(No Model.) 2 Sheets—Sheet 1.

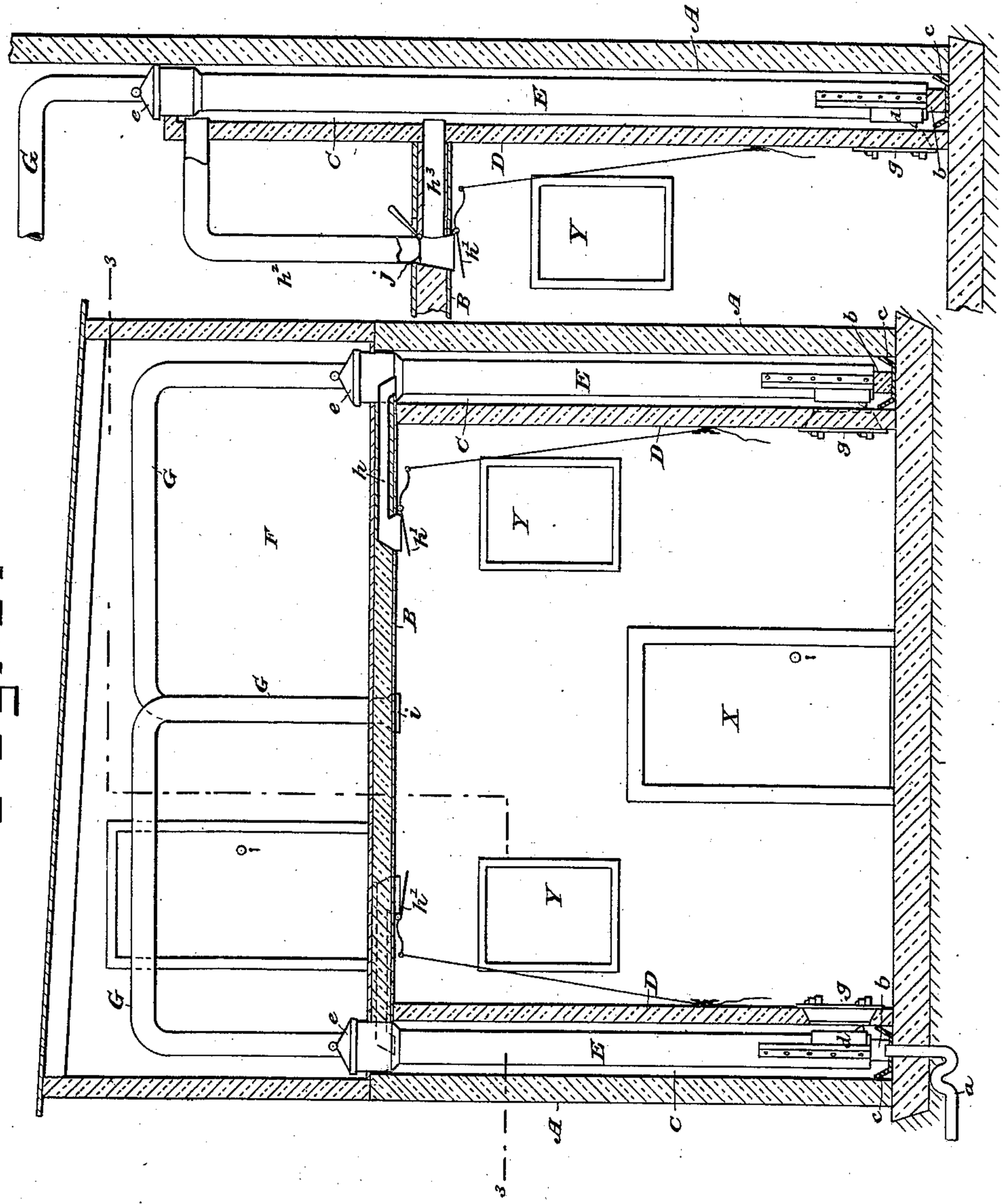
C. A. FREDERICKS.

