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2,626,508

OPEN-TOP REFRIGERATED DISPLAY CASE

Filed Jan. 12, 1949

3 Sheets-Sheet 1

FIG. 1.

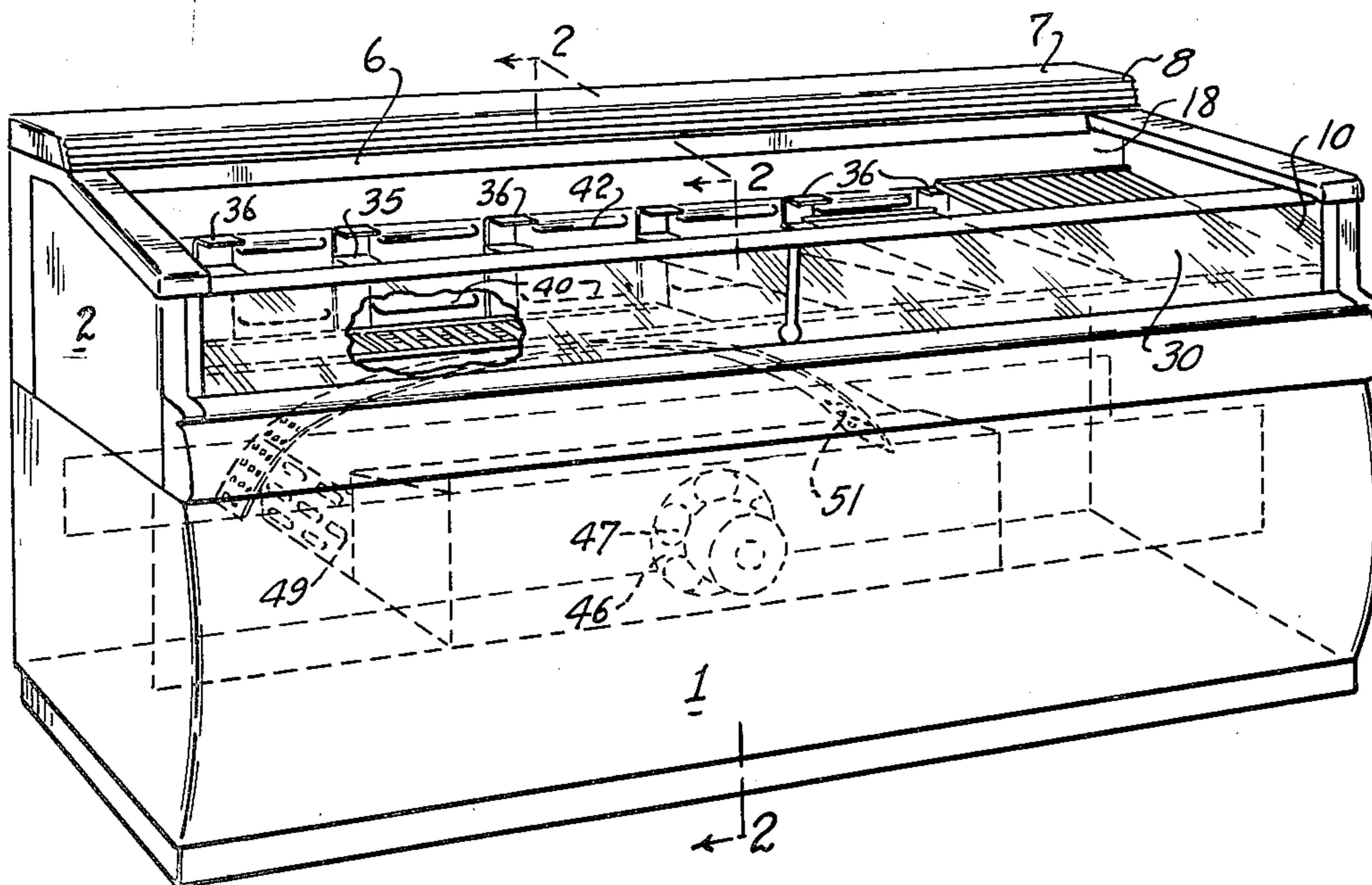
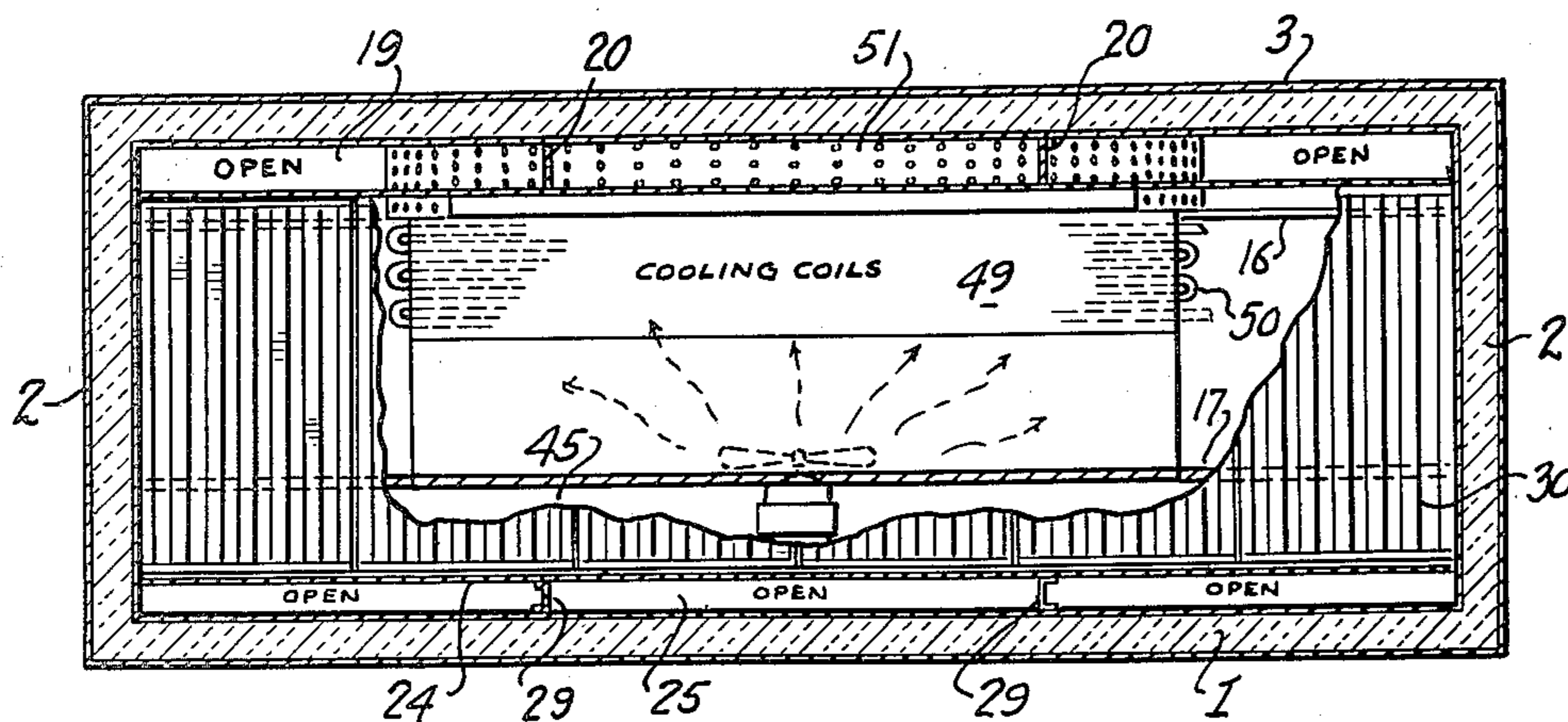


FIG. 3.



