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C. B. SHREVE
REFRIGERATED SHELVING

2,528,916

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2 Sheets-Sheet 1

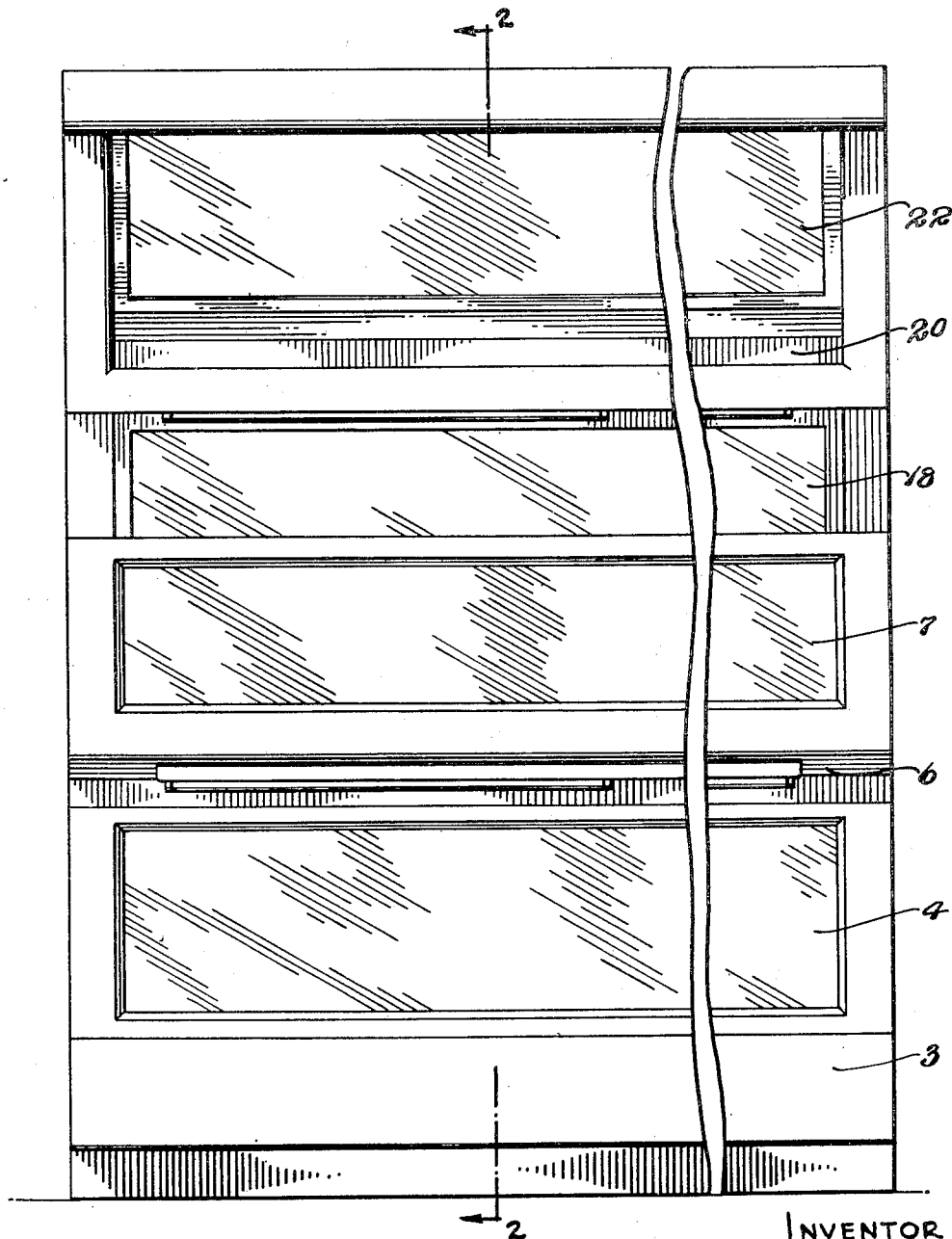


FIG. 1.