REFRIGERATOR BUILDING.

No. 373,228. Patented Nov. 15, 1887.

Fig. 4.

Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

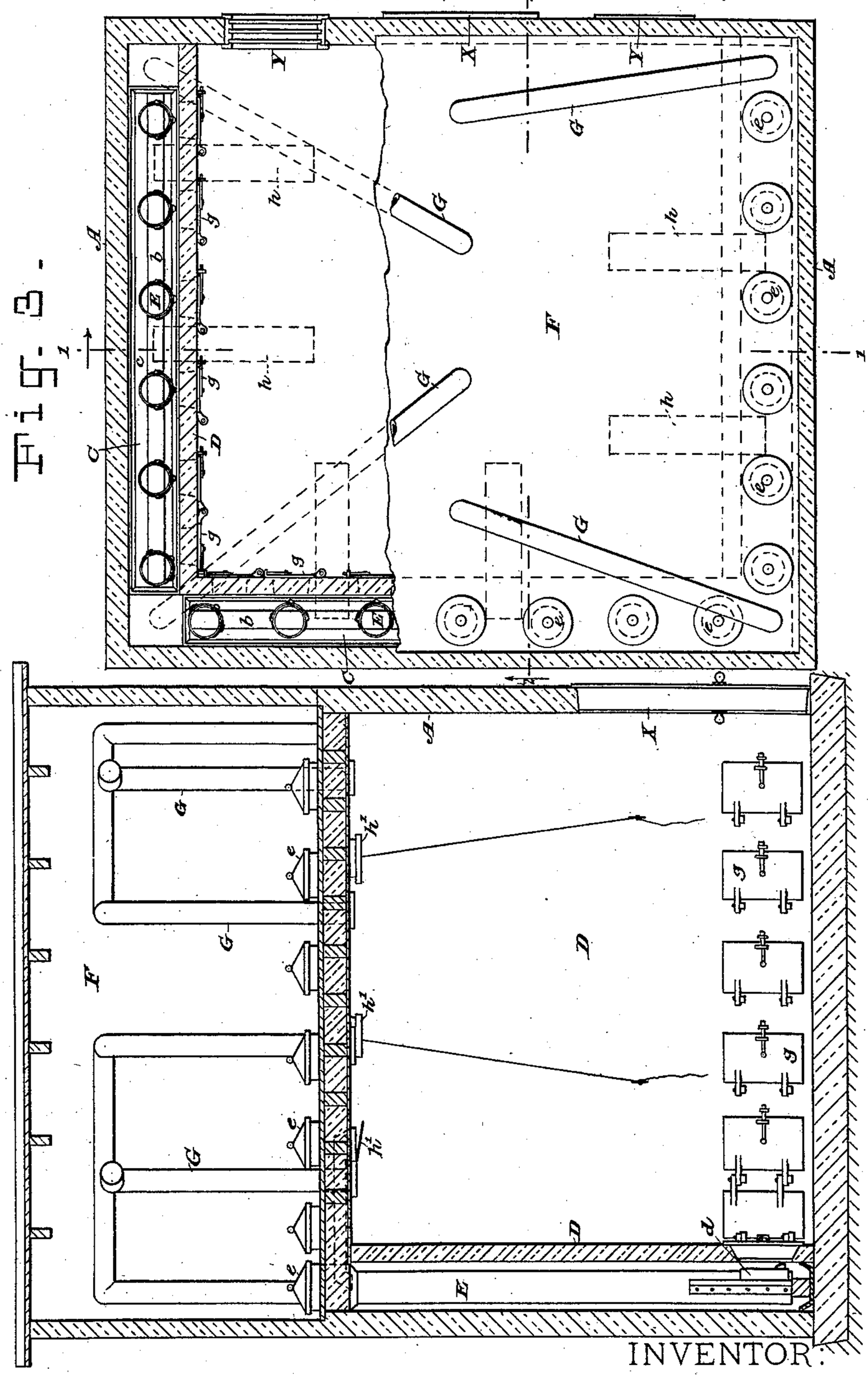

Fig. 2.

