(No Model.)

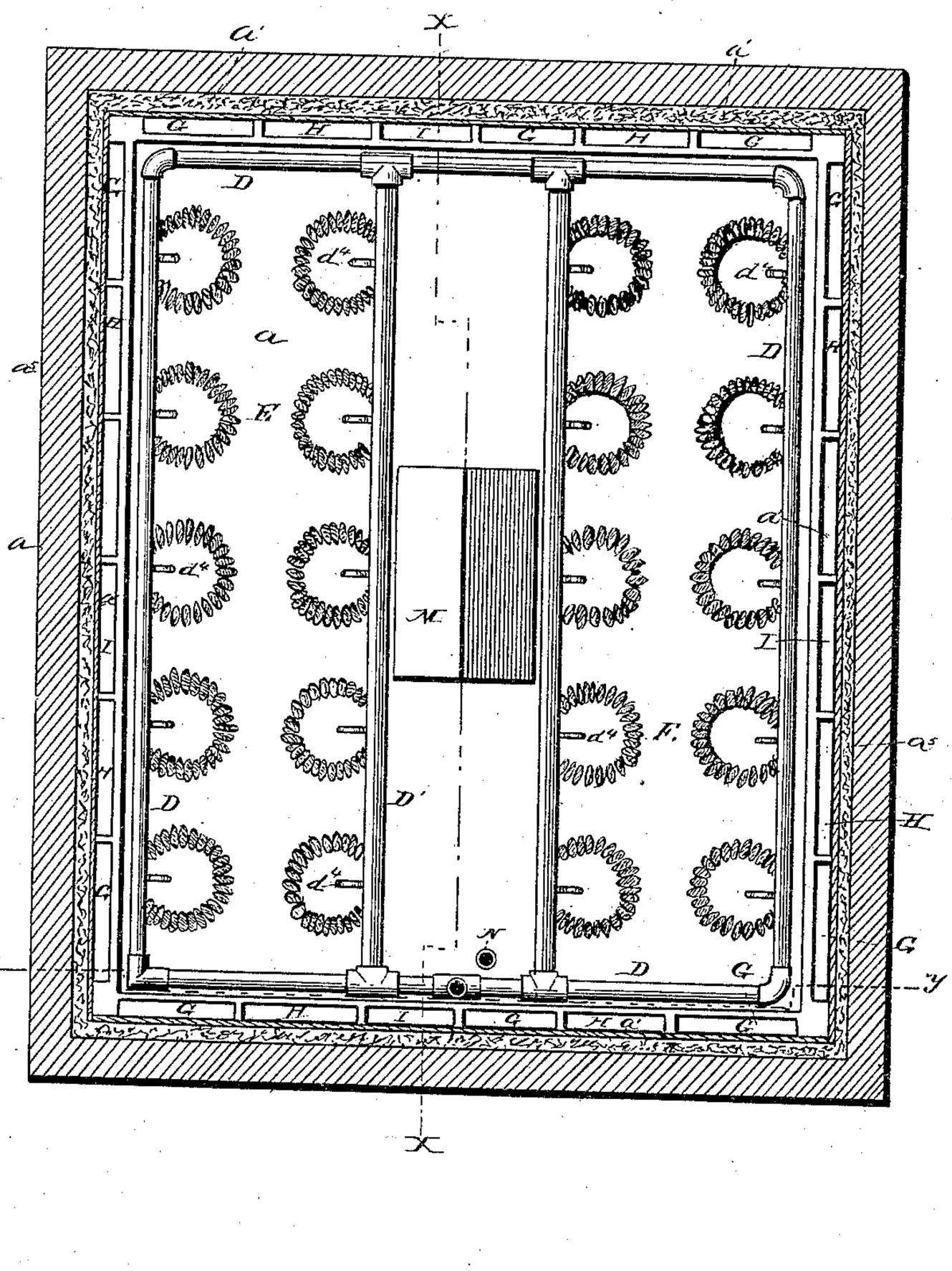
4 Sheets—Sheet 1.

