No. 627,651. Patented June 27, 1899.

A. M. MURPHY.

REFRIGERATOR.

(Application filed Mar. 26, 1898.)

(No Model.) 5 Sheets—Sheet 1.

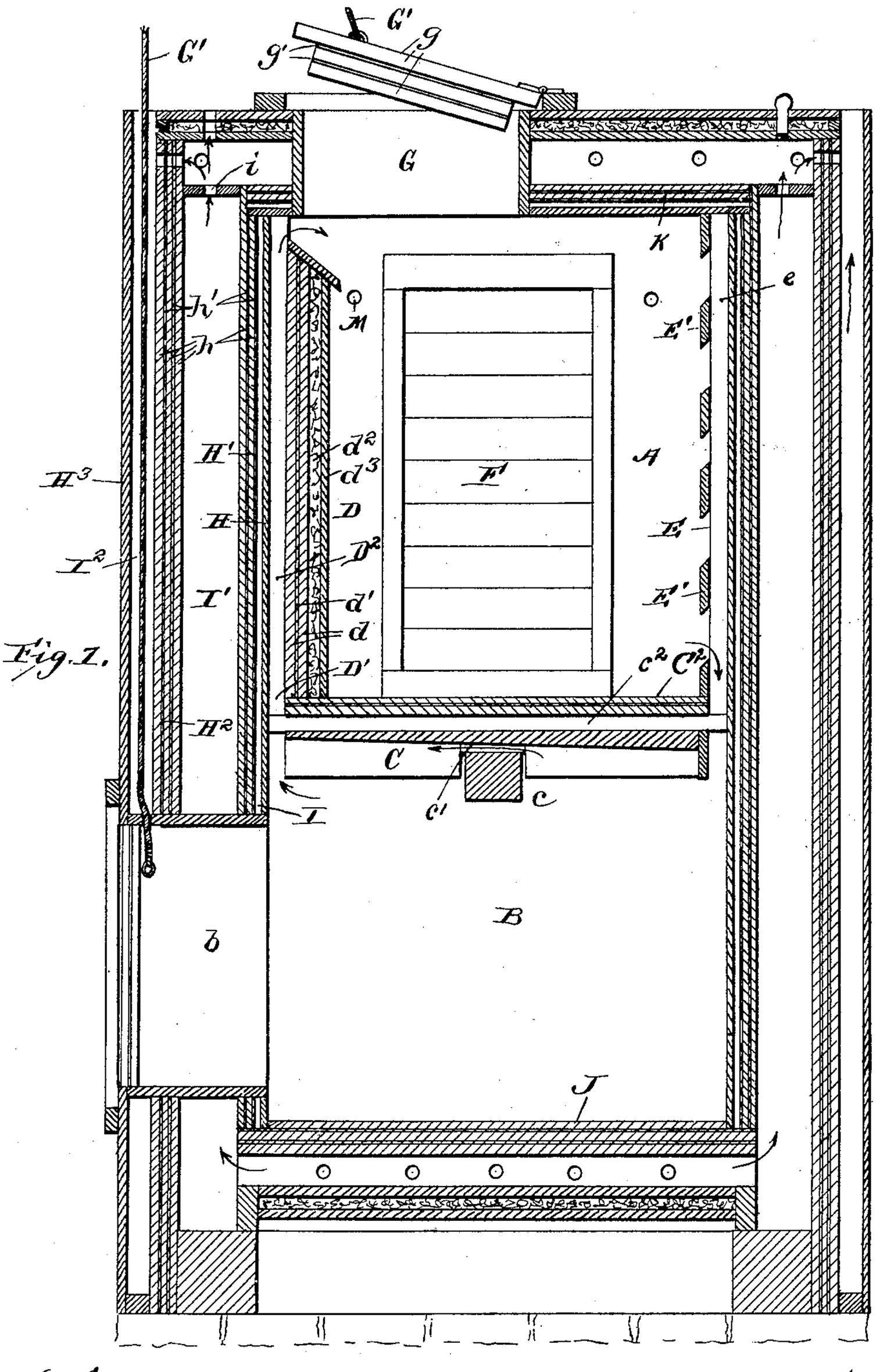


Fig. 1.

Witnesses
Wm. L. Edwards Jr.
Herbert Lawson.

Inventor
Allen M. Murphy.
By Edson Bros.
Attorneys

No. 627,651. Patented June 27, 1899.

A. M. MURPHY.

REFRIGERATOR.

(Application filed Mar. 26, 1898.)

(No Model.) 5 Sheets—Sheet 2.