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UNITED STATES PATENT OFFICE.

CHRISTIAN A. FREDERICKS, OF BROOKLYN, NEW YORK.

REFRIGERATOR-BUILDING.

SPECIFICATION forming part of Letters Patent No. 373,228, dated November 15, 1887.

Application filed April 18, 1887. Serial No. 235,185. (No model.)

To all whom it may concern:

Be it known that I, CHRISTIAN A. FREDERICKS, a citizen of the United States, and a resident of Brooklyn, Kings county, New York, have invented certain new and useful Improvements in Refrigerator-Buildings, of which the following is a specification.

My invention relates to means for refrigerating rooms or chambers, either for freezing articles contained therein or for simple cold-storage; and the two leading objects of my invention are, first, economy in the use of ice employed as a refrigerant, and, second, uniformity of temperature within the refrigerating room or chamber at all levels, regardless of the height of the chamber.

In carrying out my invention I usually employ a mixture of ice and salt as a refrigerant, although I do not limit myself strictly to this mixture. This refrigerant is placed in vessels, usually long cylindrical vessels of sheet metal, and these are placed in a close reservoir or reservoirs, usually arranged along one or more sides of the storage-room and extending from floor to ceiling. The vessels extend up through the ceiling of the storage-room and the floor of the charging-room above, for convenience of filling or charging them. The close reservoir—for it may be in one or continuous—I will call, for convenience, the "cold-air" reservoir. Cold dry air is admitted to the storage-room from this reservoir at the ceiling of the room through regulated apertures. To insure a proper circulation, air-ducts lead from the ceiling or upper part of the room up into the charging-room above, and thence down again into the cold-air reservoir. Provision is also made for taking air at a very low temperature from the bottom or lower part of the cold-air reservoir for special purposes, as will be hereinafter explained. The cold-air reservoir is narrow and contracted, and is shielded on all sides by non-conducting or heat-intercepting material, in order that the air within it may be kept at a very low temperature, and under ordinary conditions the cold air is drawn only from the top or upper part of the reservoir through valved apertures. When these apertures are closed, circulation ceases substantially, and the low temperature within the cold-air reservoir prevents the wasting away of the ice. As soon as the circulation is re-established the ice begins to melt and the cold air begins to flow from the reservoir into the room. I find that by introducing the cold dry air at several points in the ceiling or near the ceiling the air may be brought to a substantially uniform temperature at all levels in the room. This is very important, particularly where the room is to be employed for storing carcasses of beef, mutton, &c.

In the drawings which serve to illustrate my invention I have shown it applied to a room suited for preserving beef and other carcasses, the arrangement being that which I prefer for this purpose.

Figure 1 is a vertical section of the refrigerator, the plane of the section being indicated by line 1 1 in Fig. 3. Fig. 2 is a similar section of the refrigerator, the plane of the section being indicated by line 2 2 in Fig. 3. Fig. 3 is a sectional plan, the plane of the section being indicated by line 3 3 in Fig. 1. Fig. 4 is a fragmentary sectional view illustrating a slight variation in the arrangement of the cold-air reservoir with respect to the storage and charging rooms.

A represents the walls, and B the ceiling, of the refrigerator-room. These will be of suitable heat-intercepting material—as, for example, two tight walls filled in between with sawdust. On three sides of the room is formed a cold-air reservoir, C. This may be formed conveniently by building within the room a heat-intercepting wall or partition, D, standing out from the walls A far enough to form a chamber or reservoir wide enough to receive the long sheet-metal vessels or refrigerant holders E. The partition extends from floor to ceiling, and the vessels E also, the mouths or upper ends of the latter extending through the ceiling into the charging-room F above, where they are provided with suitable covers, *e*. At the bottom of the cold-air reservoir C is placed a pan, *c*, to catch the drip from the vessels E, and this drip may flow away through a trapped outlet, *a*. The lower ends of the vessels E may be provided with gratings or screens to permit the water to flow out and yet retain the ice; but I find it sufficient to support their open lower ends on a beam or block of wood, *b*, not quite wide enough to close their bottoms. Each vessel is provided with a sliding door or

wicket, *d*, in order that their interiors may be conveniently reached for cleaning, and in order that these wickets may be reached from inside the room, doors *g*, opposite to them, are provided in the wall or partition D.