T. R. WINGROVE.

REFRIGERATOR BUILDING AND APPARATUS.

No. 319,374. Patented June 2, 1885.

Fig. 1.



WITNESSES

J. R. Reynolds

J. Frank Whitt

INVENTOR

Thos. R. Wingrove

By E. G. Siggers

Attorney

(No Model.)

4 Sheets—Sheet 2.

T. R. WINGROVE.

REFRIGERATOR BUILDING AND APPARATUS.

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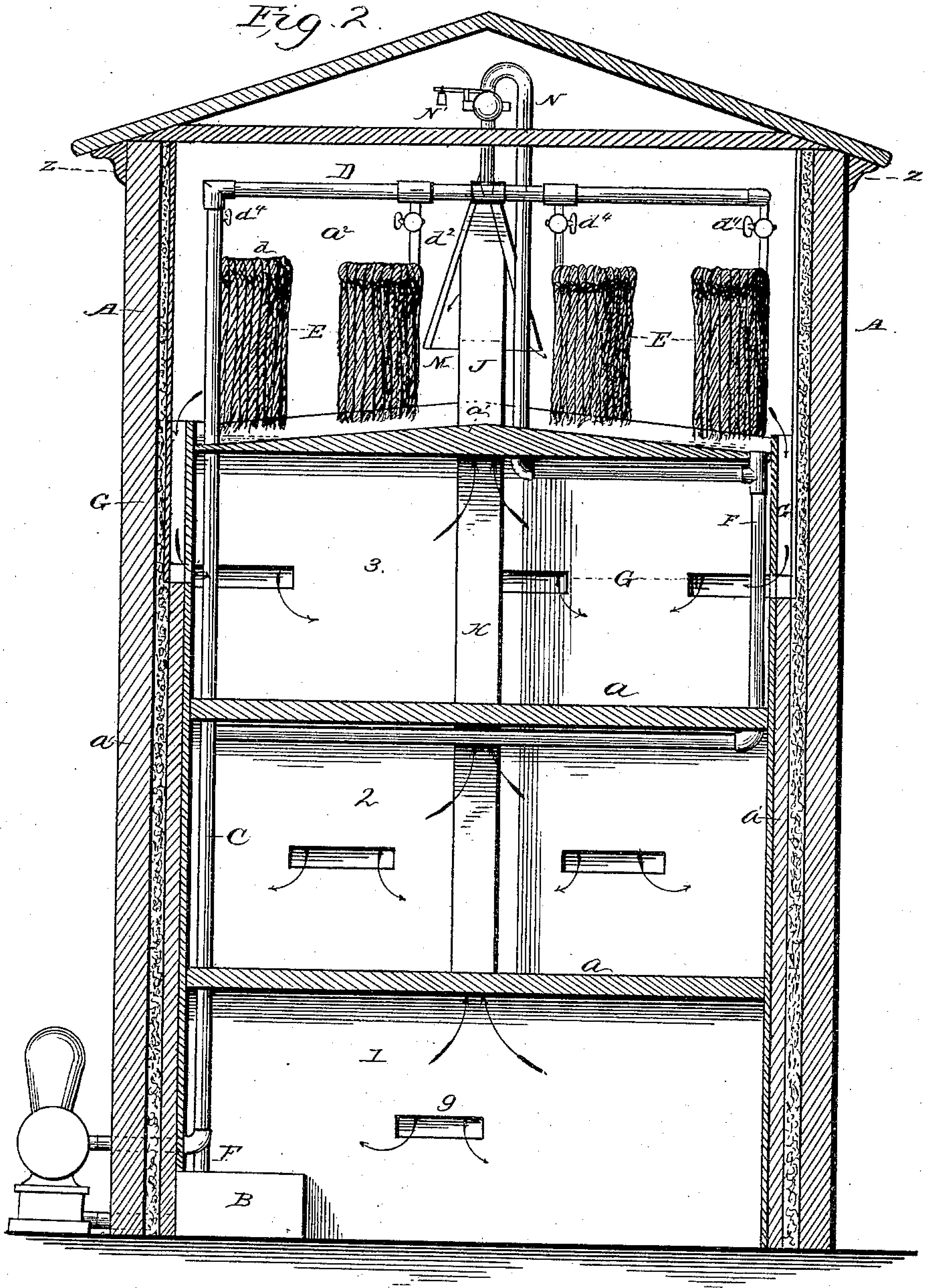
Fig. 2.