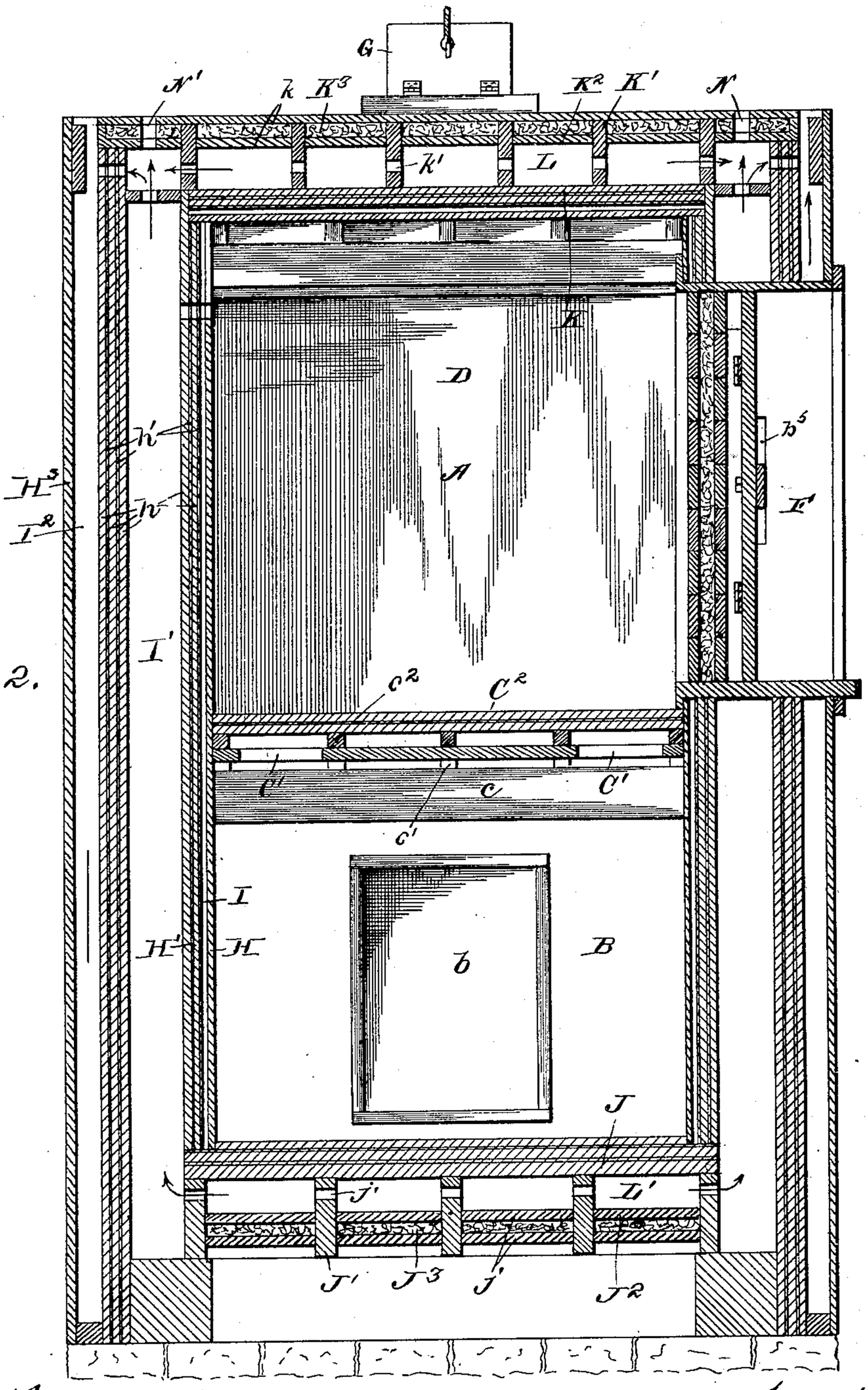


Fig. 2.

Witnesses
Wm. H. Edwards Jr.
Herbert Lawson.

Inventor
Allen M. Murphy
By. Edson Bros.
Attorneys

No. 627,651. Patented June 27, 1899.

A. M. MURPHY.

REFRIGERATOR.

(Application filed Mar. 26, 1898.)

(No Model.) 5 Sheets—Sheet 3.

Fig. 3.

