2 Sheets—Sheet 1.

R. M. BIRDSALL.

REFRIGERATOR BUILDINGS.

No. 195,565. Patented Sept. 25, 1877.

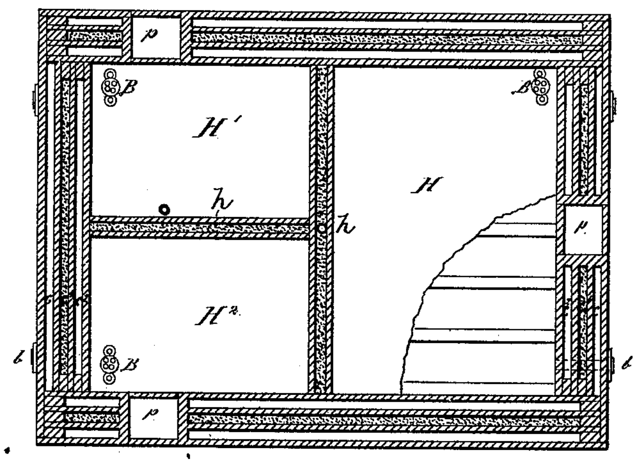

Fig: 1.

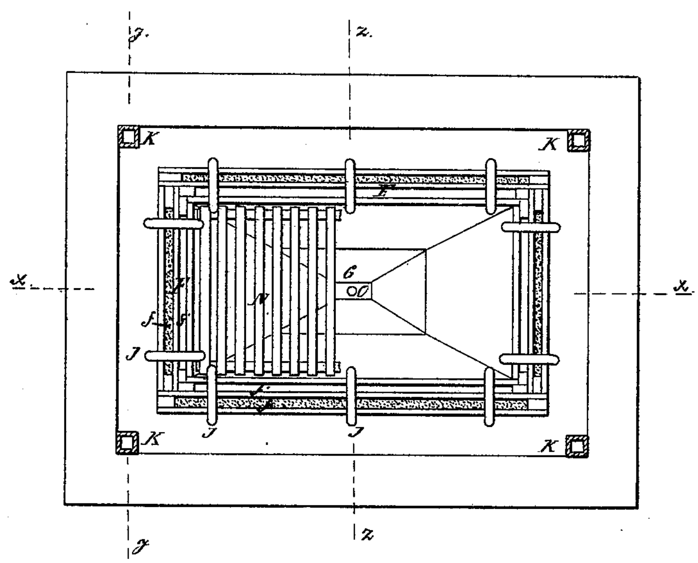

Fig: 2.

Witnesses.

Inventor.

Richard M. Birdsall
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2 Sheets—Sheet 2.

R. M. BIRDSALL.

REFRIGERATOR BUILDINGS.

No. 195,565 Patented Sept. 25, 1877.

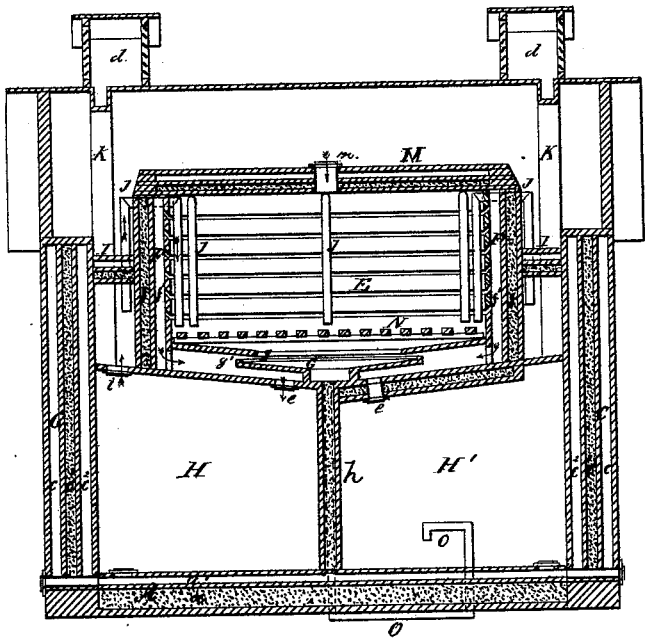


Fig: 3.

Fig: 4.

