

H. A. DUC, Jr.
Refrigerator.

No. 224,282.

Patented Feb. 10, 1880.

Fig 1

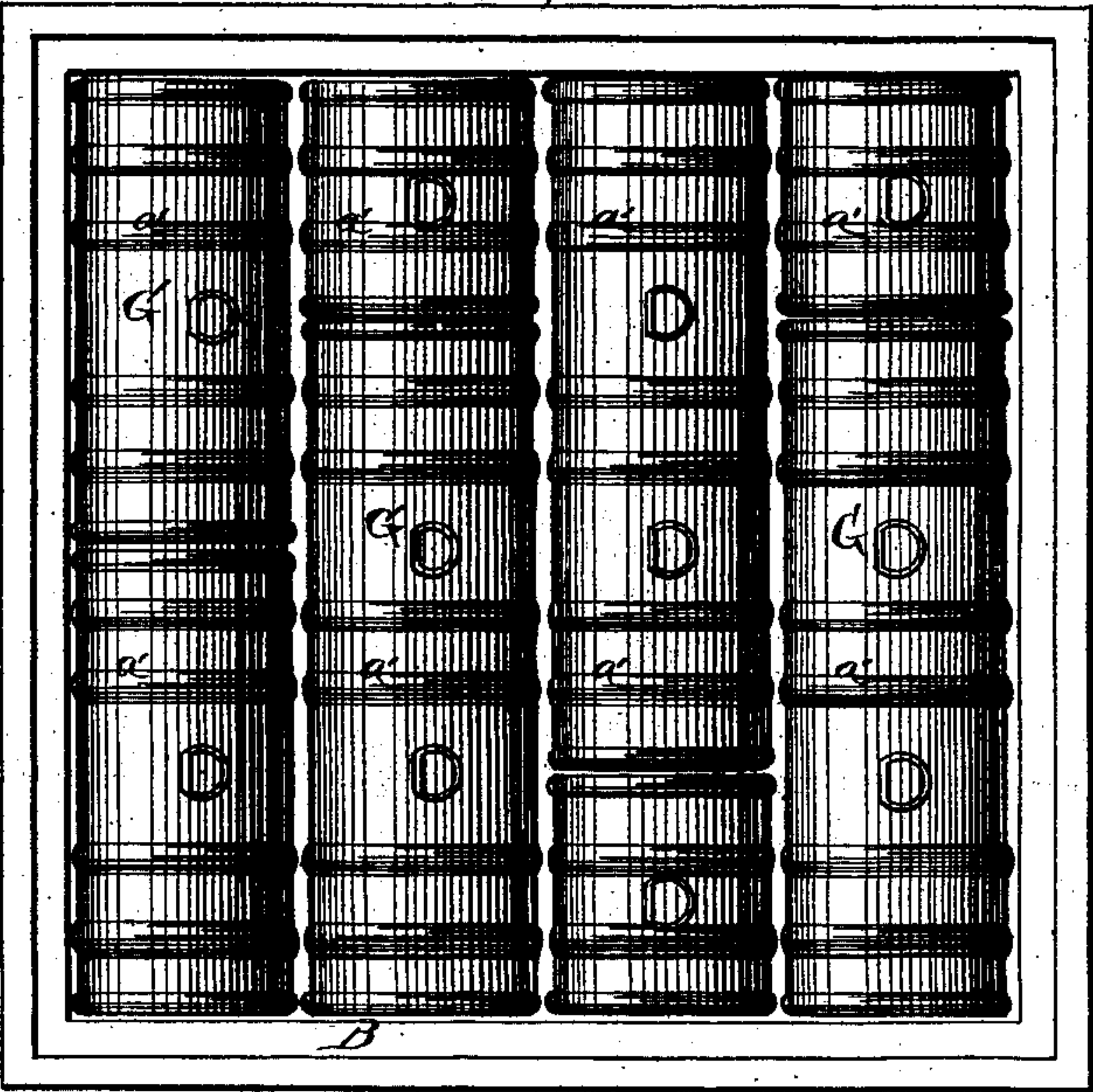
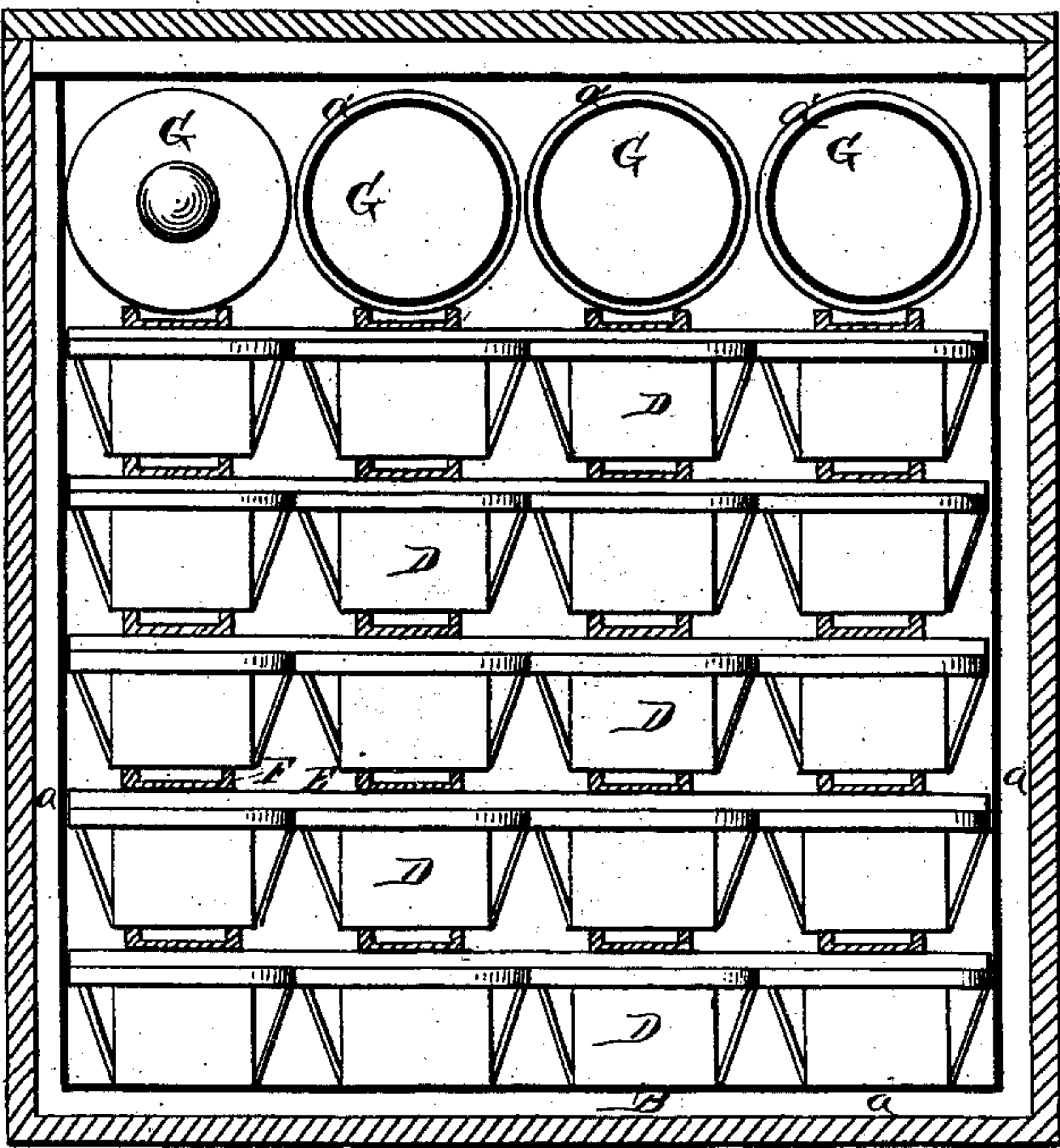