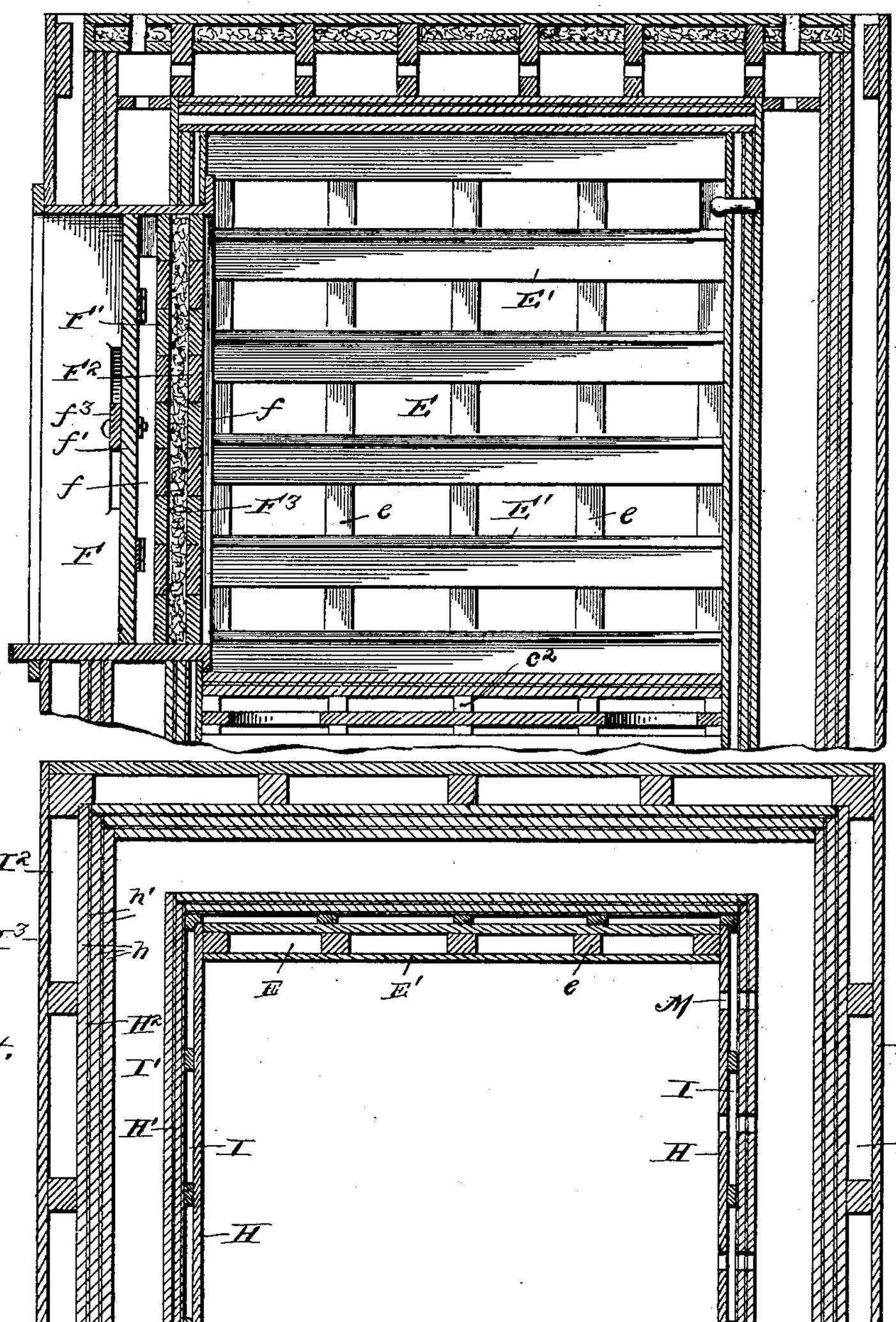


Fig. 4.

Witnesses
Wm. H. Edmunds Jr.
Herbert Lawson.

Inventor
Allen M. Murphy.
By Edson Bros.
Attorneys

No. 627,651. Patented June 27, 1899.

A. M. MURPHY.

REFRIGERATOR.

(Application filed Mar. 26, 1898.)

(No Model.) 5 Sheets—Sheet 4.

Fig. 5.