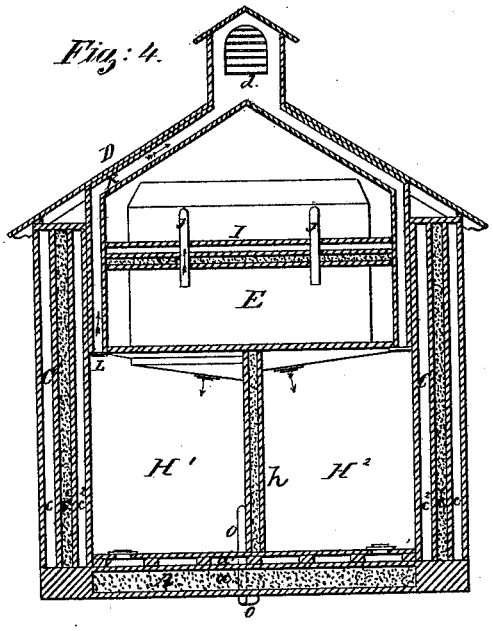
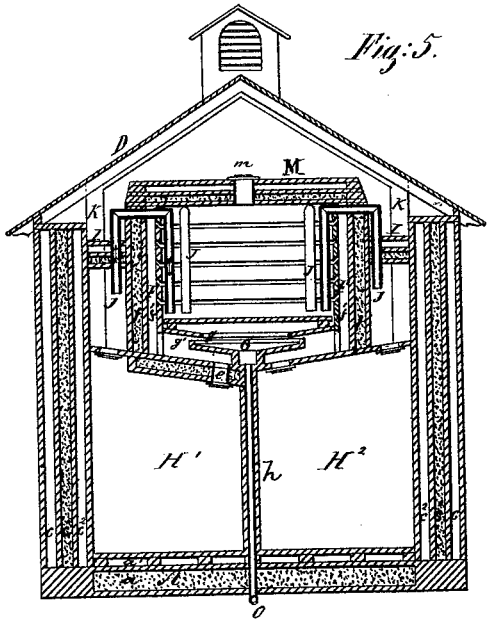


Fig: 5.



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UNITED STATES PATENT OFFICE.

RICHARD M. BIRDSALL, OF CLINTON, WISCONSIN.

IMPROVEMENT IN REFRIGERATOR-BUILDINGS.

Specification forming part of Letters Patent No. **195,565**, dated September 25, 1877; application filed August 2, 1877.

To all whom it may concern:

Be it known that I, RICHARD M. BIRDSALL, of Clinton, in the county of Rock and State of Wisconsin, have invented certain Improvements in Refrigerator-Buildings, of which the following is a full and exact description, reference being had to the accompanying drawings, in which—

Figure 1 is a plan of the lower floor or cooling-vaults. Fig. 2 is a plan of the upper or ice-reservoir floor. Fig. 3 is a longitudinal vertical section on line *x x* in Fig. 2. Fig. 4 is a vertical cross-section on line *y y* in Fig. 2, and Fig. 5 is a similar section on line *z z* in Fig. 2.

This invention has for its object to provide an ice-house in which a series of cooling-vaults are so arranged that each vault, independent of the others, can be kept at a temperature best suited for the kind of provisions to be preserved therein, and in which a large amount of fresh, dry, and cold air is supplied in suitable quantities and with a proportionately small consumption of ice.

The invention consists in an air-jacket surrounding the ice-reservoir, communicating through registers with the cooling-vaults, and through the U-shaped metallic flues with the ice-reservoir, which, in combination with the ducts leading from the ice-reservoir air-space, will permit a free circulation of air between the cooling-vaults and the ice-reservoir; and, further, in the construction and arrangement of the several parts composing my ice-house, as fully hereinafter explained.

A is the floor, composed of a lower space, *a*, which is packed with a non-conducting material, and of an air-space, *a'*, above it, having floor-registers B, one for each compartment, and outdoor registers or trap-vents *b*, which latter are located at opposite ends of the building, so that a draft of air can be passed through said floor-space from one end of the building to the other. C are the outside walls of the building, having three spaces, *c*, c^1, and c^2, the middle one, c^1, of which is packed with a non-conducting material, while the outward and inward spaces *c* and c^2 are dead-air spaces. D is the roof, having ventilating-cupolas *d*. E is the ice-reservoir, its walls F, being constructed with an outside double wall, *f*, filled with a non conducting material, and an air-space, *f'*, communicating with the ice-chamber through narrow openings in the inner lining of its walls. G is the bottom of the ice-reservoir, being hopper-shaped, and having a step-like offset, *g*, with a narrow opening as a passage for the ice-surrounding air into an air-space, *g'*, which is provided below said bottom G, and communicates with the air-space of the side walls F, so that a free circulation of the air to the ice is permitted from all sides and from the bottom, which air will pass into the cooling-vaults below through registers *e*.