WITNESSES
J. W. Reynolds
J. Frank White

INVENTOR
Thos. R. Wingrove
By Attorney
O. E. Duffy
Atty.

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.)

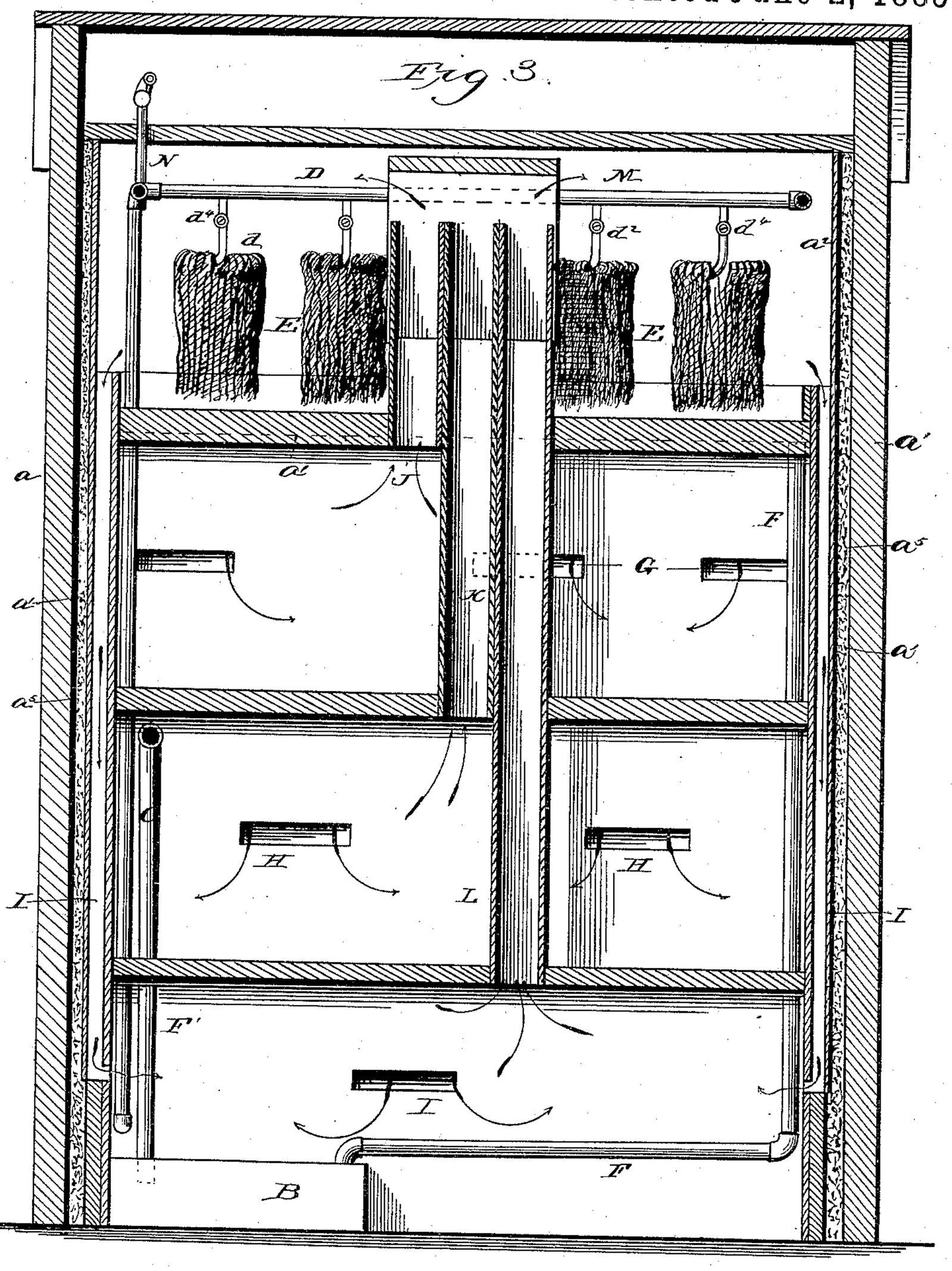
4 Sheets—Sheet 3.

