

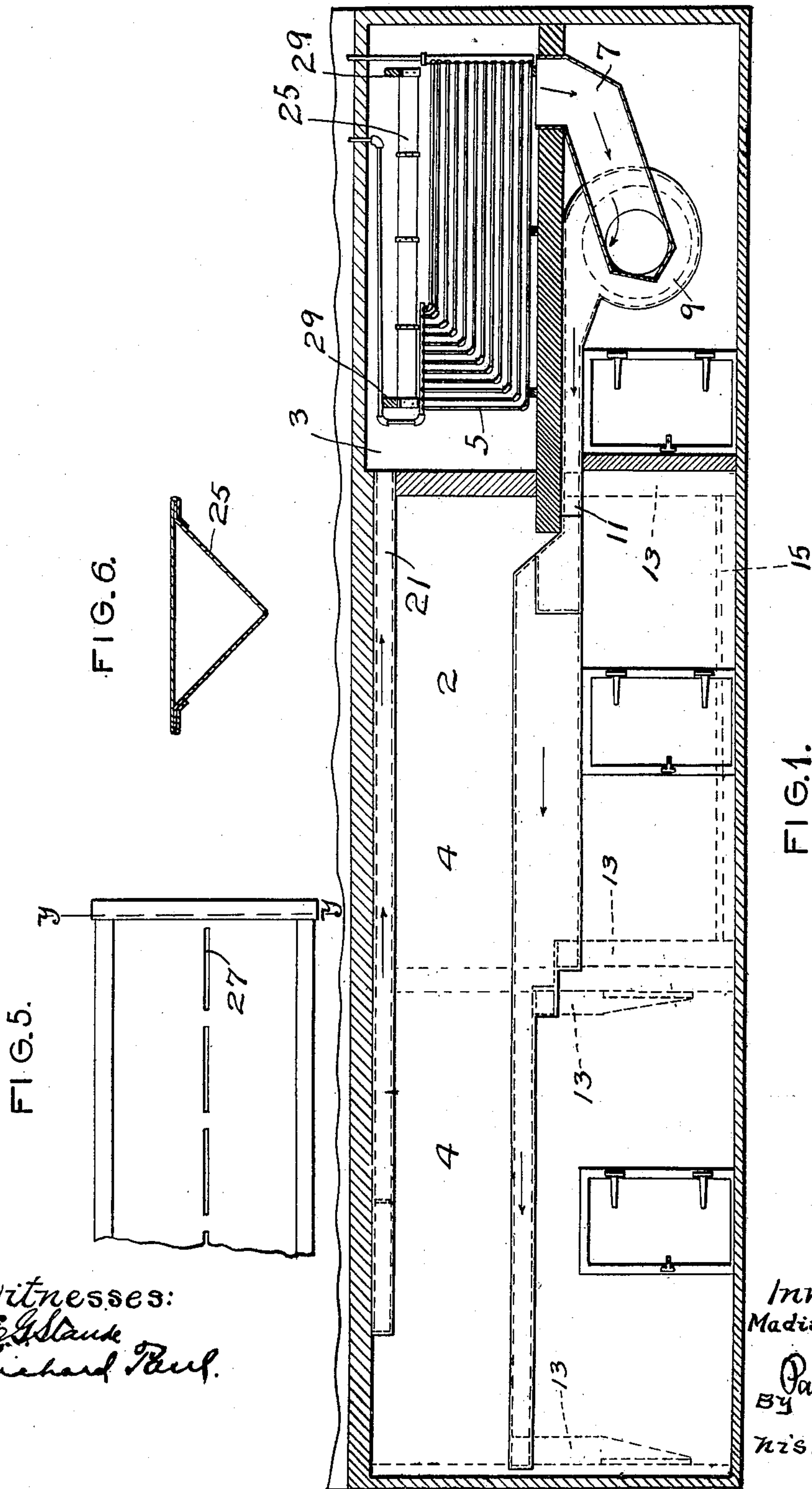
No. 754,749.

PATENTED MAR. 15, 1904.

M. COOPER.
COLD STORAGE APPARATUS.
APPLICATION FILED JULY 3, 1899.

NO MODEL.