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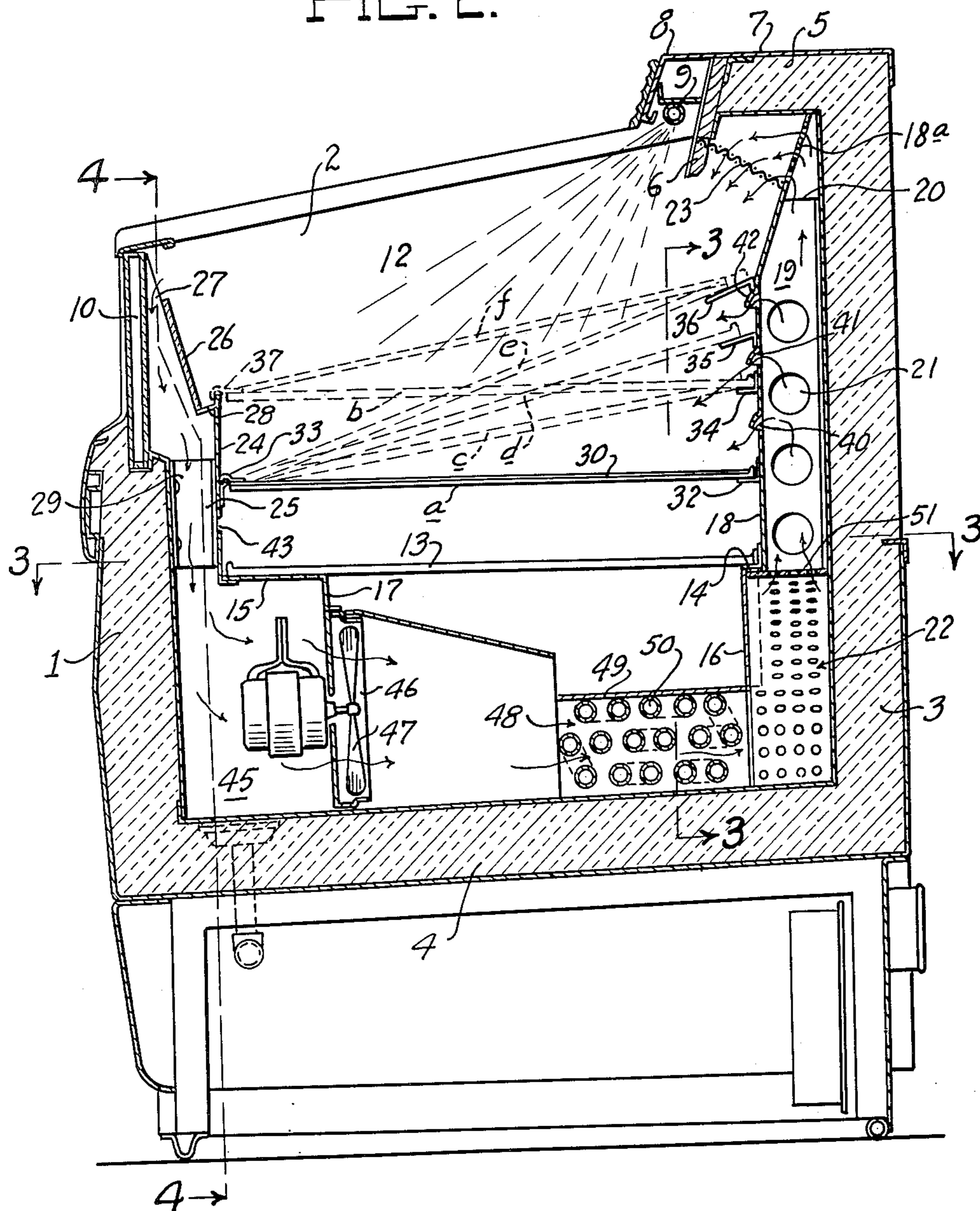
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3 Sheets-Sheet 2

FIG. 2.