T. R. WINGROVE.

REFRIGERATOR BUILDING AND APPARATUS.

No. 319,374. Patented June 2, 1885.

Fig 3.



WITNESSES

J. W. Reynolds

J. F. McClure

INVENTOR

Thos. R. Wingrove

by Edson Bros.

Attorneys

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 4 Sheets—Sheet 4.

T. R. WINGROVE.

REFRIGERATOR BUILDING AND APPARATUS.

No. 319,374. Patented June 2, 1885.

Fig. 4.

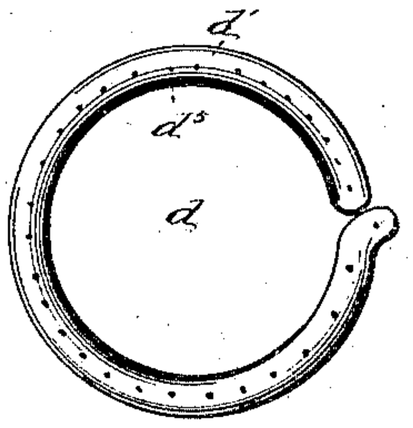


Fig. 5.

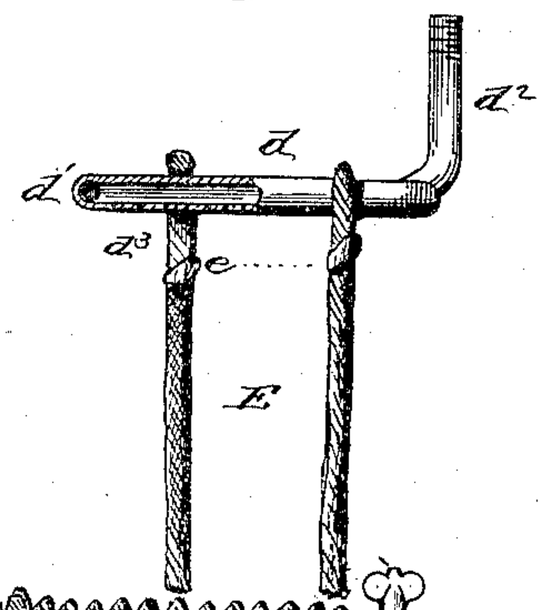


Fig. 6.