Air-ducts *h*, arranged in the heat-intercepting partition of the ceiling, lead from the upper part or top of the deep cold-air reservoir C out and open into the storage-room at the ceiling, each duct-outlet being provided with a hinged closing-valve, *h'*, whereby the outlet of said duct may be wholly or partially closed, if desired. Air-ducts G, for effecting the proper circulation, lead from openings *i* in the ceiling up into the charging-room, thence over to near the walls, and thence down through the ceiling into the cold-air reservoir. I usually extend the ducts G up about six feet in the room F, so that the men in charging may not be hindered by them.

Where beef carcasses, for example, are to be kept in the room, the operation is somewhat as follows: First, the ice is delivered on the floor of the charging-room (which is made water-tight) and broken up. The vessels E are charged with ice and salt and the covers *e* placed on them. The temperature in the cold-air reservoir C soon falls nearly to zero if the circulation is stopped by closing valves *h'*. The ice in the vessels E will also cease to melt under these conditions, and will remain frozen almost indefinitely. The valves *h'* should now be opened and circulation between the room and the upper part of the cold-air reservoir established. The air from the room will flow out through the ducts G and enter the reservoir C. The contraction produced by the cooling of the air at the end of the duct entering the reservoir will cause a current to flow through the duct G from the room to the reservoir, and this will cause the cold air from the upper part of the reservoir to flow through ducts *h* into the room. The air from the latter ducts slowly descends, diffusing itself through the room, until in a short time the temperature in the room will fall to from 20° to 24° Fahrenheit. Now, the carcasses are admitted and hung up, and the heat in these will usually raise the temperature to about 32° to 38° Fahrenheit. If it should rise too high, the valves *h'* should be opened to admit more cold air until the temperature falls to the required point. The valves *h'* may be so set as to regulate the temperature as desired, and to maintain it uniform, or approximately so. It will be found, also, that the temperature stands about the same in all parts of the room—the same near the ceiling as near the floor. In the cold-air reservoir, however, the temperature will be lowest at the bottom, and I find that after the carcasses in the room have been cooled through and a uniform temperature of about 32° Fahrenheit has been established in the room, the ice on the refrigerant-vessels will cease or nearly cease to melt, and that no drip will reach the drip-pan *c* below.

Whenever a new charge of carcasses is placed in the room, however, and air-circulation is established, the ice will again begin to melt.

By this apparatus I am enabled to effect refrigeration with a great saving of ice over the old methods; but it is essential that the walls and partitions be of good heat-intercepting material, and be made water-tight. The doors *g* should also be kept tightly closed.

If intense cold be required to freeze articles placed near the floor, this can be effected by opening some of the doors *g* and allowing the air at a temperature of 3° to 4° Fahrenheit to flow into the room.

I have shown a good and economical arrangement for refrigerative purposes; but I do not wish to limit myself in every respect to the construction shown. In some respects the cold-air reservoir C need only be at one side of the room, and this is especially the case where the room is long and narrow; or there might be two such reservoirs on opposite sides of the room; or if the room were quite large the reservoir C might be in the middle of the room. I prefer to make the vessels E cylindrical in form; but this is not essential.

In order that the ducts G may not enter the cold-air reservoir and the room at or near the same points where the ducts *h* enter them, I generally prefer to arrange these ducts somewhat as seen in Fig. 3. The number of ducts G and *h* will be governed by the size and form of the room, as will also the number of the vessels E employed.

X is the door of the refrigerator-room, and Y are windows. These latter I provide with three glazed sashes, in order to intercept the heat.