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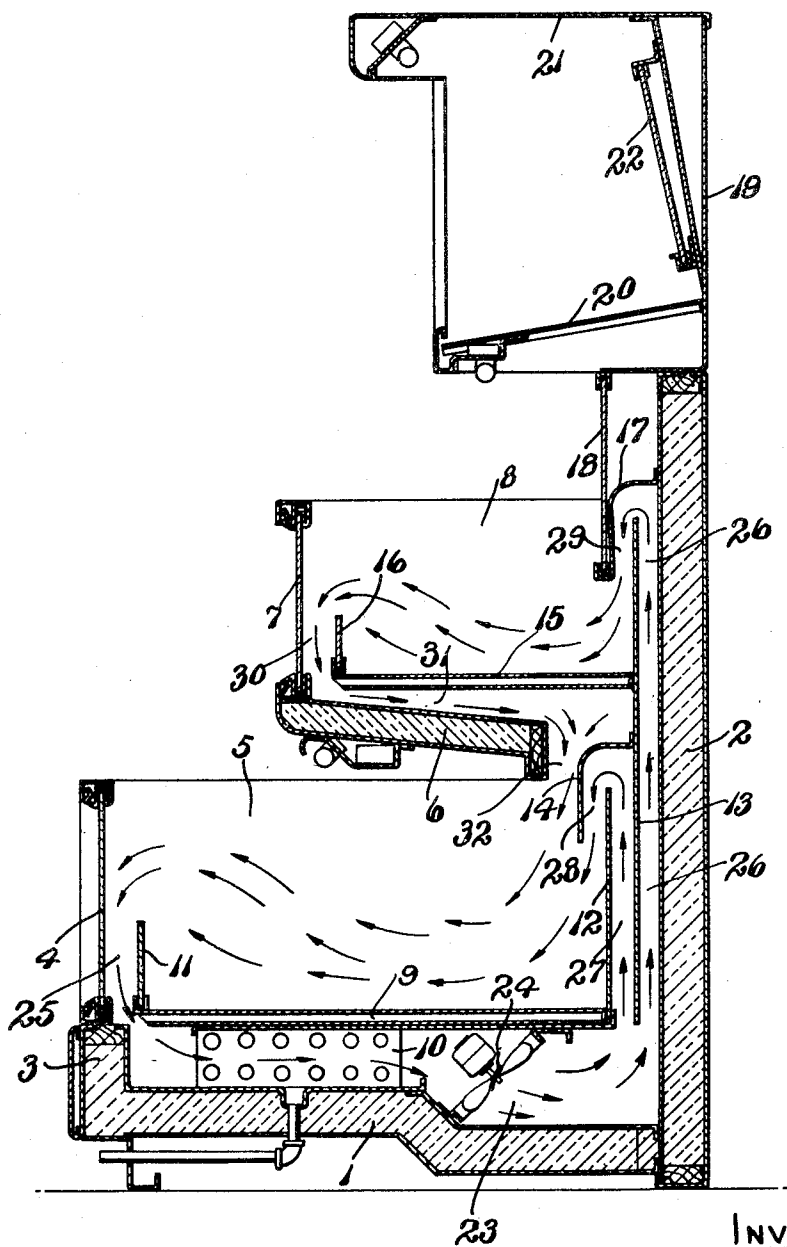


FIG. 2.

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UNITED STATES PATENT OFFICE

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REFRIGERATED SHELVING

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5 Claims. (Cl. 62—89.5)

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This invention relates to refrigerated shelving. The holding and display of merchandise which, in order to prevent spoilage and other damage, is to be kept at a low temperature has, in the main, been by placing the merchandise in rather deep well cabinets having an open top and refrigerating the cabinet so as to maintain the merchandise within it at the desired low temperature. With an open top cabinet with a well for holding the merchandise, the cold air, being of greater weight than warmer and more expanded air, tends to take a lower level and remain in the well and rises and expands from heat taken from the merchandise, or in part from the outside. There is little or no circulation in said well except what may come from convection currents due to the taking on of heat from the merchandise by the air within the well.