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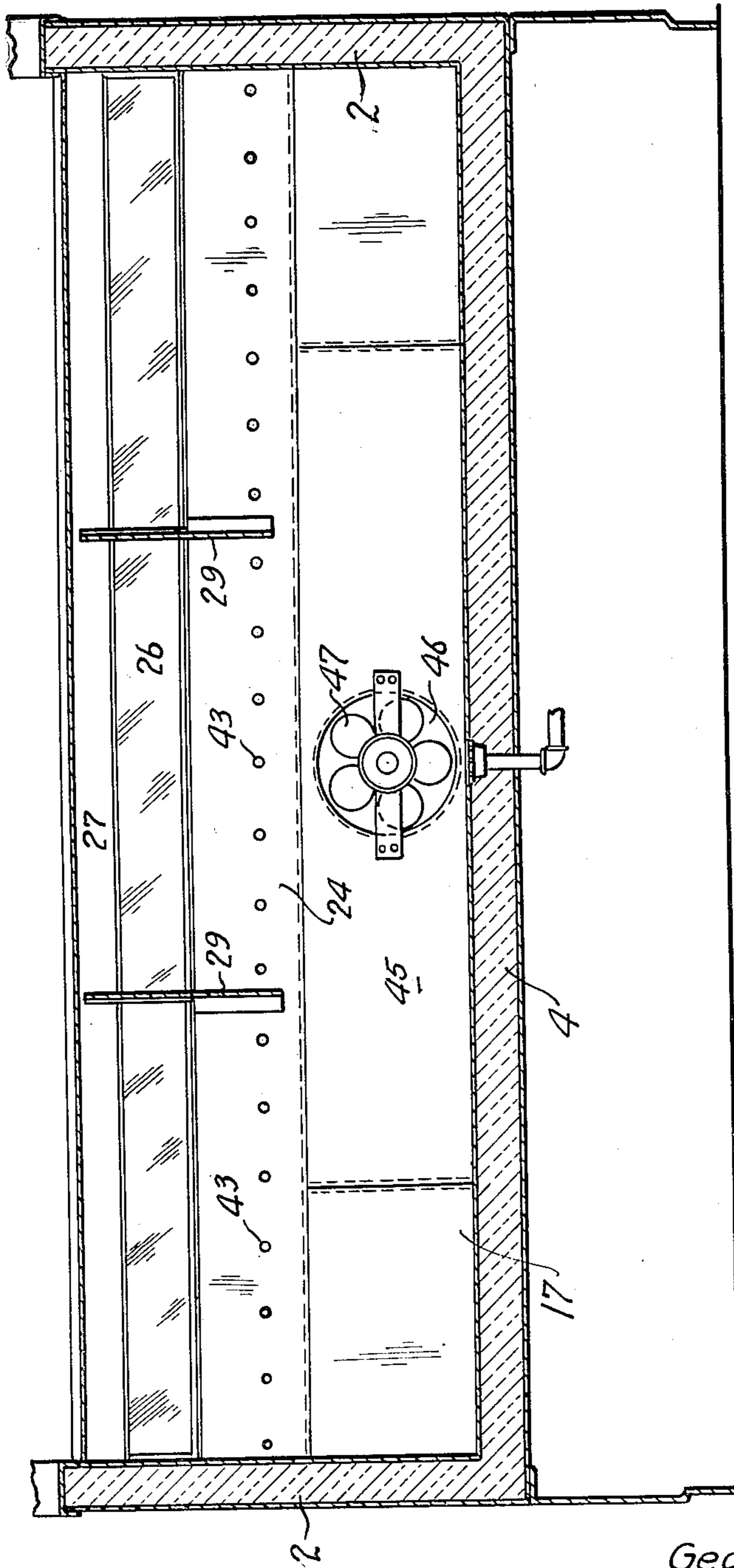
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3 Sheets-Sheet 3

FIG. 4.



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OPEN-TOP REFRIGERATED DISPLAY CASE

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7 Claims. (Cl. 62—89.5)

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This invention relates to open-top refrigerated display cases of the type used in food stores to display merchandise of a perishable nature.