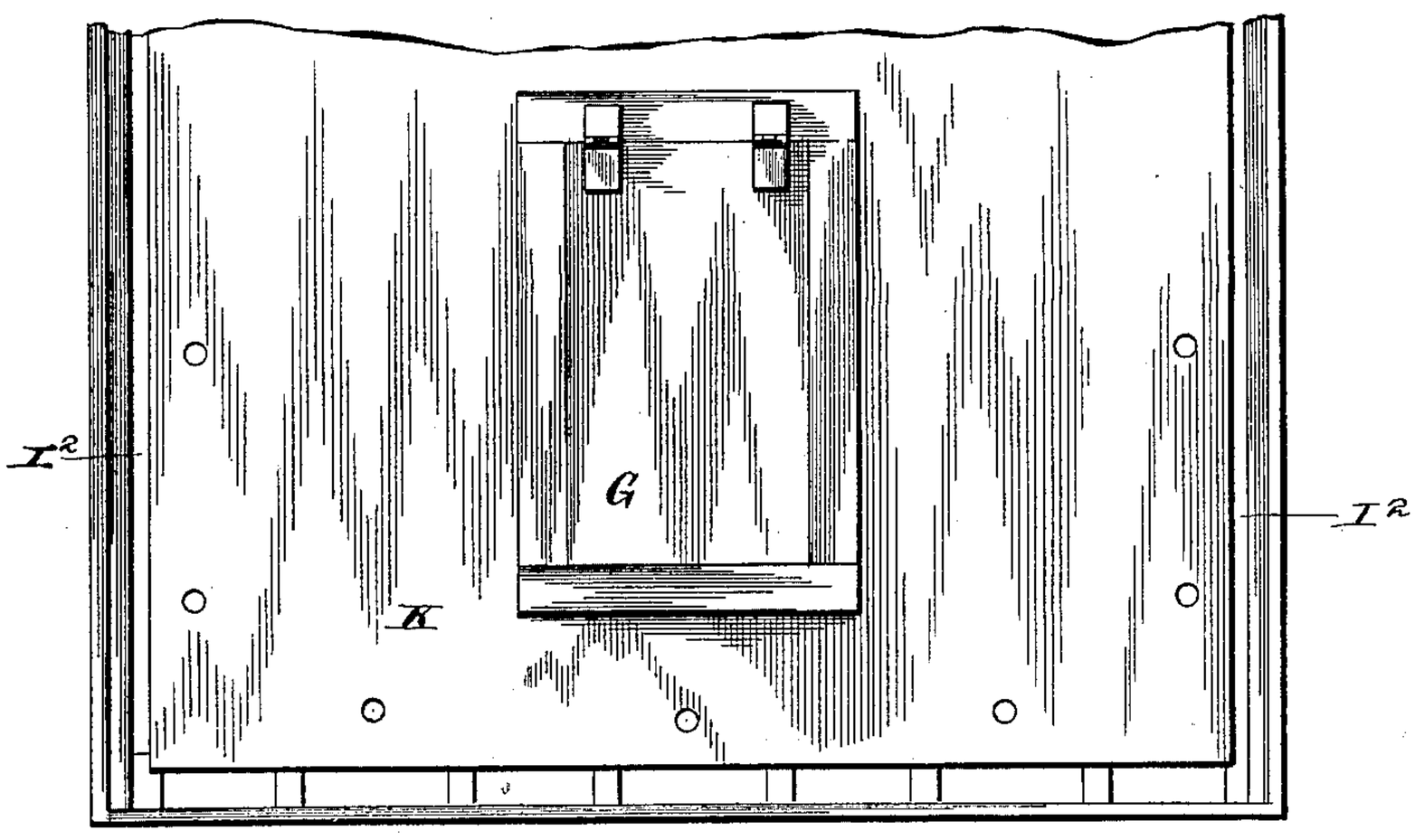
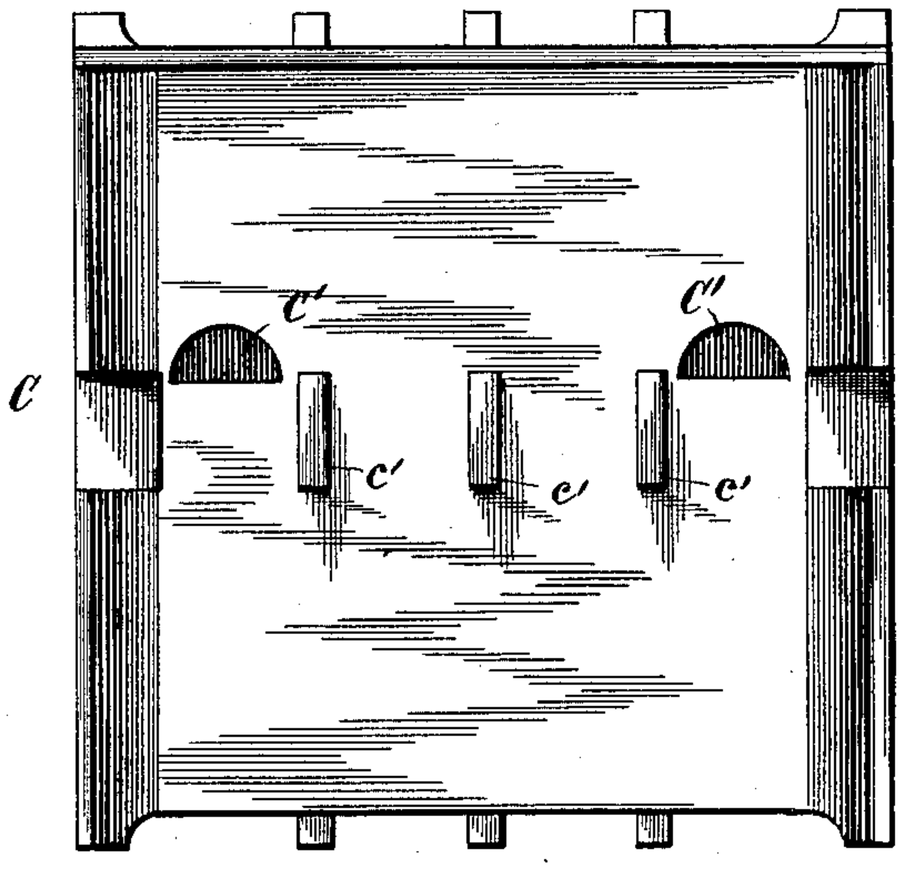


Fig. 6.