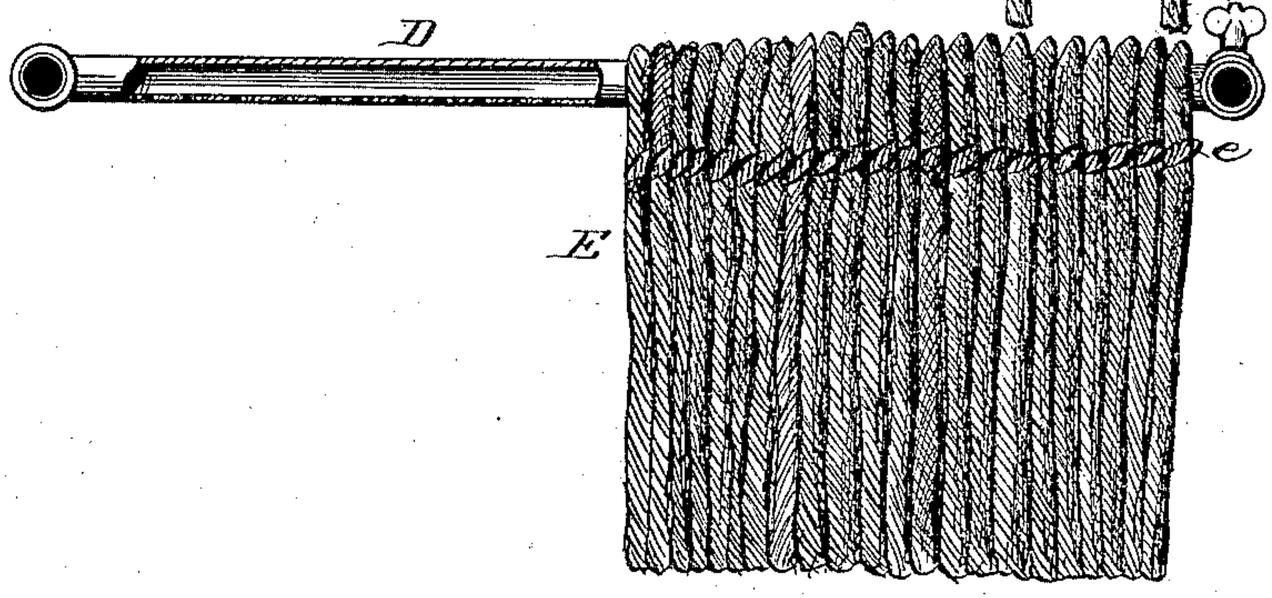
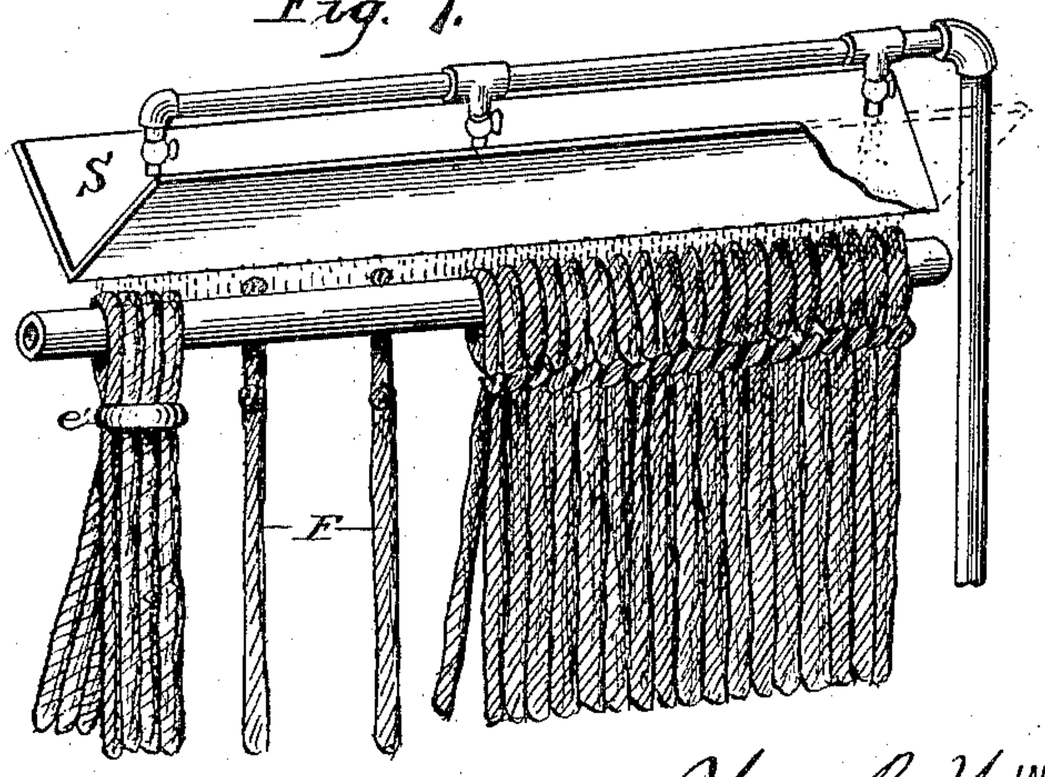


Fig. 7.