The primary object of the invention is to improve on refrigerated display cases of this character by effecting a more efficient and uniform cooling of produce with a less loss of cooled air to the outside atmosphere than with the cases now generally used, and to accomplish this in a simple and economical manner.

Other objects and advantages of the invention will be apparent from the following detailed description, and from the accompanying drawing illustrating a preferred embodiment thereof, in which—

Fig. 1 is a front perspective view of a case embodying the invention; Fig. 2 is an enlarged section thereof on the line 2—2 in Fig. 1, and Figs. 3 and 4 are reduced sections taken on the lines 3—3 and 4—4, respectively, in Fig. 2.

Referring to the drawings, 1 designates the front wall 2, 2 the opposing end walls, 3 the rear wall and 4 the bottom of the case body. The rear wall 3 extends above the level of the front wall, and is provided at its upper end with a forwardly extending top 5 that is narrow in its forward extension so as to provide a top access opening to the interior of the case of considerable area between said top and the front wall of the case. The front edge of the top 5 is provided with a downwardly extending baffle 6 that is preferably but necessarily forwardly inclined. A metal facing sheet 7 for the top extends forwardly a distance from the front edge of the top and then downwardly a short distance on a forward incline to form a front canopy 8 the full length of the top. A source 9 for directing a light into the case is disposed under the canopy 8 and preferably extends substantially the length of the case. The exposed front side of this canopy forms a price tag rail.

The front body wall 1 is considerably lower than both the rear wall 3 and the end walls 2,2, and is extended to near the level of the front end edges of the end walls by a front wall part 10 preferably of glass, so that the produce in the case may be viewed therethrough. The top edges of the end walls extend rearwardly on a slight incline to the lower front edge of the canopy 8. The baffle 6 extends down a distance into the case with its lower edge below the level of the high rear end portion of the ends 2,2, and preferably above the level of the top edge of the front wall part 10. In the present instance, the bottom edge of said baffle is approximately half way between the top edge

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level of the part 10 and the bottom edge level of the canopy front.

The interior of the case is provided in its upper portion with an open-top produce display chamber 12, the bottom of which is indicated at 13 and may comprise sheet metal sections that are removable to permit access to parts below and which rest at their rear end edges on a rear ledge 14 and at their front end edges on a front ledge 15. The ledges 14 and 15 are formed at the upper edges of rear and front vertical partitions 16 and 17, respectively, which extend the full length of the interior of the case with both partitions spaced from the respective rear and front case walls.

The rear wall of the display chamber 12 is formed by a vertical partition 18 extending upward from the rear edge of the ledge 14 to near the top 5 at the rear of the baffle 6 throughout the length of the case and in forwardly spaced relation to the rear wall 3 to form a vertical flue 19 therebetween. This flue is divided lengthwise into a plurality of sections by vertical webs 20 serving as braces for the partition 18. These webs are provided with openings 21 for the free passage of air therethrough.

The flue 19 at its lower end communicates with and is supplied with cool air from a distributing chamber 22. The upper end of the flue 19 is preferably somewhat restricted by reason of the upper end portion of the partition 18 being slightly rearwardly inclined at such point so that the discharge of air from the flue is upward under the top 5 and thence forward and downward under the baffle 6 into the top rear portion of the display chamber 12. The air in its discharge from the flue into the interior of the case is diffused and retarded to some extent by a screen or foraminous partition 23 which extends rearwardly and downwardly from the baffle 6 a distance above its lower edge portion of the partition 18. Upwardly beyond this point, the partition 18 is preferably formed with a perforated or slotted extension 18a which tends to further diffuse and retard the air in its discharge from the flue 19 into the case.