4 SHEETS—SHEET 1.



Witnesses:
E. G. Stank
Richard Paul

Inventor:
Madison Cooper
By *Paul & Hanly*
his Attys

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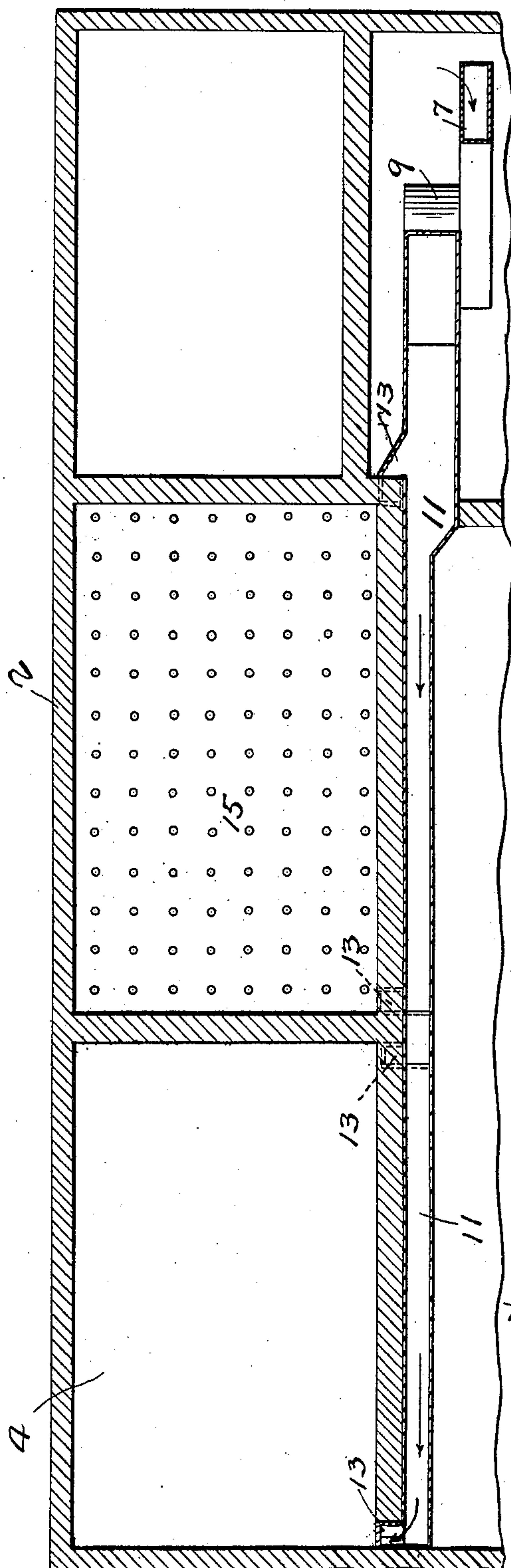
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4 SHEETS—SHEET 2.

FIG. 2.



Witnesses
E. G. Staudt
Richard Paul.