WITNESSES

W. W. Reynolds

J. Frank White

INVENTOR

Thos. R. Wingrove

by E. G. Siggers

Attorney

UNITED STATES PATENT OFFICE.

THOMAS R. WINGROVE, OF BALTIMORE, MARYLAND.

REFRIGERATOR BUILDING AND APPARATUS.

SPECIFICATION forming part of Letters Patent No. 319,374, dated June 2, 1885.

Application filed March 3, 1885. (No model.)

To all whom it may concern:

Be it known that I, THOMAS R. WINGROVE, of Baltimore, in the county of Baltimore and State of Maryland, have invented certain new and useful Improvements in Refrigerating Apparatus and Buildings therefor; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

My invention relates to that class of apparatus for the refrigeration of buildings, &c., in which the cooling medium is forced through suitable pipes into the upper apartment or cooling-chamber of the building, and there escapes from the pipes to cool the air in the said chamber, which in turn descends through suitable flues to cool the various apartments of the building, and, after extracting the heat from these lower rooms, ascends through hot-air flues into the cooling-chamber, where it is again cooled, the cooling medium being returned from the refrigerating-chamber through suitable escape-pipes leading into the refrigerating-tank in which it is stored; and it consists in the improved construction and combination of parts of an apparatus of the above-described class, as will be hereinafter more fully described, and particularly pointed out in the claims.

The principal object of my invention is to circulate the cool brine through the building, room, or ship desired to be refrigerated in such a manner as to absorb from the heated air at the time of cooling it all foul gases and impurities which it may contain before returning it to the rooms desired to be cooled, and I effect this object by the peculiar construction hereinafter set forth.

Referring to the annexed drawings, Figure 1 represents a horizontal sectional view of a building provided with my improved refrigerating apparatus, taken on line *z z*, Fig. 2. Fig. 2 is a vertical sectional view taken on line *y y*, Fig. 1. Fig. 3 is a vertical sectional view taken on line *x x*, Fig. 1. Figs. 4 and 5 are enlarged views of portions of the refrigerating apparatus; and Figs. 6 and 7 are perspective detail views of modifications, the nature of which will be hereinafter described.

Referring to the several parts by letter, A A represent the outer walls of the buildings, and A′ A′ the inner walls, a suitable heat non-conducting and water-proof material being placed between the outer and inner walls for the purpose of preventing the entrance of moisture into the several apartments of the building, and also to prevent the rooms from becoming heated by the exterior warm atmosphere.

The building may be divided into three or more stories by means of the floors *a*, *a*, and *a′*.

B represents the tank or reservoir, which for convenience I shall herein term the "brine-reservoir," and in which the brine is cooled, preferably by placing a coil of pipe in the tank into which the compressed refrigerating agent (preferably ammonia) is admitted, and in expanding absorbs the heat from the brine, which is thereby reduced to a very low temperature.

For the cooling medium I prefer to use a strong brine, which, after being cooled to a sufficiently low temperature in the tank B, is forced up through the vertical supply-pipe C by means of a small force-pump, P, of any suitable construction. The service-pipe C extends up through the floors *a a a′* to a point near the ceiling of the upper or cooling chamber, A^2, where it connects with the horizontal pipes D D′, which extend around and across the ceiling in the manner shown, and have inserted in their lower sides the small perforated pipes *d*. (Shown in detail in Figs. 4 and 5.) These pipes consist of a small piece or length of pipe, the lower portion, *d′*, of which is bent at right angles to its stem d^2, and then curved, preferably, into the form of a circle. The lower side of the circular portion *d′* of each pipe is provided with a series of perforations, d^3, while the free extremity of the same is preferably closed. A stop-cock, d^4, regulates the admission of brine into each of the perforated pipes.