In some cases I may extend the cold-air reservoir C up above the ceiling of the storage-room, and may provide means for taking cold air from its top and from a point about at the level of the ceiling of the storage-room. To effect this I may employ the construction illustrated in Fig. 4. In this construction I extend the cold-air reservoir C up into the charging-room F any distance required—say six feet, for example. I then lead a duct, h^2, from its top down through the floor of room F and ceiling of the storage-room and provide its mouth or inlet with a closing-valve, *h'*. So far as described this would produce the same results as the construction heretofore described; but in order that I may admit air into the storage-room at its ceiling from a lower point in the reservoir also, and thus get air at a lower temperature, I provide another duct, h^3, leading from the reservoir C at about the level of the ceiling of the storage-room, which duct taps duct h^2. At the junction of ducts h^2 and h^3, I provide a valve, *j*, which may be turned so as to close either duct, but leave the other duct open.

If I wish to operate as described with reference to Figs. 1, 2, and 3, I turn valve *j* so as to close the lower duct, h^3; but if the exigencies require that the storage-room shall be quickly

cooled I turn valve *j* so as to close duct h^2 and permit colder air from the lower duct to enter the room. Of course the ducts h^2 and h^3 might be separate ducts, and be each provided with a valve; but a two-way valve, like that described, is perhaps more convenient. The circulation-ducts G will be the same as before described with respect to Figs. 1 to 3.

Any means of arresting the circulation of air through the ducts may be employed—as, for example, dampers in said ducts, like those commonly employed in stove-pipes and flues. It is only necessary to stop the passage through the duct in order to arrest the circulation of air.

Having thus described my invention, I claim—

1. A refrigerating apparatus consisting of a storage-room or chambers for the reception of the thing to be kept cold, a tight cold-air reservoir with heat-intercepting walls, a vessel with tight or non-apertured walls for the refrigerant, arranged in said cold-air reservoir, said cold-air reservoir communicating with the room at the ceiling thereof, a duct, G, leading from the room to the cold-air reservoir to effect the proper circulation, and means, substantially as described, for arresting the circulation of air through the ducts.

2. A refrigerating apparatus consisting of a storage-room, a tight cold-air reservoir, C, in said room provided with heat-intercepting walls and extending to the ceiling of said room, a series of deep vessels, E, arranged in said cold air reservoir and extending through the ceiling of said storage-room, cold-air ducts leading from the upper part of said cold-air reservoir into the storage-room at or near its ceiling, ducts G, leading from the upper part of said room to the cold-air reservoir to effect the proper circulation, and means, substantially as described, for arresting the circulation of air through said ducts.

3. The combination, with the main storage-room provided with heat-intercepting walls and the charging-room above it, of a tight cold-air reservoir, C, within or partly within said storage-room, a deep vessel, E, for the refrigerant, arranged in said cold-air reservoir, and its upper end or mouth entering into the charging-room, said cold-air reservoir communicating with the storage-room at its upper part or near its ceiling, an air-duct, G, extending from the upper part of the storage-room up into the charging-room and thence down into the cold-air reservoir, and means, substantially as described, for arresting the circulation of air through said ducts.

4. The combination, with a storage-room of a refrigerating apparatus, of a tight cold-air reservoir, C, having two cold-air delivery-ducts leading from it at different levels and both opening into said storage-room at its ceiling, means, substantially as described, for closing either one of these ducts and opening the other, a duct, G, leading from the ceiling of the said storage-room up outside of said room and into the top of said reservoir C, means for closing the same, and a vessel, E, with tight walls to contain the refrigerant, arranged in said reservoir C, whereby cold air of different degrees of temperature may be admitted to the room at will.

5. The combination, with a storage-room of a refrigerating apparatus, of a tight cold-air reservoir, a tight vessel to contain the refrigerant, arranged in said reservoir, a duct leading from said room near its ceiling to the top of said reservoir to convey air from the room to the reservoir, and a cold-air duct leading from said reservoir to the storage-room and opening into same at its ceiling, whereby dry cold air is supplied to the room at its upper part only, as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

CHRISTIAN A. FREDERICKS.

Witnesses:
HENRY CONNETT,
J. L. CAPLINGER.