The grate N is placed on the bottom G of the reservoir E, upon which the ice is placed.

The bottom of the air-space *g'* is extended to join with the exterior walls B of the building, forming the ceiling of the lower story of the ice-house, which is intersected by partition-walls *h*, double and packed with a non-conducting material, into several compartments, H, H^1, and H^2, a double door, *p*, for each compartment through the exterior walls, giving access thereto.

The floor I covers the space between the ice-reservoir walls F and the exterior walls C. It has two spaces, the lower one of which being packed with a non-conducting material. This floor I and the ceiling of the cooling-vaults form an air-jacket, which surrounds the ice-reservoir E, and communicates with the vaults H through registers *i*.

J J are U-shaped metal flues, the central portion of which is placed into and across the top edges of the ice-reservoir walls F, with their legs vertically suspended, one into the ice-chamber and the other one projected through the floor I into the air-jacket. K K are flues, commencing from under the ceiling of the several cooling-vaults H, passing through the air-jacket to and under the roof, and thence into the cupolas *d*. The draft through these flues is regulated by registers L in the vaults H H^1 H^2.

M is the cover for the ice-reservoir, fitting air-tight upon it, and being constructed with two spaces, the lower one of which is packed with a non-conducting material and the upper one is filled with air. An opening, *m*, is provided through its center, which is covered by a register.

The conductor-pipe O leads from the lowest point of the hopper-shaped bottom G of the ice-reservoir downward between the partitions *h*, and through the floor A, whence, with two rectangular bends, it is projected again through the floor into one of the vaults H, whence it may be carried into any compartment in which cold water is wanted. The object of carrying this pipe below the floor and of turning it upward again is to form a trap, since by perpetually holding water no air can escape through said pipe from the ice-reservoir.

The construction of the above-described ice-house is based entirely upon the well-known fact that air will contract in bulk, and therefore will increase its weight in proportion as its temperature becomes lower, and this is the reason why the coldest air will rush for the lowest position in a room, and will displace air of less density.

The reservoir being filled with ice and the registers *e* and *i* being opened, the air coming into contact with the ice will be the coldest, and will sink down through registers *e* into the cooling-chambers, thereby displacing the warmer air therein, which will rise through registers *i* into the air-jacket, and thence, through the flues J, it will pass into the reservoir, thus forming a continuous circulation, and the inner legs of flues J, being in contact with the ice, will cool the air, while passing through them, very rapidly, and will condense any moisture therein, which moisture will discharge with the drippings of the ice, thus furnishing a perfectly dry air only for the cooling-vaults H, and obviating all drippings of water therein.

Each cooling-compartment may be kept at the required temperature by shutting partly or entirely the registers *e* and *i*, thereby regulating the circulation of the air with the ice independently for each compartment, and in such compartments where a higher temperature is required, as for creameries, their ceilings are made non-conducting of heat by adding an extra lining, as shown in compartment H^1.

For renewing the air in the ice-vaults, the register *m* in ice-reservoir cover M is opened, and also the registers L of ventilating-flues *k*, when the air from the vaults will rush out through said flues *k*, and will be replaced by fresh air entering the ice-reservoir through register *m*, and the several vaults through registers *e*.

Damp and foul air, being heavier than pure air, will settle to the floor of the vaults, and through registers B into the space below said floor, and is expelled from time to time by closing registers B and by opening outdoor trap-vents *b*, when the draft of the outdoor atmosphere will thoroughly ventilate the air-space *a'* of floor A.

As will be seen, this ice-house will have a large cooling capacity with a proportionately small consumption of ice, only such air coming into contact with the ice as is used for cooling the vaults, and which is replaced by the outdoor atmosphere only when actually necessary.

A great advantage in the arrangement of the ice-reservoir is, also, that the air is not passed through the ice, but comes into contact with it only at its sides and bottom.

What I claim as my invention is—

1. The ice-reservoir E, having registers *e* arranged in its bottom, and surrounded by an air-jacket, having registers *i*, and provided with the U-shaped metallic flues J, in combination with the cooling-vaults, substantially as described.

2. The ice-house described, consisting of the cooling-compartments H H^1 H^2, the superposed ice-reservoir E, provided with non-conducting walls and circulating air-space, the U-shaped metallic flues J, the registers *e i*, the ventilating-flues, and the conducting-pipe, all constructed and arranged to operate substantially as described and shown.

RICHARD M. BIRDSALL.

Witnesses:
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J. F. CLEGHORN.