Witnesses
Wm. H. Edwards Jr.
Herbert Lawson.

Inventor
Allen M. Murphy
By Edson Bros.
Attorneys

No. 627,651. Patented June 27, 1899.

A. M. MURPHY.

REFRIGERATOR.

(Application filed Mar. 26, 1898.)

(No Model.) 5 Sheets—Sheet 5.

Fig. 7.

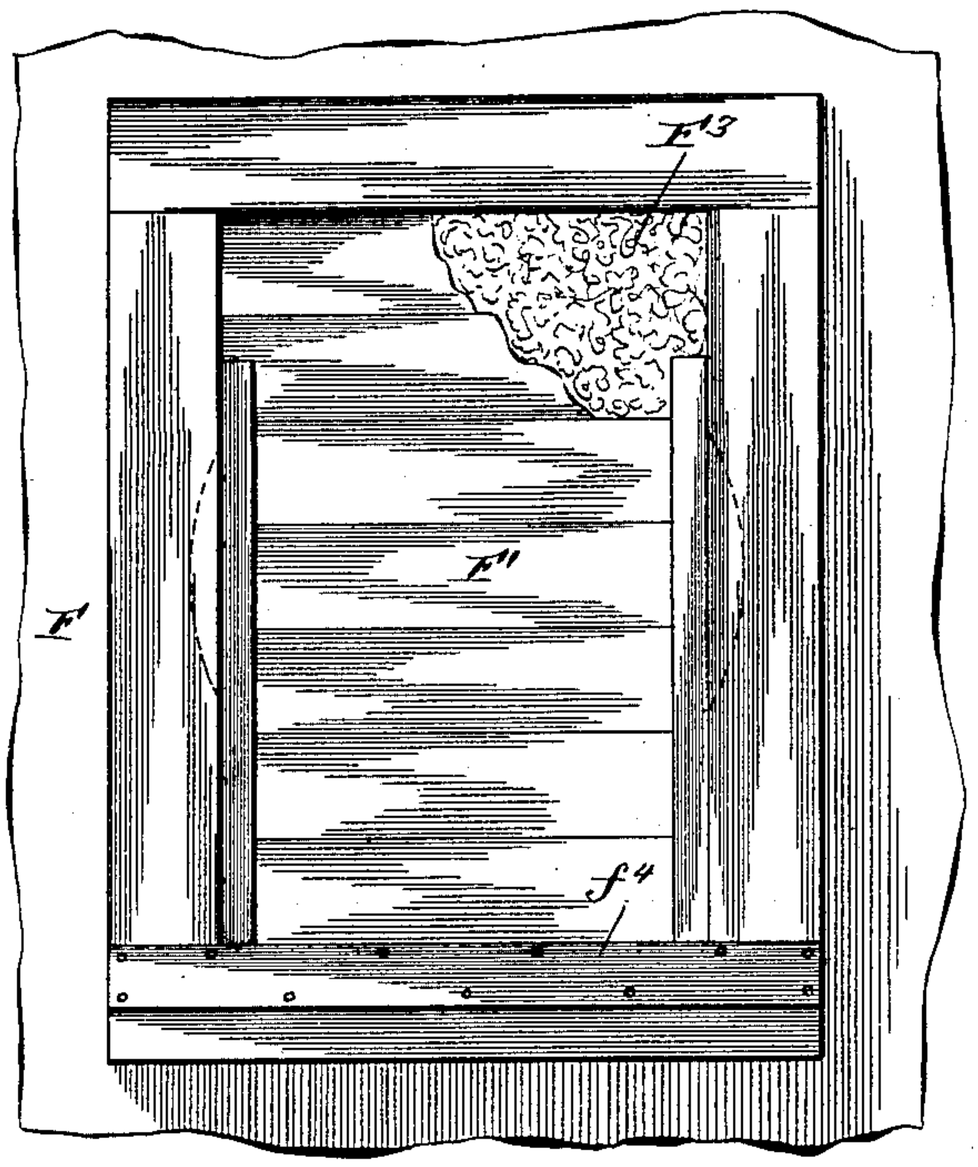
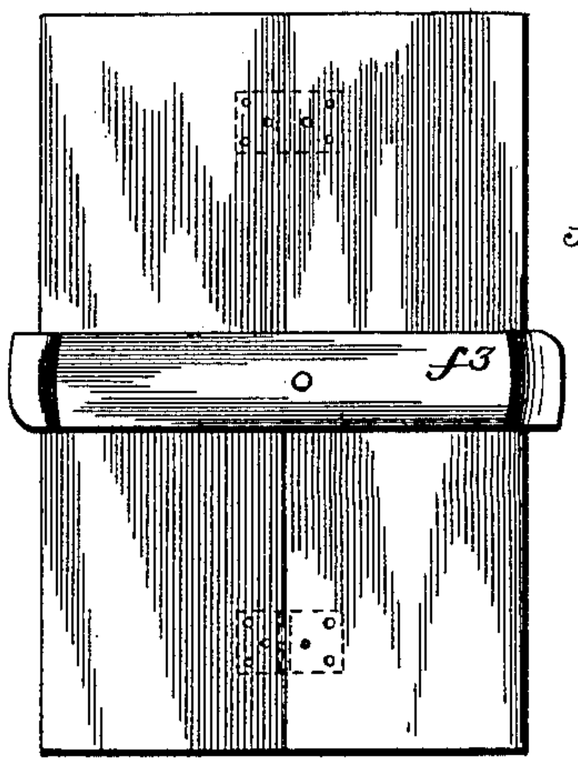