Inventor,
Madison Cooper
By Paul H. Hawley
his Attys

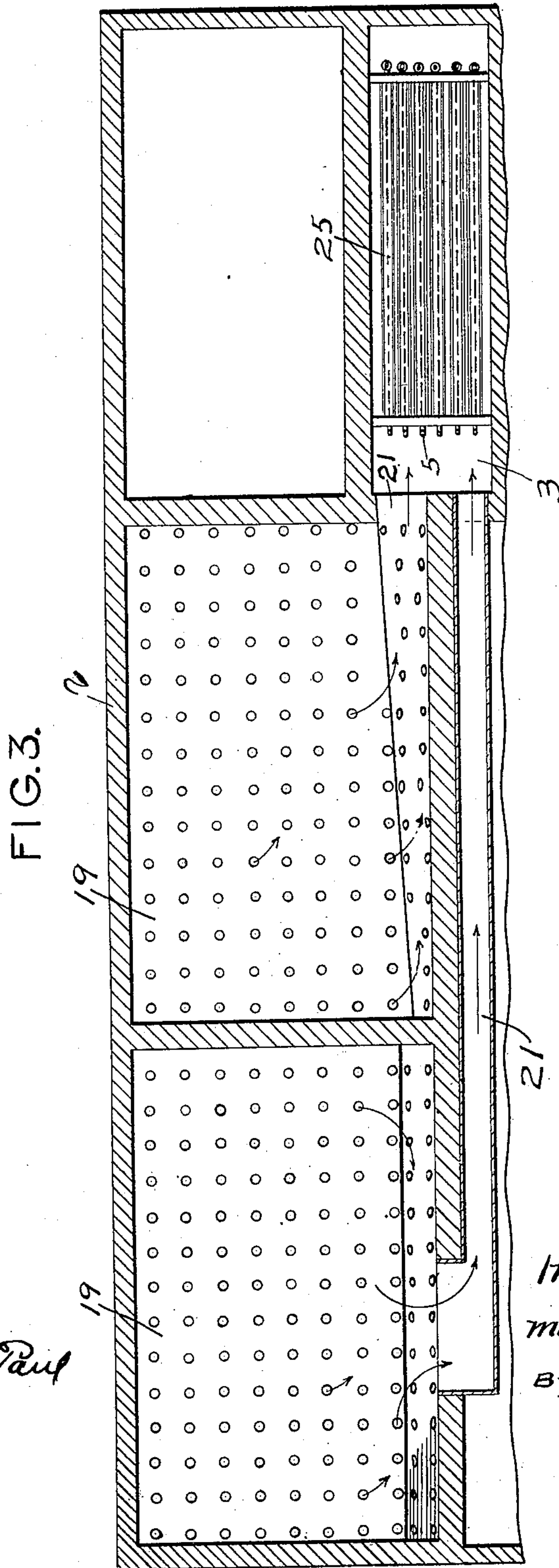
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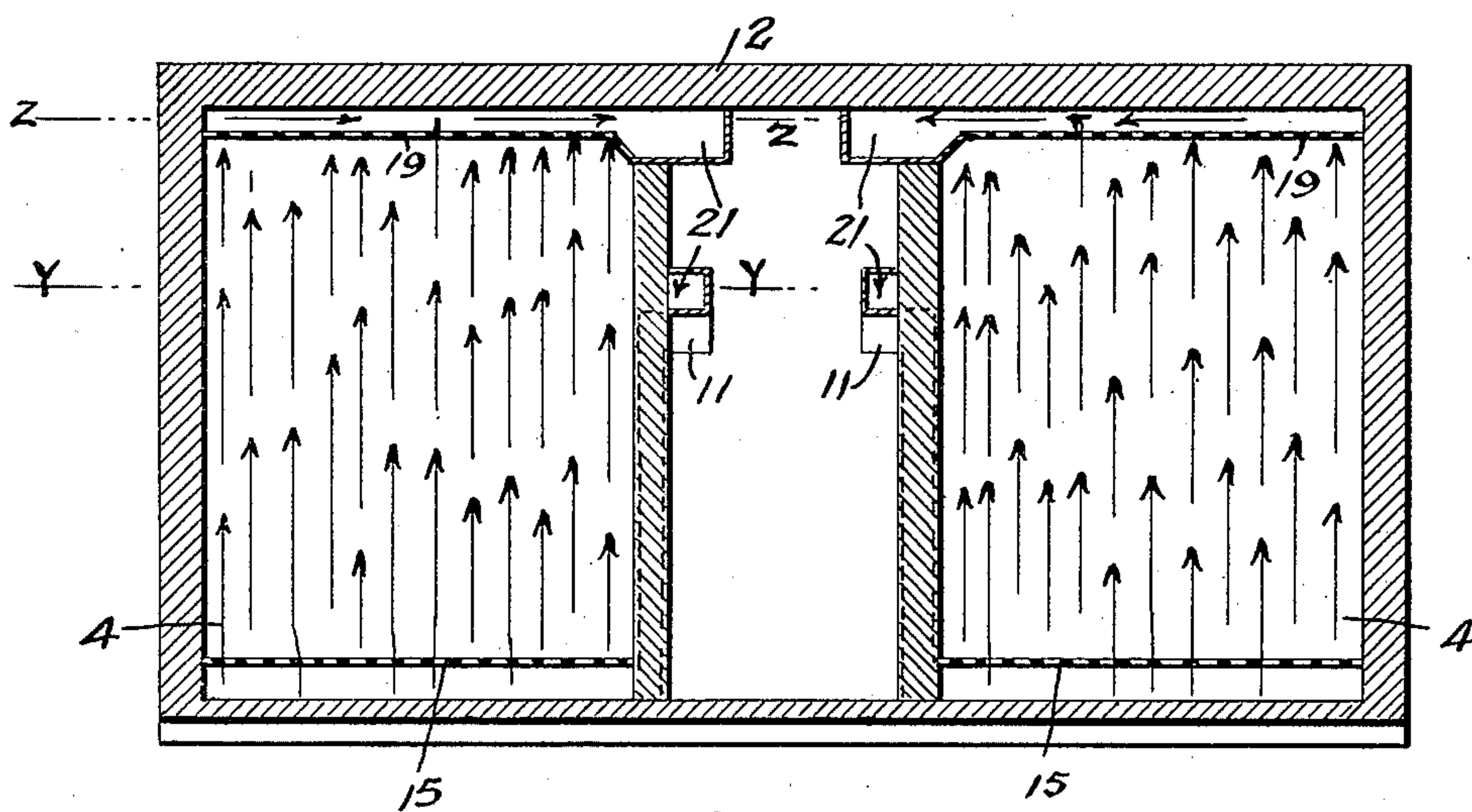