A partition 24 extends upward from the forward edge of the ledge 15 for the entire length of the case and in rearwardly spaced relation to the front wall to form the flue 25 in the front portion of the case. The partition 24, in the present instance, extends vertically to near the lower edge of the front wall part 10 and then continues upward at a forward incline, as shown at 26, to a short distance below the top of the wall part

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10 and in rearwardly spaced relation thereto to provide a narrow slot-like entrance 27 to the upper end of the flue 25. The parts 24 and 26 of this partition, in the present instance, are shown as connected by an offset 28, and the part 26 is preferably of transparent glass to permit articles in the case to be viewed therethrough. A plurality of bracket plates 29 are attached to the inner side of the front wall 1 and serve as supports and braces for the partitions 24 and 26.

The produce is supported in the case by a shelf 30 extending the entire length of the display compartment 12 and slatted or perforated to permit the circulation of air therethrough. The shelf 30 is preferably composed of a plurality of rectangular tray-like members placed side by side to permit any or all to be removed or vertically adjusted. These trays are adapted to be placed in various positions best suited to the display of the particular merchandise in hand and also for the selective distribution of cold air above and below the shelf, as hereinafter described. For this purpose, the trays may be placed in different vertically spaced horizontal positions *a*, *b*, or inclined upwardly and rearwardly from either of such positions, as shown at *c*, *d*, *e* and *f* in Fig. 2, or the trays may rest on and be supported by either the bottom 13 or the ledges 14 and 15. In the *a* position, a tray is supported at its rear end by a ledge 32 on the front of the rear flue wall 18, and at its front end by releasable hooked engagement with the front partition 24, as shown at 33. The trays may be tilted from this position to any of the positions *c*, *d* and *e* by raising their rear ends to be supported, respectively, by ledge brackets 34, 35 and 36 provided in superimposed relation on the front side of the partition 18. When the trays are in the raised horizontal position *b* they are supported at their rear ends by the ledge 34 and at their front ends by the hooked connection 37 with the partition 24. The trays may be tilted from this position to the position *f* by resting their rear ends on the ledge brackets 36. If desired, the trays 30 may be removed and the produce supported by the bottom trays 13.

The partition 18 is provided lengthwise thereof between the ledges 32 and 35 with a plurality of louvered openings 40 and also with similar openings 41 and 42 between the ledges 34 and 35 and the ledges 35 and 36, respectively. These openings direct air from the flue 19 forwardly and downwardly into the compartment 12 below the shelf trays 30 when in any of their several positions, except, in the present instance, the bottom position *a*. These openings, or some of them, also serve to direct air into the compartment above the trays when in the various positions other than *e* and *f*.

The front partition 24, in the present instance below the tray position *a*, is provided with a series of comparatively small openings 44 for the exit of air from the compartment 12 to the interior of the down flue 25. These openings combined with the inlet openings 27 for the flue 25 are of sufficient combined area to take care of the low pressure cold air admitted to the compartment 12 through the various openings from the flue 19.

The flue 25 opens at its lower end into a plenum chamber 45 formed at its rear side by the partition 17, and this partition has an opening 48 in its central portion through which a motor driven fan 47 drives the air rearwardly through a broad flue 48 having a restricted portion 49 at its rear end in which a cooling coil 50 is disposed to cause the air passing therethrough to be cooled the desired extent. The rear end of the flue part 49

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opens into the air distributing chamber 22 in the lower portion of the flue 19. While the flue part 49 is restricted in width relative to the length of the case, it is still of considerable width, as shown in Fig. 3. The chamber 22 into which the flue 49 discharges is formed at its top and sides by a semicircular perforated or foraminous baffle 51, which causes the air discharged into the chamber 22 to be trapped and pressurized and evenly distributed into the central and end portions of the flue 19. The baffle 51 is disposed between the rear wall 3 and partition 18. This is found to be an important feature for the completely satisfactory operation of a case constructed as shown.