Fig 2



WITNESSES
H. C. McArthur
John S. Rogers

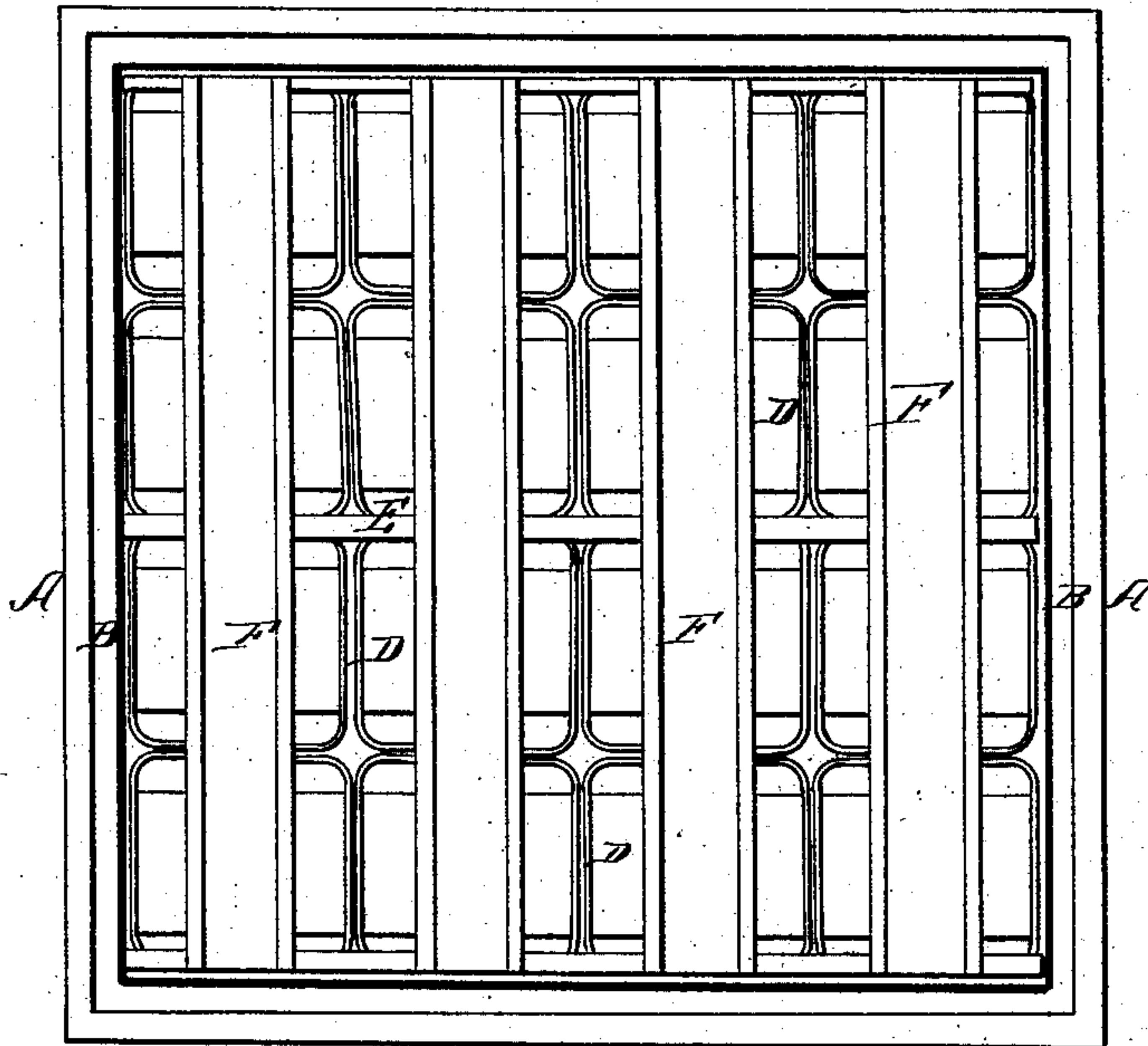
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Fig 3



Witnesses

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UNITED STATES PATENT OFFICE.

