vary the flow of cold air to one section or the other a laterally shiftable baffle or deflector **59** is provided on the floor of the storage compartment in alignment with the duct **26**. As illustrated this baffle comprises a sheet of metal of substantially conical shape in cross section and extending from the front to the rear wall of the storage space. In Figure 7 the baffle is shown with slots **60** in the lateral portions through which project bolts **61** having wing nuts **62** by means of which the baffle can be secured in the central position shown in Figure 7 to apportion the flow of cold air equally to the two refrigerating sections or in a position to one side of the central position to deflect more cold air to one section than to the other. Thus should a quantity of fresh food be placed in one section, the baffle can be adjusted so as to deliver more cold air to that section. In the event a user finds that the drawers of one section are opened more frequently than the drawers of another section, the baffle can be adjusted to compensate for the greater refrigeration demand of the particular section.

In Figures 12 and 13 the baffle or deflector **59** is shown with more convenient adjusting mechanism comprising a shaft **63** journaled at **64**, **65**, and having an operating handle **66** which is disposed inwardly of the ends **36a** and **38a** of the drawers **36** and **38** respectively, the post **30** being provided with a recess **67** to accommodate the handle. The shaft is provided with front and rear pinions **68** which mesh with racks **69** carried by the baffle **59** whereby movement of the handle in one direction shifts the baffle in the same direction to vary the proportion of air delivered to the refrigerating sections. The baffle can be conveniently adjusted by pulling drawers **36**, **38** outwardly a distance sufficient to provide access to the handle which normally is concealed by the drawer ends.

By means of the present improvements not only can a selected refrigerating effect as between the two sections be obtained, but a more uniform temperature within the refrigerator can be maintained due to the air circulation arrangement and the loss of a minimum quantity of cold air upon opening the drawers.

While we have shown and described certain embodiments of our improvements for the purpose of illustration, we do not wish to be restricted specifically thereto except as so limited by the appended claims.

We claim:

1. A refrigerator provided with a pair of spaced partitions dividing the interior into independent refrigerating sections and providing an air duct therebetween, inlet ports at the upper ends and outlet ports at the lower ends of said partitions, a cooling unit in said duct, a plurality of outwardly movable vertically spaced food compartments in each of said sections having openings through which air can pass, said compartments having insulated forward ends arranged to cooperate mutually when in closed position to close the forward faces of the respective sections, and laterally adjustable means at the lower end of said duct for variably apportioning the air delivered to said sections by said outlet ports.

2. A refrigerator provided with spaced partitions dividing the interior into separate refrigerating sections, said partitions having ports adjacent the upper and lower ends thereof and imperforate intermediate sections and defining therebetween an air circulation duct common to said sections, a cooling unit in said duct for cooling the air stream descending therethrough from the upper portions of said sections to the lower portions thereof, and outwardly movable food compartments in said sections arranged in tiers and provided with openings whereby the air ascending from said lower to said upper ports can circulate through said compartments.

3. A refrigerator provided with spaced partitions in the interior dividing the same into two independent refrigerating sections and defining a cold air duct therebetween, inlet ports at the upper end and outlet ports at the lower portions of said partitions communicating with the respective sections, a cooling unit in said duct for cooling the air therein and effecting the circulation of air downwardly through said duct and through said outlets into the respective sections and upwardly through the latter and through said inlets into said duct, and a laterally adjustable baffle disposed adjacent one end of said partitions for controlling the flow of air through the adjacent ports.

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WALTER BOYDSTON.