Fig. 8.



Witnesses
Wm. H. Edwards Jr.
Herbert Lawson.

Inventor
Allen M. Murphy
By Edson Bro's,
Attorneys.

UNITED STATES PATENT OFFICE.

ALLEN MINOR MURPHY, OF FOND DU LAC, WISCONSIN.

REFRIGERATOR.

SPECIFICATION forming part of Letters Patent No. 627,651, dated June 27, 1899.

Application filed March 26, 1898. Serial No. 675,281. (No model.)

To all whom it may concern:

Be it known that I, ALLEN MINOR MURPHY, a citizen of the United States, residing at Fond du Lac, in the county of Fond du Lac and State of Wisconsin, have invented certain new and useful Improvements in Refrigerators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to refrigerators in general, and more particularly to those of large capacity designed for cold storage, packing-houses, breweries, markets, &c. Its object is to provide a durable refrigerator of economical construction, perfectly ventilated, requiring but a minimum supply of ice and yet possessing unsurpassed preserving qualities.

To these ends the invention consists in the novel construction and combination of parts hereinafter fully shown and described.

In said invention I employ cold and warm air flues, by means of which a continuous circulation of cold air passes through the refrigerator-room, upward over the ice, and back again. I also provide improved methods of ventilation, which enable me to maintain a temperature during the hottest season of from 32° to 33° Fahrenheit, although permitting the escape of all foul or tainted air and leaving a clear and dry atmosphere.

Another advantage of my present construction is that but a minimum supply of ice is necessary to keep the contents of the refrigerator in perfect condition for weeks.

All of these advantages result from the peculiar construction and arrangement of parts constituting my device, more particularly the construction of the walls, the location and construction of flues for the circulation of air, and the means for ventilating the chambers. The walls contain three series of air passages or chambers running the entire height and breadth of the structure and separated from each other and from the interior of the refrigerator by means of alternate layers of wood and paper or other suitable insulating material, as hereinafter described. I also employ in addition thereto at certain desired points layers of mineral wool. As will be more fully described, the flues are placed at the front and rear ends of the ice-chamber and so constructed as to cause all air admitted through the entrance to the refrigerator-chamber to pass upward over the ice before reaching the contents of the lower chamber.

For ventilating purposes I provide a trap-door above the ice-chamber, which is adapted to be opened, as will be more fully hereinafter described, to permit of better ventilation at certain periods of the year. In addition thereto I also provide a series of openings within the upper outer and interior side walls of the ice-chamber, which may be opened or closed, as desired, foul or tainted air being adapted to pass therethrough to the air-passages within the walls, and hence to the attic or chamber above, from which they disperse without in the least tainting or otherwise injuring the contents of the refrigerator.

In the accompanying drawings, which illustrate the preferred form of my invention, Figure 1 is a central vertical section through my improved refrigerator from front to rear. Fig. 2 is a similar section from side to side-showing the front flue. Fig. 3 is a section similar to Fig. 2 through the upper half of the refrigerator, showing the rear flue. Fig. 4 is a horizontal section through the ice-cham, ber. Fig. 5 is a partial top plan view of the refrigerator. Fig. 6 is bottom plan view of the ceiling of the cooling-chamber. Fig. 7 is a front elevation of the inner door to the ice-chamber, and Fig. 8 is a similar view of a form of outer door.

A is the ice-chamber, of any suitable size and dimensions, located above or adjacent to the cooling or refrigerator room B and separated therefrom by means of a ceiling or partition C, adapted to rest upon a supporting beam or beams *c*, as shown, or may be supported in other suitable manner. Said ceiling is constructed so as to slant upward toward the warm-air flue, thereby facilitating the direct passage of warm air to the ice-chamber. The ceiling is preferably constructed of alternate layers of wood and paper covered by suitable material, as zinc, and forming a floor C^2 for the upper chamber A. Said floor is secured to cross-beams c^2, running from front to rear of the ceiling, and to the lower edges of which are secured the ceiling

proper, C, of the lower chamber. As the rear and front ends of the ceiling are open, the spaces formed between the floor C^2, ceiling C, and cross-beams c^2 permit a free circulation therethrough. Openings C′ are provided which permit air to readily flow into the ceiling from the lower chamber. Blocks c' are also provided, which are placed between the ceiling C and the supporting-beams c thereof, permitting the air to flow along the lower surface of the ceiling from front to rear unobstructed by said beams c. If desired, the ceiling may be made solid and the blocks c' alone used to permit the free circulation of air thereunder.