In the operation of the case, air is drawn from the display compartment 12 through the inlet openings 27 and 43 to the flue 25 and thence to the chamber 45 by the action of the fan 47, and is forced by the fan through the cooling coil flue 49 and into the distributing chamber 22 where it is pressurized and its flow restricted by the perforated arcuate baffle 51. This baffle causes the air to be distributed uniformly, vertically and sidewise into the bottom of the up flue 19 so that the air flow throughout the entire horizontal length of the flue is substantially equalized. Some of this air in its passage up the flue is distributed to the chamber 12 through the louvered openings 40, 41 and 42, with more or less of it passing under the merchandise supporting shelf 30, depending on the adjusted position of the shelf trays or sections except when resting on the bottom 13 or when in the lower horizontal position *a*. The louvers, which are above the shelf in any position of its adjustment, are designed to direct the discharging air down onto the shelf and onto the produce supported thereby, while those that are below the shelf, which is in all positions except *a*, cause a supply of cold air to flow beneath the shelf, a portion of which discharges to the flue 25 through the openings 43 with the balance passing up through the slatted or perforated shelf and around the produce thereon. This manner of circulation causes distribution of cold air directly to the bottom of the produce so that its lower portion is maintained at a substantially uniform temperature with its upper portion that is cooled by the discharge of cold air into the upper portion of the chamber. This is an important feature, for in systems where the cold air passes either up or down, but not both, through the shelf and supported merchandise, the air is warmed in its contact with the merchandise, so that the far side of the merchandise with respect to the air flow is necessarily warmer than the near side. This is especially true with respect to large produce articles or packages, such for instance as meat, and may result in such a temperature differential in the package that portions may not be maintained at a safe temperature to prevent spoilage or objectionable bacteria formation. The extent of cold air caused to be discharged below the shelf and to pass upward therethrough depends, of course, upon the adjusted position of the shelf and the number and extent of louver openings 41 and 42 that have their discharge below the shelf. The cold air that is discharged above the shelf through the louvered openings from the up or cold flue 19 is directed downwardly against the produce on the shelf and flows slightly thereover to its point of discharge from the chamber through the outlet flue opening 27. At the same time the stream of cold air discharging from the top of the flue 19 under the baffle 6, and the air

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rising through the shelf 30, commingle with the air discharging from the louvered openings and passes therethrough into and down the discharge flue 25. The air discharging from the flue 19 is at a relatively lower pressure than that passing through the return flue 25.

The air discharging into the chamber 12 from the upper end of the flue 19 forms a blanket of cold air over the air discharging from the louvered openings and compensates to a large extent for the heat taken up from the produce by such louver discharging air. This also protects the produce contacting air from the warmer outside air.

In practice, it is preferable to have the air discharge into the chamber 12 from the upper end of the flue 19 above the level of the top edge of the front wall part 10. It is also preferable to pull only a limited quantity of air from the lower portion of the chamber 12 through the small openings 43 sufficient only to maintain a slow circulation through the area beneath the shelf with a considerable portion passing up through the shelf. The amount of refrigeration underneath the shelf is determined by the position of the shelf, and consequently the number of effective openings 40, 41 and 42 available for the purpose. Thus, a raising of the shelf position increases such refrigeration and a lowering decreases it. It is found in practice that no particular advantage would be derived by controlling the discharge through the openings 43 by use of a valve and for this reason no valve has been shown. However, such a controlled discharge may be employed if desired. It is further found in practice that with the circulation as illustrated the air is forced out of the top of the flue 19 at the back of the chamber 12 at low velocity, and is taken in the narrow flue opening 27 near the top edge of the wall part 10 at high velocity, and that this minimizes the amount of cold air spilled to the atmosphere and also the amount of warm air taken in from the outside.

I wish it understood that my invention is not limited to any specific construction, arrangement or form of the parts, as it is capable of numerous modifications and changes without departing from the spirit of the claims.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent, is:

1. In an open-top refrigerated display case, a produce display chamber, a broad flue for directing cold air to said chamber, means for forcing cold air through said flue, and an arcuate perforated baffle in the inlet end of the flue serving to pressurize and distribute the air in various directions into the flue to render the air flow substantially uniform throughout the broad area of the flue.

