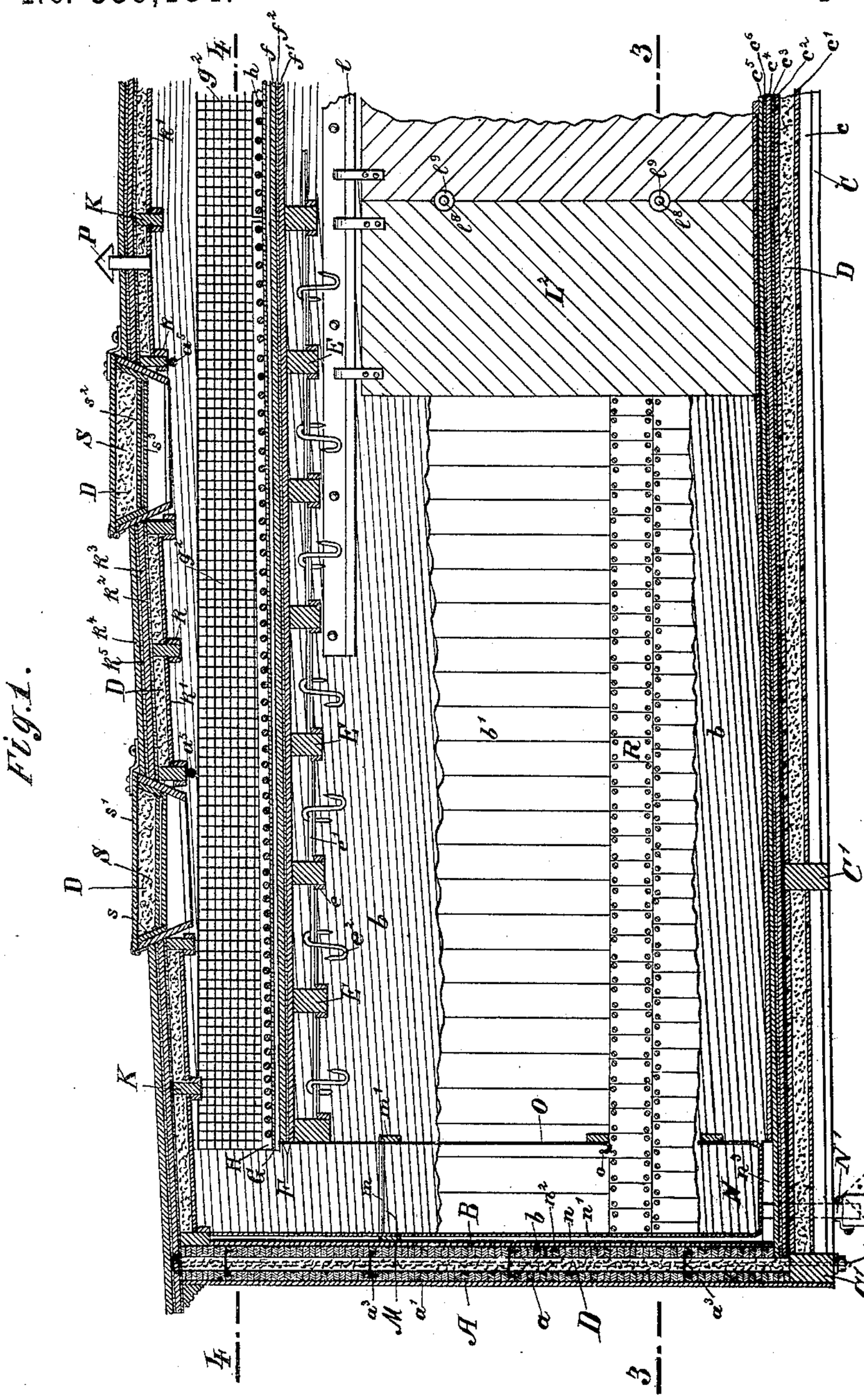
(No Model.) 4 Sheets—Sheet 1.

C. B. HUTCHINS.

REFRIGERATOR CAR.

No. 339,184. Patented Apr. 6, 1886.



Witnesses:

Chas. F. Baum.

H. W. Munday.

Inventor:

Carleton B. Hutchins,

Munday, Evarts & Adcock

his Attys.

(No Model.)