In the front of the cooling-chamber B is the entrance or door b, closed by any suitable means. Directly over said entrance and projecting from the inner edge of an opening in the ceiling upward to a point near the ceiling of the ice-chamber is an inner wall D, secured to perpendicular uprights D^2, which form a flue D′ for the free passage of air from the cooling to the ice chamber. Said inner wall D is constructed substantially as shown, it consisting of two layers of wood d, separated by, preferably, three thicknesses of paper d', said sections $d\,d'\,d$ being divided from a third section of wood d^3 by a layer of mineral wool d^2. The whole is capped at the top, as shown, thereby keeping all warm air from the pores of the inner layers or sections and effectually protecting the ice packed within the chamber. At the opposite or rear end of the ice-chamber is a second flue E, formed between the edge of the floor and the wall and having slats E′ above the inner edge, which run the entire length thereof, as shown, and are secured to uprights e, resting against the wall of the chamber. Either or both of the sections D and E′ may be fixed within the chamber or made detachable by extending the perpendiculars e and D^2 downward between the ceiling and walls, as shown in Fig. 1, as desired.

At one side of the ice-chamber is constructed a door F. Said door extends, approximately, from the floor to the ceiling of the chamber and is formed of two sets of narrow boards F′ F^2, slidably secured between strips or beads f, fastened upon the frame of the door and extending to a sufficient distance from the top of said frame to permit of the removal of the boards one at a time. After filling the chamber with ice all the boards but the outer top one are placed in position, the space therebetween being filled with mineral wool F^3, thereby forming an excellent air-tight door. The last board F′ is then placed in position after putting as much mineral wool therebehind as possible. As an additional precaution I also provide a suitable hinged door f', adapted to securely close the outer end of the door-casing, thereby leaving an air-space f^2 between the two doors. For the smaller sizes of refrigerators I use the center hinged door f' with the iron bar f^3. (Shown in Fig. 8.) This can be so proportioned as to form an air-tight chamber behind it when pressed into position and can be easily removed by simply swinging around the bar f^3, which will engage with notches f^5 in the frame of the door, (shown in Fig. 2 and in dotted lines in Fig. 7,) as will be obvious. I am not able to use this form of door in the large refrigerators owing to the great size and weight thereof. I, however, always use the inner filling F^3. In order to further protect the doorway from the admission of warm air, I secure a metal plate f^4 upon the outer edge of the sill, thereby practically sealing the pores of the wood.

Running through the ceiling of the ice-chamber A and permitting of the free passage of air from said chamber to the outside is an opening or shaft G, closed on all sides and covered by a trap-door, as shown. Said trap-door is preferably formed of three sections of wood $g\,g\,g$, each section being separated from the adjoining one by means of a suitable number of layers of paper $g'\,g'$, which effectually prevent all escapage of cold or absorption of heat. This door is preferably operated by means of a rope G′, running over a pulley or other suitable device thereabove, adapted to hang between the front walls of the refrigerator and permitting of easy manipulation from a point at or near the entrance thereto.

I lay much dependence for the effectiveness and superiority of my refrigerator upon the peculiar construction of its walls, which are formed of boarding and paper or other non-conducting material having air-spaces located therebetween at certain desired points.

The inner section H of the front, rear, and side walls is formed of plain or beaded ceiling, these being far preferable to iron, which sweats and rusts out. Said inner section is separated from a second section H′, preferably composed of two layers of wood h and paper h', arranged alternately, as shown, by a narrow air-shaft I. A third section H^2, formed of three layers of wood h, divided by a suitable non-conducting material, preferably paper h', is separated from section H′ by a large shaft I′ and from the outer covering H^3 by a third shaft I^2, closed at the bottom, as shown. Said outer covering is composed of boarding or of any other suitable material or materials.

The lower floor and upper ceiling of my improved refrigerator are with a few exceptions exactly similar in construction. The inner section J of the lower floor is formed substantially as shown at H^2 in Fig. 1, while the inner section K of the upper ceiling is of the construction shown at H H′, Fig. 1, and both are secured to joists J′ and K′, respectively, which are provided throughout with openings j' and k' to permit of the free passage of air in all directions between said sections J and J^2 and K and K^2. Said sections J^2 and K^2 are composed of two layers of wood $j\,k$, separated, preferably, by mineral wool J^3 K^3, as shown.

The air-shafts L, formed within the ceiling, communicate at each end with air-shafts I^2, which communicate at the top with the open air, as shown in Fig. 1, and with each other through perforations *k'*, Fig. 2. Said shafts L likewise communicate with shaft I' by means of openings *i*, said shaft I' being in communication at its lower end with the shafts L', formed within the lower floor.