2. In an open-top refrigerated display case, a produce display chamber, a broad vertical flue for directing cold air to said chamber, an arcuate perforated baffle forming an air distributing chamber in the lower end of said flue, said distributing chamber being of less width than said flue and said baffle having its bowed side upward whereby air is distributed upward and sideways therethrough to the flue, and means for cooling and forcefully discharging air into said distributing chamber.

3. In an open-top refrigerated display case having front, rear and end walls, means within the case forming an open-top produce display chamber and vertical flues at the front and rear

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sides thereof, the flues being narrow from front to rear and substantially corresponding in width to the horizontal length of the chamber, the rear flue having a plurality of vertically spaced rows of louvered openings directing air downwardly therefrom into said chamber, and said front flue having its top open to the chamber below the top of the front wall and having a lower series of openings for the inlet of air from the chamber, a produce supporting shelf having provision for the passage of air therethrough, means for supporting the front edges of the shelf above said lower series of openings to the front flue, and a plurality of vertically spaced supports at the front of said rear flue to selectively support the rear edge of the shelf in different vertically spaced positions to place a greater or less number of said rear louvered openings below the shelf, and means below said chamber communicating with the lower ends of said flues and operable to create an up draft through said rear flue and a down draft through said front flue.

4. In an open-top refrigerated display case having front, rear and end walls, means within the case forming an open-top produce display chamber and vertical flues at the front and rear sides thereof, the flues being narrow from front to rear and substantially corresponding in width to the horizontal length of the chamber, the rear flue having a plurality of vertically spaced rows of louvered openings directing air downwardly therefrom into said chamber and said front flue having its top open to the chamber below the top of the front wall and having a lower series of openings for the inlet of air from the chamber, a produce supporting shelf having provision for the passage of air therethrough, means for supporting the front edges of the shelf above said lower series of openings to the front flue and a plurality of vertically spaced supports at the front of said rear flue to selectively support the rear edge of the shelf in different vertically spaced positions to place a greater or less number of said rear louvered openings below the shelf, means communicating with the lower ends of said flues and operable to create an up draft through said rear flue and a down draft through said front flue, and an arcuate perforated baffle in the inlet end of the rear flue to pressurize and distribute the air in various directions into the flue to render the air flow substantially uniform throughout the broad area of the flue, said baffle disposed widthwise of the lower end portion of the rear flue and having its convex side upward and its concave side disposed toward and receiving the air from the said draft creating means.

5. In an open-top refrigerated display case having front, rear and end walls, means within the case forming a produce display chamber, a second chamber therebelow and vertically disposed flues connecting said chambers at the inner sides of two opposing walls of the display chamber, one flue being for cold air and the other for relatively warm air, a shelf in said display chamber spaced from its bottom and having openings for the passage of air therethrough, said cold air flue having provision for discharging air therefrom into the display chamber at at least one side of said shelf, and said other flue having provision both below and above the shelf for the inlet of air thereto from the display chamber, and means in said second chamber for drawing air from said warm air flue and cooling and forcing it through said cold air flue.

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6. In an open-top refrigerated display case having front, rear and end walls, means within the case forming an upper produce display chamber and a lower chamber and vertically disposed flues at the inner sides of two opposing walls of the upper chamber, one flue being for cold air and located at the rear of the upper chamber and the other flue being for relatively warm air, said cold air flue having openings for discharging air into the rear of said upper chamber, a produce supporting shelf in said upper chamber in vertically spaced relation to its bottom and being vertically adjustable relative to the discharge openings in said cold air flue to vary the amount of cold air discharging into the chamber below the shelf, said shelf having provision for the passage of air therethrough from the upper to the lower portion of its chamber and said warm air flue having provision for the inlet of air thereto from the upper portion of said upper chamber above the shelf and also from the lower

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portion thereof below the shelf, and means in the lower chamber for drawing air from said warm air flue and cooling and forcing it through said cold air flue.

7. A combination as called for in claim 6 wherein the openings from the cold air flue are at different levels and some at least thereof are louvered to direct the discharging air downwardly into the upper chamber.

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