FIG. 4.

WITNESSES

E. G. Stange
M. Q. Noonan

INVENTOR

MADISON COOPER

BY *Paul H. Paul,*
HIS ATTORNEYS

UNITED STATES PATENT OFFICE.

MADISON COOPER, OF MINNEAPOLIS, MINNESOTA.

COLD-STORAGE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 754,749, dated March 15, 1904.

Application filed July 3, 1899. Serial No. 722,833. (No model.)

To all whom it may concern:

Be it known that I, MADISON COOPER, of Minneapolis, Hennepin county, Minnesota, have invented certain new and useful Improvements in Cold-Storage Apparatus, of which the following is a specification.

This invention relates to improvements in air-cooling apparatus designed especially for cold-storage houses, and particularly to an air-circulating system forming part of said apparatus and to means for purifying the air and controlling its humidity and for preventing the collection or forming of frost upon the refrigerating-pipes in the air-cooling room of said apparatus.

The invention consists generally in an air-circulating system, comprising means for forcing the cool air into the cold-storage rooms through false floors, removing the warm air from the tops of said rooms through perforated ceilings, and returning said air to the air-cooling room or chamber from which, after being cooled, dried, and purified, it is again forced through the storage-rooms, and this circulation continued as long as desired.

The invention consists, further, in suitable drip-pans arranged over the cooling-pipes and supplied with chlorid of calcium or other similar salt which, absorbing the moisture of the air, forms a brine which drips down over the outside of the cooling-pipes and effectually prevents the formation of any frost on said pipes. As said brine freezes at a very low temperature and forms a thin film on the pipes at all times, the moisture instead of collecting on the pipes is absorbed by the brine, which becoming more and more dilute is finally led into a waste-pipe and discharged into the sewer.

The invention consists, further, in the constructions and combinations hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a longitudinal vertical section of a refrigerating apparatus embodying my invention, showing the arrangement of the air-circulating ducts and their relation to the air-cooling room and the means for forcing the cold air into the rooms and drawing the warm air therefrom

and through the air-cooling room. Fig. 2 is a horizontal section on line *yy* of Fig. 4, showing the arrangement of the ducts for forcing air into the rooms. Fig. 3 is a horizontal section on line *zz* of Fig. 4, showing a plan view of the perforated ceiling and one of the return-ducts. Fig. 4 is a transverse vertical section of a refrigerating or cold-storage apparatus embodying my invention. Fig. 5 is a plan view of a trough or gutter for holding the frost-preventing salt or material. Fig. 6 is a transverse section of said trough or gutter on line *yy* of Fig. 5.

In the drawings, 2 represents a suitable structure or building or portion thereof forming part or the whole of a cold-storage plant and within which the refrigerating apparatus is arranged. The building may be of any suitable size, shape, or structure, provided with any desired number of rooms, and constructed of any suitable material. The air-circulating system herein described may be applied to any number of rooms, although in the accompanying drawings I have for illustration shown its application to a few rooms only. Arranged at any convenient point is the air-cooling room 3, within which is a series of pipes 5, supplied with gutters for holding a deliquescent salt, and through which any suitable refrigerant is circulated. These pipes and their arrangement in the air-cooling room and the means for supplying them with the refrigerating liquid form no part of my invention and need not be particularly described. An air-duct 7 is connected to the air-cooling room and to a suitable fan-casing 9, within which may be located a fan of any suitable construction. The position of the fan is indicated by dotted circle in Fig. 1. An air-duct 11 leads from the fan-casing 9 and extends to the several rooms 4 4 which it is desired to maintain at a uniform temperature for cold-storage purposes. Suitable branch or distributing ducts 13 lead off from the main duct 11, and these ducts extend to points near the floors of the rooms to be cooled. I provide each room with a false floor 15, (see Fig. 4,) beneath which the ducts 13 discharge their air-currents, and this floor forms a means of evenly distributing said currents of