Shelving in the past has not generally been used for refrigerated items of merchandise, though it has been recognized as the most attractive and efficient means of displaying such merchandise. The difficulties encountered include uneven stratified temperatures, and abnormally high barriers to retain the cold air, which has made it impractical for self-service retail stores. Also there has been required the sacrifice of usable and acceptable display space for housing and baffling the refrigerator coil mechanism if conventional refrigerating cooling methods are used.

It is an object and purpose of the present invention to provide inexpensive and efficient means of displaying food and other perishable merchandise which requires refrigeration while on display, and in a manner that the merchandise may be plainly viewed by the prospective customer and is readily accessible for self-service, and at the same time reduce to a minimum the space required for the refrigerating coil mechanism which will be located in the base of the shelving structure and from and over which the low temperature air produced by it is forced through the merchandise and conducted back to the refrigerating coil and the passage in which it is located, with little and comparatively no loss of refrigeration through the cooled air spilling out at the front of the shelving. The air, the temperature of which has been raised by circulating through the merchandise to maintain it at the desired low temperature, is returned for recirculation, with small refrigeration losses.

With my invention a plurality of shelves for carrying merchandise, located one over the other, may be provided and with which, if desired, mir-

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rors to properly reflect the merchandise are supplied at the rear of the shelving structure with cold air carrying ducts and the air forced downwardly at the rear of the shelves and above them so that it is carried through the merchandise between the rear of the shelves and the front thereof and is returned to the bottom structure and held from spilling out at the front of the shelf structure by suitable air dams or weirs which do not interfere with the display of the merchandise or accessibility thereto.

The shelves for holding the merchandise are spaced from each other vertically and may be multiplied in number from the lowest to the uppermost.

An understanding of the invention may be had from the following description, taken in connection with the accompanying drawings, in which, Fig. 1 is a front elevation of a refrigerating shelving structure made in accordance with my invention, and

Fig. 2 is a vertical section from front to rear therethrough, substantially on the plane of line 2—2 of Fig. 1.

Like reference characters refer to like parts in the different figures of the drawings.

In the structure embodying my invention, a bottom 1, generally horizontal and suitably insulated against the passage of heat, is provided, and at the rear edge of it a back wall 2, likewise of heat insulation structure, is securely connected. At the front of the bottom 1 a short vertical wall 3 extends upwardly and above it a glass 4, mounted in a holding frame therefor, is located, which provides a front holding dam against air spilling out at the front of the shelf structure, and through which the merchandise held on a shelf back of said dam may be readily viewed. End members 5 extend from the ends of the frame carrying the glass 4 rearwardly, their upper edges being located in the same plane with the upper edges of said frame.

A generally horizontal, though somewhat downwardly and rearwardly inclined partition 6 is located a short distance above the plane of the upper edges of the ends 5, and has its rear edge spaced from the back wall 2 and its front edge located back of the frame carrying the glass 4. At its front edge portion a second vertical frame, carrying a glass plate 7 is located, and ends 8 have their upper edges in substantially the same plane as the upper edge of the frame which carries the glass 7. The end parts 5 and 8 reach at their rear edges to the back 2 and at the lower edges of ends 5 to the bottom 1 and cover the space at both

ends between the rear edge of the division partition 6 and the back 2.