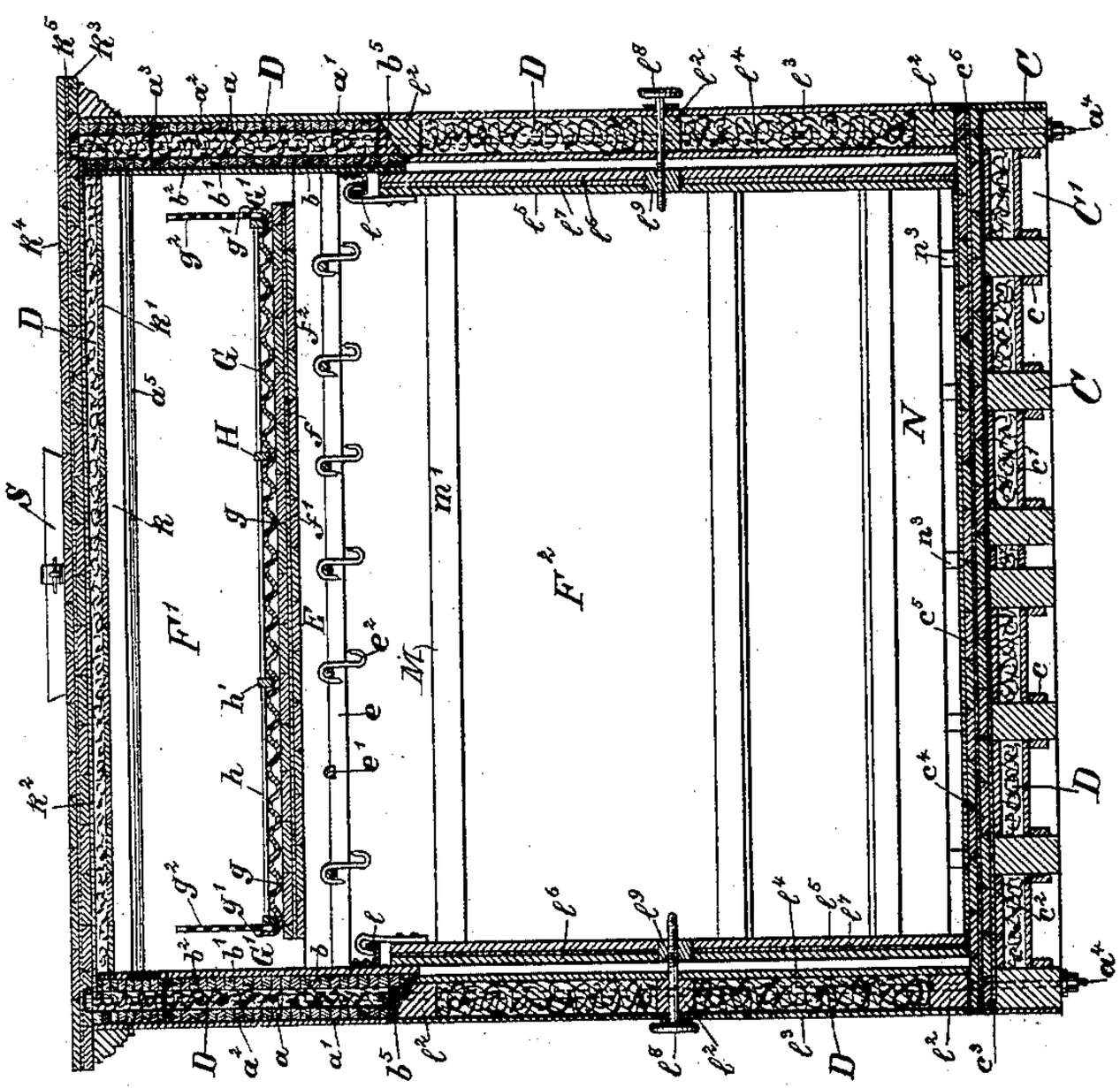
4 Sheets—Sheet 2.

C. B. HUTCHINS.

REFRIGERATOR CAR.

No. 339,184. Patented Apr. 6, 1886.

Fig. 2.



Witnesses:

Chas. Baur.

H. M. Munday.

Inventor:

Carleton B. Hutchins,

Munday, Evarts & Adcock

his Attys.

(No Model.) 4 Sheets—Sheet 3.

C. B. HUTCHINS.

REFRIGERATOR CAR.

No. 339,184. Patented Apr. 6, 1886.