Along the upper part of the inner side walls of the ice-chamber are vent-holes M, communicating with shafts I and I' and permitting the direct escape of all foul or tainted air from said chamber to the outer air. If desired, these openings M may be closed by means of plugs M' or in other suitable manner.

The air which is contained within the walls of the refrigerator by reason of the shafts or passages I, I', I^2, L, and L' escapes from and enters through a second series of holes N, forming air-passages through the upper section K^2 of the ceiling at suitable points. These holes can likewise be closed by plugs K^4, as shown, but at least two should be open at all times.

From the foregoing description it will be seen that in my refrigerator two separate and distinct circulations of air are created. One is formed by the warmed air and all air entering the cooling-chamber through the opening *b*, passing upward through flue D', crossing over the ice in chamber A, and descending through the slats E' and flue E to the lower chamber, thereby creating a complete circuit which continually supplies cold air only to the contents of the refrigerator. The second or ventilating circuit is that formed within the walls of the refrigerator, passing as it does around the entire structure through shafts I, I', I^2, L, and L' and openings M and N and permitting all moisture and foul gases to pass from the structure, as before described. It will be understood that this circulation can be easily controlled or regulated, according to the requirements of the temperature of the surrounding atmosphere, by opening or closing a greater or less number of openings N.

I have mentioned the use of paper in the walls, &c., as a non-conductor of heat and cold and a preserver. Heretofore tar paper, paper saturated with linseed-oil, sawdust, and other material substances have been used for this purpose; but owing to absence of ventilation and their poor lasting qualities have decayed, thereby giving off bad odors which permeate the entire inner structure, rendering the same unfit for use within a very short time. Owing, however, to the perfect ventilation of the walls of my refrigerator and the use of a soft non-conducting material made waterproof by a process not admitting of any chemical action, my device is far superior to all forms of refrigerators heretofore made.

While I show an iron and paper floor to the ice-chamber, I do not confine myself thereto, as I may use wooden flooring, properly calked, with equally as good results.

I do not wish to confine myself to the use of any particular number of layers of paper between the sections of the wall, as one or more may be necessary, according to the location and surroundings of the refrigerator.

In the foregoing description I have shown the preferred form of my invention; but I do not confine myself thereto, as I am aware that changes can be made in the proportions and construction of the parts without departing from the spirit or sacrificing the advantages thereof, and I therefore reserve the right to make such changes as fairly fall within the scope of my invention.

Having thus described my invention, what I therefore claim as new, and desire to secure by Letters Patent thereon, is—

1. In the walls of a refrigerator, the combination of an inner section, H, two middle sections H', H^2, each constructed substantially as described, and an outer section, H^3, said sections forming three air-passages therebetween, the inner passage I, closed except near the top thereof where it communicates inwardly with the ice-chamber and outwardly with the intermediate air-passage, I', which communicates at the bottom with air-passages L', in the lower floor, and at the top with air-passages L, in the upper ceiling, said passages L communicating upwardly with the outer atmosphere and at the ends with the outer air-passage I^2, which is closed at the bottom and communicates at the top with the outer atmosphere, substantially as shown and described.

2. A door for an ice-chamber of a refrigerator, &c., consisting of two parallel sectional partitions slidably secured in but removable from the door-frame, and filled between with non-conducting material, substantially as described.

3. A door for an ice-chamber of a refrigerator, consisting of two parallel sectional partitions filled between with non-conducting material, and a third partition formed in sections hinged together and provided with a securing-bar pivoted to one of said sections and adapted to engage with the door-frame, substantially as described.

4. In a refrigerator having an upper or ice chamber and a lower or cooling chamber, the combination of means for maintaining the circulation of air within said refrigerator, consisting of a ceiling or floor intermediate said chambers provided with shafts for the passage of air through said ceiling, a hot-air flue at the front of said ceiling, above the entrance to the cooling-chamber, and a cold-air flue at the rear of said ceiling, said flues communicating with the shafts in the ceiling and with the lower chamber; with apparatus for ventilating said refrigerator, consisting of a trap-door, constructed and operated substantially as described, and the inner walls of said refrigerator having openings, M, near the upper part thereof, communicating with passages I, I', formed between the inner and

middle sections, H, H′, H², of the walls of the refrigerator, said passage, I′, communicating at the bottom with passages L′, and at the top with passages L, which communicate upwardly with the open atmosphere, and at the ends with passage I² formed between the outer portion H³ and a middle portion H² of the walls, said passage I² closed at the bottom and communicating directly with the outer atmosphere at the top, substantially as shown and described.

In testimony whereof I affix my signature in presence of two witnesses.

ALLEN MINOR MURPHY.

Witnesses:
JOHN H. GORES,
SOLON W. EDSON.