A horizontal bottom shelf 9 is located between the ends 5 over and spaced from the bottom 1 and in such space a refrigerating coil 10 is positioned for refrigerating air which passes through said space or passage. The shelf 9 terminates at its front edge short of the glass 4 and its frame, and of the upper end of the wall 3 and at its rear edge is spaced a distance from the back wall 2. It extends between the ends 5. At its upper side and at its front end a short vertical plate 11 is secured which extends upwardly less than one-half the height of the front dam 4. At its rear edge and extending upwardly therefrom is a higher vertical plate 12, the upper edge of which reaches substantially to the plane of the upper edges of the ends 5.

A vertical metal plate 13 is located in the vertical space between the rear plate 12 and the back wall 2, its lower edge reaching to the plane of the shelf 9 and its upper edge reaching nearly to the plane of the upper edges of the end members 8. This plate extends between the ends of the shelving unit. Over the upper edge of the plate 12 a hood 14 is secured made of flat metal welded or otherwise permanently fastened to the plate 13 and extending forwardly therefrom beyond the plate 12 and then bent downwardly to below the upper edge of said plate as shown.

A second horizontal shelf 15 is located over and spaced from the generally horizontal partition 6 extending at its rear edge to the vertical plate 13 and at its front edge terminating short of the front vertical dam 7. At its front edge and upper side a short vertical plate 16 is secured, the height of which is such that its upper edge is below the middle of the plate 7. A second hood 17, similar to the hood 14, is permanently secured to the front side of the back wall 2 and extends forwardly and then is curved downwardly in front of the upper portion of the plate 13.

A vertical plate 18 is secured at its lower edge to the hood 17 and extends upwardly approximately to the plane of the upper edge of the back wall 2. An upper shelf structure, not refrigerated, may be mounted above the back wall, said structure having a back 19, a downwardly and forwardly inclined shelf 20, a top 21 with ends (not numbered), being open at the front for access to merchandise carried on the shelf 20. An inclined mirror 22 is mounted in front of the back 19 as shown for reflecting the articles of merchandise carried therein. All of the merchandise carrying shelves may be lighted by the lights shown, which are carried at the under sides of the shelf 20 and the partition 6 and in the upper front portion of the upper compartment and underneath the top 21 thereof.

With this structure an air-carrying flue or passage 23 is provided underneath the shelf 9, in which a motor driven fan 24 is mounted which, when in operation, forces air to the rear. The air enters passage 23 through the flue or passage 25 between the front plate or dam 4 and the shorter vertical plate 11 back of it. The air is forced upwardly through the two flues 26 and 27, the first between the back wall 2 and the plate 13, and the second between said plate 13 and the plate 12. At the upper ends of said flues the air is changed in direction by the hoods 14 and 17, being directed downwardly from the passage 28 toward the lower shelf 9 and from the passage 29 toward the upper shelf 15, said passages 28 and 29 being, respectively, between the plate 12

and the hood 14, and the plate 13 and the hood 17. The air delivered out of the passage 28 and directed downwardly against the shelf 9 is forced around and over the merchandise in a forward direction and flows over the upper edge of the plate 11 into the passage 25, being thus returned to the refrigerating coil for cooling. The air delivered at the lower end of the passage 29 is directed downwardly toward the shelf 15, flows in a forward direction around and over the merchandise above said shelf and over the upper edge of the plate 16, and thence downwardly through a vertical passage 30 between the air dam 7 and the plate 16, and therefrom to the rear through the passage 31 between the upper shelf and the partition 6, and is then directed downwardly toward the shelf 15 through the passage 32 between the rear edge of the partition 6 and the hood 14. Such air flows through and over the merchandise on the shelf 9 and is returned to the refrigerating coil and the passage 23 through the vertical passage or flue 25. The air is thus re-circulated and is refrigerated between successive cycles of its circulation.