HENRY A. DUC, JR., OF CHARLESTON, SOUTH CAROLINA.

REFRIGERATOR.

SPECIFICATION forming part of Letters Patent No. 224,282, dated February 10, 1880.

Application filed February 11, 1879.

To all whom it may concern:

Be it known that I, HENRY A. DUC, JR., of Charleston, in the county of Charleston and State of South Carolina, have invented certain new and useful Improvements in Refrigerating Shipping-Boxes; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

The object of my invention is to produce an efficient and cheap refrigerating-box for the transportation of fruit, vegetables, &c.; and it relates more particularly to improvements in the construction of the ice-chamber, whereby the water of condensation can be disposed of in a more convenient manner, as will be hereinafter more fully set forth.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to describe its construction and operation, referring to the annexed drawings, in which—

Figure 1 is a plan view with the lid removed; Fig. 2, a vertical section, and Fig. 3 a cross-section.

A represents an outer case, provided with an interior smaller case, B, forming a space or chamber, *a*, between them for a non-conducting material. C is the cover of the box, constructed in the same manner. In this box are placed rows of boxes D D, each row or layer being divided from the next one above and below by a rack composed of concave or grooved gutter-shaped slats F, connected by cleats E.

G G represent the ice-chambers, placed on top of the top rack in the box.

In order to prevent the water which is condensed on the surface of the ice-chambers from falling on the fruit, &c., I use a foraminous ice-chamber constructed by placing cylindrical or prismatic vessels or chambers G G side by side, and these vessels are provided with exterior corrugations or projections, *a'*, so as to keep the vessels from touching each other, thus forming spaces or flues between them to allow the heated air to pass freely to the highest part of the box instead of being compelled to remain and condense all of its moisture on

the under side of the ice-chamber, when it would drop down on and spoil the fruit, &c.

To support the ice-vessels G, I use the concaved slats F, which, in combination with the curved or sloping sides of the cylindrical or prismatic vessels, completely arrest the descending water of condensation, and at the same time admit a greater amount of cold surface to be exposed directly over the contents of the box without injuring it in the least, and does away with the necessity of an intervening cloth.

The slats F are to be made of a soft bibulous material, or wood dried so that it will absorb the moisture, and thereby increase their capacity as reservoirs independent of their gutter shape.

It is well known in practice that the use of flat cold surfaces over heated fruit, &c., is objectionable on account of the condensed moisture falling on the same.

Various designs have been resorted to to obviate this trouble, such as corrugated, pitched, arched, or inclined surfaces, but with little or no avail, or they were accompanied with some disadvantageous features, such as increased cost, waste of space, &c.

In some instances a piece of cloth or other substance was put over the fruit to catch the drippings; but this latter was a more serious objection, for it acted like a non-conductor and prevented the free descent of the cold air upon the fruit.

To overcome this great trouble is the aim of my invention, and I have found that it is necessary to have an ice-chamber constructed in such a manner that the heated air can ascend directly to the upper part of the refrigerating-box, where it can remain and condense its moisture on the top surface of the ice-chamber; and to accomplish this it necessitates flues or their equivalents passing through the ice-chamber, whereby the large cold surfaces commonly used could be divided or separated into smaller ones.

The advantage of such an ice-chamber over fruit, &c., instead of one which is continuous or unbroken by flues or otherwise, will be readily seen, as the heated air from the fruit passes directly up through the flues to the top of the box without being compelled to travel against

so much cold surface, which would condense all of its moisture on the under side of the ice-chamber before it could get to the sides, where it can ascend to the top surface of the ice-chamber; and, consequently, there will not be as much water left to fall on the fruit, whereby fermentation would be augmented and the efficiency of the refrigerator diminished.