E indicates strands of any suitable fibrous material, which are secured upon the small perforated pipes *d*, either by making a knot, *e*, in the strands themselves or by placing

a small ring, *e'*, around several of the strands, as shown in Fig. 7. The object of this arrangement will be hereinafter described.

F F' indicate escape-pipes leading from diagonally-opposite corners of the floor of the cooling-chamber down into the brine-reservoir.

G, H, and I indicate the flues for conducting the cooled air down from the cooling-chamber into the various apartments below, the upper ends of the said flues projecting a little above the floor of the cooling-chamber, while their lower ends open into the apartments below at a point midway between the floor and ceiling thereof, or even higher, the flues G, H, and I leading, respectively, into the chambers 1, 2, and 3. I prefer to place these flues, as shown, entirely surrounding the interior of the building, as by this arrangement the cold air can be more readily conducted from the cooling-chamber down into the several apartments. Each of these flues is provided at its lower end, where they open into the several rooms, with, preferably, a sliding door, *g*, *h*, and *i*, for regulating the amount of cold air admitted into the several apartments, or for entirely cutting off the supply from any room or rooms not in use.

J, K, and L indicate the central uptake-flues, for conducting the warm air from the various rooms up into the cooling-chamber, the said flues extending from the ceiling of the rooms 1, 2, and 3, respectively, to a point near the ceiling of the cooling-chamber, the upper ends of the said flues being provided with a cap or deflector, M, which deflects the warm air issuing from the upper ends of the flues down into the lower portion of the cooling-chamber.

The operation of my improved apparatus is as follows: The cooled brine is forced up through the vertical service-pipe C, and then circulates through the horizontal pipes D D'. The valves d^4 are then opened to the desired extent, thereby allowing the cold brine to enter the perforated pipes *d*, when it drips or percolates through the perforations d^3 upon the upper portion of the strands E, when the knots *e* serve to distribute it upon the exterior of the main portion of these strands below the said knots. The ring *e'* (shown in the modification, Fig. 7) serves the same purpose. The brine, after trickling down the strands E, falls upon the inclined floor of the cooling-chamber, the upper surface of this floor sloping away from the center toward the sides of the building, as shown in Fig. 2, by which arrangement the brine is distributed equally to each side of the floor *a'*, where it runs into the escape-pipes F F', and back into the brine-reservoir B, where it is again cooled and forced through the service-pipe, as before, through its closed circuit. The air in the cooling-chamber is thoroughly and effectually cooled by the cold brine, which covers the exterior of the strands E, and also by the same brine as it flows over the inclined floor *a'* on its way to the escape-pipes F F'. This cold air descends by its own gravity through the cold-air flues G H I into the chambers 1, 2, and 3, entering the said chambers at points at least half-way up the side of said rooms, or, preferably, even nearer the ceiling. The cold air entering the rooms at these points, falls by its own gravity to the floor of the room, thereby displacing the warm air contained therein, and causing it to ascend to the upper part of the rooms, where it escapes through the central uptake-flues, J, K, and L, into the cooling-chamber A^2, being deflected by the cap M down into the lower portion thereof, so as to come into contact with the strands E and the cool brine on the floor of the chamber. After being cooled the air descends, as before, and thus continues passing through its closed circuit. The cap or deflector M serves also to keep the brine from splashing into the upper ends of the warm-air flues or ducts, as it might otherwise do. The cold brine exposed in the cooling-chamber not only cools to a very low temperature the hot air which ascends through the central uptake-flues into it, but also absorbs from the said hot air all foul gases and impurities, thereby purifying and drying it before it descends through the cold-air flues. The cooled briny air which is thus delivered into the lower rooms, absorbs from the meat, fish, dried or green fruit, or other articles stored therein all foul air or gases generated, and conveys them through the central uptake-flues into the cooling-chamber. The number of cold-air pipes G leading into the chamber 3, which is the uppermost chamber of the three desired to be cooled, is greater than the number leading into the next lower chamber, 2, while those leading into the lowest or first apartment, 1, are still less in number. I make use of this arrangement because the upper rooms of a building are always warmer, and therefore require a greater amount of cold air to cool them than the lower apartments, and I thereby introduce the greatest amount of cold air into the warmest room, decreasing the amount of cold air introduced until the lowest and coolest apartments receive the least amount thereof. An overflow-pipe, N, leads from one of the horizontal service-pipes D to the escape-pipe F, the upper curved end of this pipe being connected to the upper side of the pipe D, so that no brine will flow into the overflow-pipe except when the amount of brine entering pipes D and D' becomes too great to pass through the small perforated pipes *d*. A safety-valve, N', permits the escape of brine from the overflow-pipe directly into the cooling-chamber should the pressure in the said pipe become too great.