With the invention as disclosed, strata or layers of air of different temperatures in association with the food products or other merchandise which is to be maintained at a low temperature are eliminated. The circulating movement of the air eliminates the possibility of such different temperatures strata such as occur under substantially static air conditions. The heavier weight of the lower temperature air insures that such cooler air will not pass outwardly over the air dams 4 and 7, but will follow the passages 25 and 30. This results in economy in operation as there will not be a waste of electric current to refrigerate air lost by escaping to the outside. The structure is economical to build and the refrigeration mechanism occupies a minimum of space at a lower part of the unit and in space which would not otherwise be utilized, as the lowermost shelf, the one shown at 9, should not practically be at such a low level that access to merchandise immediately over its upper side is difficult. While two of the shelves 9 and 15 have been shown, it is apparent that the number of shelves vertically spaced from each other may be increased by an increase in the number of flues or additional flues, besides those shown at 26 or 27 for carrying the air forced from the single supply passage at 23 through which all of the air utilized passes, and is divided in its upward passage among the vertical flues.

The structure is economical to build and in service and is very practical and useful.

The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within their scope.

I claim:

1. A refrigerating shelf structure comprising, a generally horizontal bottom, a vertical back wall at the rear of the bottom, a vertically positioned air obstructing dam extending upwardly at the front edge of the bottom, sides between the back wall and said front dam, a horizontal shelf spaced from and located over said bottom and terminating at its front and rear edges short of said dam and said back, a vertical plate at the front edge of the shelf the upper edge of which is positioned a distance below the upper edge of said dam, a vertical plate at the rear edge of the shelf extending upwardly to approximately the height of the front dam, air cooling

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means between said bottom and shelf, air propulsion means between said bottom and shelf to force air rearwardly, and conduit structure back of said shelf providing a conduit for air vertically at the back of the shelf to the upper edge of said back plate and over it and for directing air propelled by said propulsion means downwardly toward the rear end portion of the shelf.

2. In a structure as described, a horizontal bottom of heat insulating structure, a vertical back of heat insulating structure, a horizontal lower shelf spaced from and located above said bottom and terminating at its front and rear edges short of the front portion of said bottom and of said back, respectively, a second horizontal shelf located above the first shelf, spaced vertical ends extending above said bottom and forwardly of said back between which said shelves are located, said upper shelf at its rear edge being short of said back, a vertical plate connected to said upper shelf at the rear edge thereof extending above the shelf and extending below said upper shelf substantially to said lower shelf, said vertical plate being spaced from the back, a second vertical plate extending upwardly from the rear edge of the lower shelf, additional vertical plates, one at the front edge of each of said shelves, extending upwardly therefrom to a height less than first and second vertical plates, a hood connected to the first mentioned vertical plate extending over and spaced from the upper edge of the plate attached at the rear edge of the lower shelf and terminating in a down-turned section in front of and below the upper edge of said plate, a like hood secured to the back over the upper edge of the first mentioned plate and extending downwardly and to the front thereof, a generally horizontal partition between said ends underneath and spaced from the upper shelf, the rear edge of which is located a distance outward of the first mentioned hood, and vertical air dams, spaced forwardly from and extending higher than the additional plates secured at the front edges of said shelves.

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3. A structure as defined in claim 2, and air propulsion means located under the lower shelf between it and said bottom at the rear portions thereof, and air temperature reducing means located in said space in front of the air propulsion means.

4. In a structure as described, a horizontal shelf, supporting means therefor, a bottom spaced below the shelf, an air conduit including the space between the shelf and the bottom for conducting air from in front of said shelf to and above the rear of said shelf, means for directing air from said conduit downwardly toward the rear of the shelf, air propulsion and temperature reducing means in said conduit, and a second shelf located over the first shelf and spaced therefrom, air conducting means for conducting air to and above the rear of said second shelf and directing it downwardly against the upper side and rear portion thereof, and air conducting means at the front of and below the front portion of said second shelf for conducting air around the front edge of the shelf and underneath it to the rear and thence downwardly toward the lower shelf.

5. The elements of claim 4 in which said means for conducting air to and above the rear of the second shelf is separate from the conduit for conducting air to and above the lower shelf.

CLIFFORD B. SHREVE.

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