cool air to all parts of the bottoms of the rooms. I provide each room with a perforated ceiling 19, arranged, preferably, a short distance below the usual ceiling of the room, and the space above said ceiling constitutes a large duct through which the warm air at the top of the room is taken out. A return-duct 21 is connected to the space above each of said ceilings, (see Figs. 3 and 4,) and a portion of the ceiling nearest the duct is preferably placed on an incline, as shown in Fig. 4, so as to permit the ready passage of the air into the return-ducts 21. The return-ducts 21 connect, as shown in Figs. 1 and 3, with the air-cooling room 3. By the means described the air is caused to pass from the air-cooling room through the duct 11 and the branch ducts 13 to points below the false floors, by which means it is evenly distributed all through the lower parts of the rooms. The air passing through the room or rooms rises and passes through the perforations in the perforated ceilings. These ceilings form means of exit for the air at the tops of the rooms, and as the tendency of the air is to pass vertically as it becomes warmer it follows that the cold air being evenly distributed throughout the lower parts of the rooms and the warmer air being evenly drawn off at the tops of the rooms a uniform temperature throughout each room will be maintained.

For the purpose of drying the air and controlling the humidity of same and for preventing the collection of frost on the cooling-pipes in the air-cooling room I provide the troughs or gutters 25, which have suitable slots or openings 27 in them, and said troughs are secured to suitable supports 29, so as to be arranged longitudinally of and directly above the refrigerating-pipes 5 in the air-cooling room. These troughs are filled with chlorid of calcium or other salt of like properties, and the moisture in the atmosphere coming in contact with this salt forms a brine which drips down over the refrigerating-pipes and forms a thin film thereon, and the moisture from the atmosphere of the room instead of collecting on the pipes and freezing, as it usually does in such air-cooling rooms, is absorbed by this brine, which becomes more and more dilute and which may finally be led out of the room by a suitable waste-pipe and discharged into the sewer or other suitable place. The moisture and impurities from the air of the room are thus absorbed by this brine and effectually disposed of. By keeping the frost off from the pipes they are maintained at all times at their maximum refrigerating efficiency. Where the refrigerating-pipes are allowed to become coated with frost during the period of the year when refrigerating material is passed through said pipes, such frost will come off from the pipes when the cool weather sets in and the refrigerating material is not used in the pipes. Then the

moisture will be taken up by the air with all its impurities and be circulated through the storage-rooms. By using the deliquescent salt this disadvantage is done away with and in cool or cold weather the air may be circulated from the cooling-room through the storage-room and be dried and purified as it passes through the cooling-room. It has been proposed in some instances to coat the refrigerating-pipes with a non-congealable fluid which was pumped over the pipes for the purpose of forming a coating thereon; but this method of preventing the formation of frosts on the pipes is objectionable, as the impurities which are absorbed from the atmosphere remain in the liquid which is constantly present in the air-cooling room. This liquid will after a time become foul and pollute the air which is forced through the air-cooling room into the storage-room. None of these objections are, however, present when the frost is kept off the pipes by the method herein described.

The forced-air-circulating system herein described secures a uniform temperature through the storage-rooms, and in combination with the pan for supporting a moisture-absorbing salt it secures purity of air and a proper degree of dryness or humidity of the atmosphere. The air in passing through the rooms is forced to cover very uniformly the entire cross-sectional area of each room. This is owing mainly to the use of the false ceiling, which covers the whole top of the room, and the false floor, by means of which the air is supplied to the lower part of these rooms. The air from the cooling-room is forced beneath the false floor and flows out through the perforations. Passing through the articles placed in the cold-storage room the air moves upward through the perforations in the false ceiling and thence through the space between the false ceiling and the ceiling proper to the air-cooling room again. As the fan or blower is preferably located on the main cold-air duct between the air-cooling room and the storage-rooms, the air is exhausted from the air-cooling room and forced into the storage-room. This tends to put each storage-room under a slight pressure and the air-cooling room under a vacuum. In this way if there is any leakage of warm moist air from the outside it is into the air-cooling room, where it is dried and cooled before being forced into the storage-room. With this system of forced circulation a vigorous circulation of the air may be obtained, and the moisture and impurities which are given off by the articles in the storage-room are quickly removed. They are not allowed to remain in the vicinity of the stored articles to work mischief, but are promptly hurried off to the air-cooling room, where they are for the most part absorbed or rendered harmless. It is also with this system as easy to control the humidity by the

use of a larger or smaller quantity of deliquescent salt as it is to control the temperature and with no bad effect on the other conditions in the storage-room.