With a view of simplifying the construction and lessening the cost, I have constructed the ice-chamber of the cylindrical vessels G, having the corrugations or projections *a'*, to form flues between them, and between them and the sides of the box.

I do, however, not confine myself exclusively to the cylindrical form of these vessels, as various other forms will readily suggest themselves.

The top sides may be concaved or depressed, while the lower sides are convexed. In such case the depressed top surface will give room for a bibulous substance, and will hold all the water which is condensed on it, while the sloping or curved bottom surface will allow the water to slide into the gutter-shaped slats F.

Since there is only a certain amount of water in air heated to a certain degree, it is evident that the greater the area of cold surface presented the thinner will be the film of moisture condensed thereon, and the larger the quantity which is allowed to go up and condense and be held on the depressed top of the ice-chamber the smaller will be the amount left to be condensed on the under side; hence the advantage of having a tubulated ice-chamber, or its equivalent, by which a large portion of the moisture can ascend and remain in a condensed form on its upper surface, and, if necessary, be taken up by an absorbing-cloth put there for that purpose, in which position it would be advantageous instead of detrimental.

Again, if there is but little moisture to be condensed on the under side, it will remain there in an undisturbed condition, clinging close to the cold surface in the form of a light dew; but if the quantity is large or be increased, it very soon assumes the shape of elongated globules, which will drop on the fruit instead of sliding into the gutter-shaped slats if the box receives the slightest shock or jar. Therefore the important tubulated feature of my ice-chamber will be readily appreciated, as it not only allows more cold surface to be placed directly over heated fruit without injury, but also admits of placing the absorbing-cloth, if used, on the top of the ice-chamber instead of having it between the fruit and the cold surface or bottom.

The ice-vessels G may be made of any suitable material and furnished with openings for charging, which can be closed with cocks, rubber plugs, or otherwise; or they may be filled with broken ice or a freezing-mixture and a cap soldered on quickly; or water or an uncongealable fluid may be soldered up in the vessels, and, if necessary, the temperature be

reduced to a point far below freezing, whereby a smaller vessel would be made more efficacious than a larger one filled with broken ice, and at the same time be freed from the danger of leaky plugs, &c.

In the construction of the ice-chamber I make the integral parts bear such relation to each other as will admit of using them in different-sized boxes without losing any available space—that is to say, the vessels G are made of varying sizes, and their positions can readily be changed to alter the shape and dimensions of the ice-chamber for the purpose of adapting it to different-sized boxes.

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

1. The combination, with the box or case of a refrigerator, of a cooling or ice chamber, closed on all sides, but provided with flues or spaces extending through said chamber for the passage of heated air, and located in the upper part of said box, a space being left above said chamber, with which said flues or spaces are in communication, substantially as described.

2. In a refrigerator, an ice-chamber composed of one or more vessels provided with corrugations or projections, the said corrugations or projections being arranged as set forth, whereby flues or spaces for the passage of air are formed, substantially as described.

3. The combination, with an ice-vessel having corrugations or projections thereon, of a concaved slat placed beneath said vessel, and upon which the said projections or the ridges formed by said corrugations rest, whereby channels are formed, substantially as described.

4. In combination with the box or case of a refrigerator, an ice-chamber made of integral parts, arranged in parallel lines side by side and end to end, substantially as and for the purpose described.

5. In combination with a refrigerating shipping-box, a series of movable hermetically-sealed boxes filled with a cooling medium, the temperature of which is at or below the freezing-point of water, substantially as described.

6. The combination, in a refrigerator, of a box with non-conducting walls and top, an ice-chamber located at its upper part, which ice-chamber is formed of a series of vessels with corrugations or projections thereon, arranged side by side, and concaved slats, of wood or similar non-conducting material, located beneath the vessels, spaces being left on all sides of said vessels by means of said projections or corrugations, substantially as described.

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

HENRY A. DUC, JR.

Witnesses:

ISAAC HOLMES,
SID. H. QUINTARD.