If desired, I may dispense with the small perforated curved pipes *d*, and use in place thereof the modification shown in Fig. 6, which consists in perforating the lower sides of the horizontal pipes D D' and securing the strands directly thereon, the horizontal pipes being in that case provided with suitable cocks

for regulating the amount of brine which it is desired to introduce into said pipes.

Fig. 7 illustrates another modification, in which the cold brine is discharged into a trough, S, perforated at its bottom, and suspended immediately above and parallel with a rod, upon which the strands E are suspended.

The tank in which the brine is cooled may, if desired, be placed outside of the building instead of inside the same, as shown in the accompanying drawings.

It will be seen that by securing the strands E upon the circular portion of the small perforated pipes *d*, I expose a much larger surface to the heated atmosphere which is to be cooled by contact with the brine on said strands than would be the case if the strands were suspended directly upon the horizontal service-pipes, the heated air in this case passing not only between the rows of pipes *d*, but also up through the central opening in each bunch of strands, which are thoroughly saturated with the cold brine, the air being thus rapidly and effectually cooled, dried, and purified.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of my improved refrigerating apparatus will be readily understood without requiring further explanation.

It will be seen that by constructing and operating my improved apparatus in the manner described, I succeed not only in cooling the several rooms to a very low temperature, but also take up and absorb all foul air or gases which may be generated in the meat, fish, or other articles stored therein.

Having thus described my invention, I claim and desire to secure by Letters Patent of the United States—

1. The combination, in a refrigerator-building, of a vertical supply-pipe for the cooling medium, horizontal service-pipes connecting with the upper end thereof, and a series of small circular perforated escape-pipes having fibrous material for the cooling medium extending from the lower faces of the horizontal service-pipes, as set forth.

2. The combination, in a refrigerator-building, of a vertical supply-pipe for the cooling medium, horizontal service-pipes connecting with the upper end thereof, and a series of small circular perforated escape-pipes for the cooling medium extending from the lower faces of the horizontal service-pipes, and provided severally with suitable regulating-valves.

3. The combination, with the vertical supply-pipe, the horizontal service-pipes, and the escape-pipes F F′, of the overflow-pipe N, having a safety-valve, N′, for the purpose specified.

4. The combination, with a building, of a series of ducts or flues leading from the bottom portion of an upper cooling-chamber into the different stories of the building at a suitable distance above the floors of the several rooms below, other central flues or ducts leading from the top portion of the lower rooms to the upper portion of the upper cooling-chamber, and provided with a cap or deflector for the purpose specified, and a refrigerating apparatus for cooling the air in the upper chamber, as set forth.

5. The combination, with the vertical supply-pipe, the horizontal service-pipes, and the escape-pipes F F′, of the floor *a′*, inclined from its center toward either side, and having at its apex a downwardly-deflecting hood, substantially as described.

6. In a refrigerator-building of the described class, the combination, with the upper cooling-chamber, of a series of cold-air flues or ducts alternately arranged in close proximity to each other to form hollow walls of said building, and leading to the different stories at a suitable distance above the floor of the several rooms below, substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

THOMAS R. WINGROVE.

Witnesses:
JNO. T. MADDOX,
GEORGE F. WIESSNER.