5 As the details of the construction of the apparatus herein described may be considerably modified or changed without departing from my invention, I do not confine myself to such details as are herein shown and described.

10 Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, in a cold-storage apparatus, with means for cooling the air and with a deliquescent salt arranged in proximity
15 to the cooling means for purifying and drying the air, of a storage-room provided with a perforated false floor forming an air-distributing duct at the bottom of the room, and a perforated false ceiling forming an air-duct at the
20 top of the room, means for removing air from the upper part of the room through said perforated ceiling and conducting it to the place where it is purified, dried and cooled, and means for conducting said air from the place
25 where it is purified, dried and cooled into said storage-room through said perforated floor.

2. The combination, in a cold-storage apparatus, with means for cooling the air and with a deliquescent salt arranged in proximity
30 to the cooling means for purifying and drying the air, of a storage-room, means for removing the air from the upper part of said storage-room and conducting it to the place where it is purified, dried and cooled, and means for
35 conducting the purified, dried and cooled air to, and distributing it through, the lower part of said storage-room.

3. The combination, in a cold-storage apparatus, with refrigerating-pipes, of troughs
40 arranged above said pipes and adapted to hold chlorid of calcium, in a solid form, and to permit the brine formed by moisture of the atmosphere uniting with said chlorid of calcium to pass over said pipes to keep the same clear
45 of frost, substantially as described.

4. The combination, in a cold-storage apparatus, with an air-cooling room provided with refrigerating-pipes, of troughs arranged
50 above said pipes and adapted to hold deliquescent salt in a solid form and to permit the brine formed by moisture of the atmosphere uniting with said deliquescent salt to pass over said pipes to keep the same clear of frost, a storage-room, means for removing air from
55 the upper part of the storage-room and conducting it to said air-cooling room, and means for conducting the air from said air-cooling room to, and distributing it through, the lower

part of said storage-room, for the purpose set forth.

5. The combination, in a cold-storage apparatus, with a refrigerating-surface, of means supporting a deliquescent salt in solid form above said refrigerating-surface so that the
60 brine formed by the absorption of the moisture of the atmosphere by said salt passes over said refrigerating-surface and keeps the same free from frost.

6. The combination, in a cold-storage apparatus, with a storage-room provided with a
70 perforated false floor and with a perforated false ceiling, of an air-cooling room provided with refrigerating-surfaces, ducts connecting said air-cooling room with the space below said false floor, and above said false ceiling,
75 means causing the air to pass from said air-cooling room into said storage-room through said perforated floor, and from said storage-room through said perforated ceiling and back to said air-cooling room, and means located in
80 said air-cooling room for supporting a deliquescent salt in solid form above said refrigerating-surfaces.

7. The combination, in a cold-storage apparatus, with a storage-room provided with a
85 perforated false floor and with a perforated false ceiling, of an air-cooling room, ducts connecting said air-cooling room with the space below said false floor and above said false ceiling, means causing the air to pass from said
90 air-cooling room into said storage-room through said perforated floor, and from said storage-room through said perforated ceiling back to said air-cooling room, and means in
95 said air-cooling room for holding a deliquescent salt in solid form, whereby as the air passes through said air-cooling room it is dried and purified, for the purpose set forth.

8. The combination, in a cold-storage apparatus, with an air-cooling room provided
100 with refrigerating-surfaces, of a storage-room, means for conducting air from said air-cooling room through said storage-room and back to said air-cooling room, means for holding a
105 deliquescent salt in a solid form in said air-cooling room above said refrigerating-surfaces, whereby as the air passes through said air-cooling room it is purified and dried, for the purpose set forth.

In testimony whereof I have hereunto set my
110 hand this 28th day of June, 1899.

MADISON COOPER.

Witnesses:

A. C. PAUL,
A. F. HOLMES.