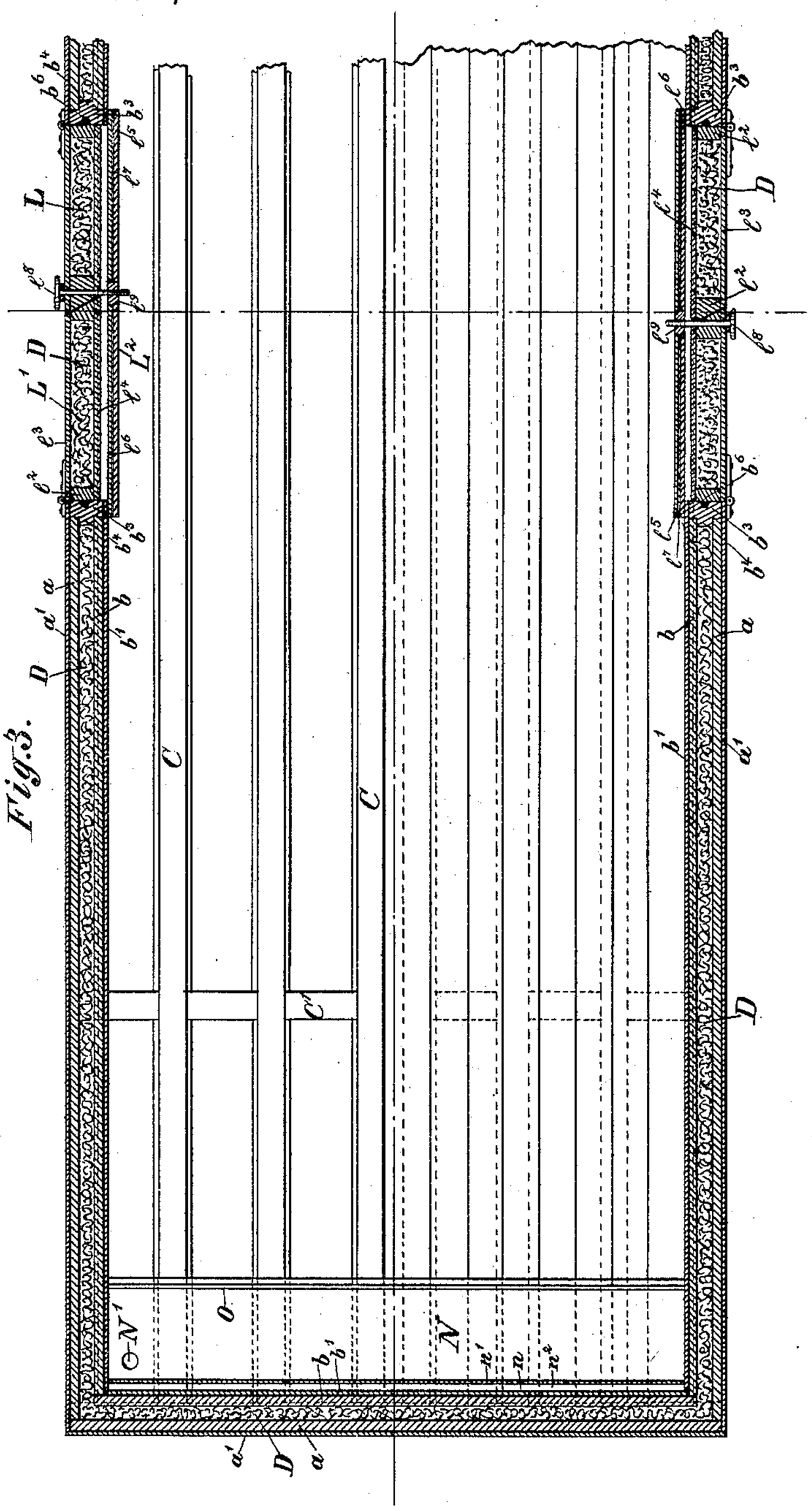


Fig. 3.

Witnesses:

Chas. J. Saur.

A. W. Munday.

Inventor:

Carleton B. Hutchins,

Munday Evarts & Adcock

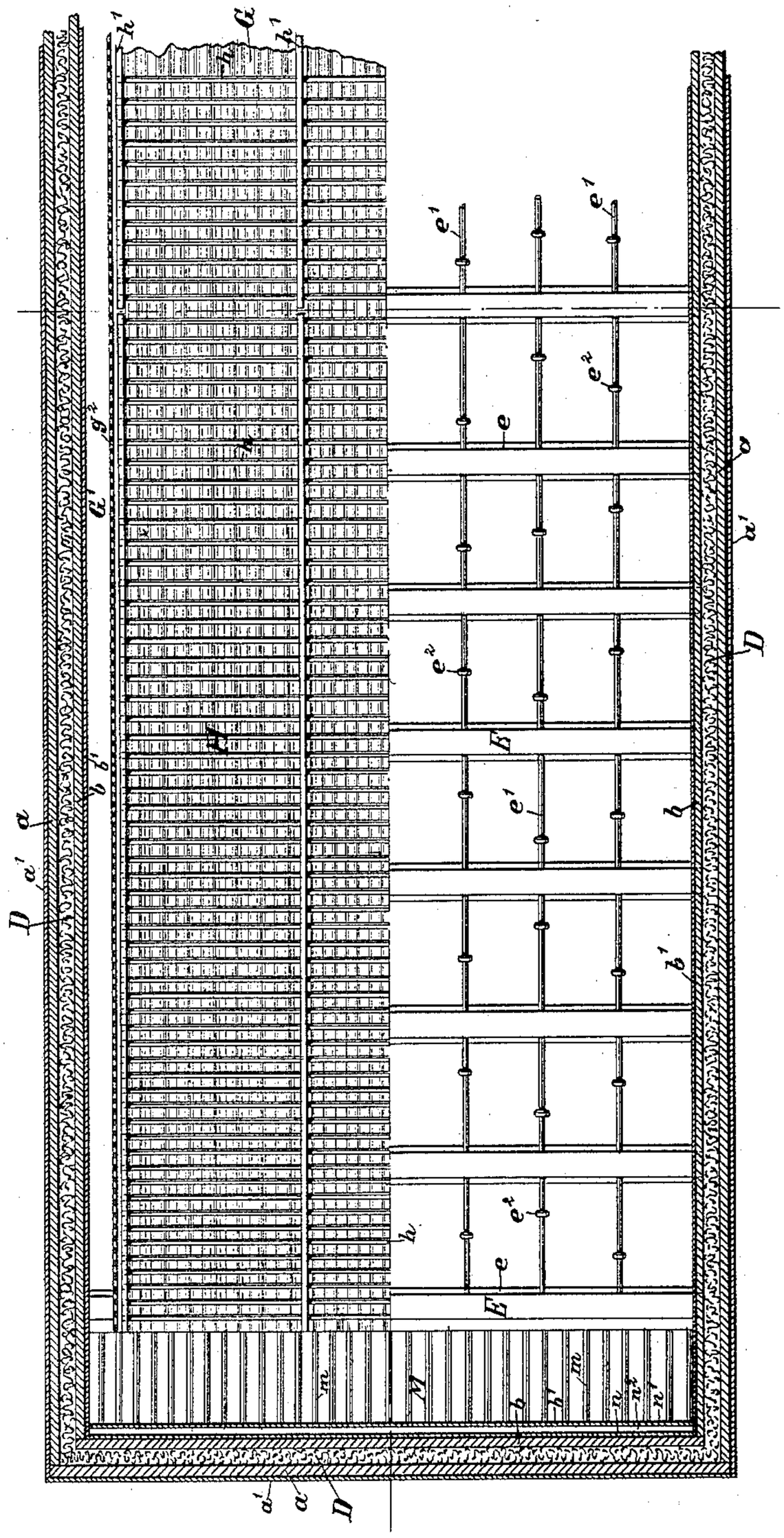
his Attys.

(No Model.) 4 Sheets—Sheet 4.

C. B. HUTCHINS.

REFRIGERATOR CAR.

No. 339,184. Patented Apr. 6, 1886.



Witnesses:

Chas. Baur.

A. W. Munday.

Inventor:

Carleton B. Hutchins.

Munday Evarts & Adcock

his Attys.

UNITED STATES PATENT OFFICE.

CARLETON B. HUTCHINS, OF DETROIT, MICHIGAN.

REFRIGERATOR-CAR.

SPECIFICATION forming part of Letters Patent No. 339,184, dated April 6, 1886.

Application filed September 29, 1885. Serial No. 178,517. (No model.)

To all whom it may concern:

Be it known that I, CARLETON B. HUTCHINS, a citizen of the United States, residing in Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Improvement in Refrigerator-Cars, of which the following is a specification.

In the practical operation of refrigerator-cars heretofore in use it has been found necessary to generally replenish the supply of ice about every twenty-four hours, and in shipping from Chicago to New York, for example, it is customary to stop two or three times and refill the cars with ice, it being necessary, usually, to replenish the ice every twenty-four hours. These stops, and the time necessarily consumed in switching the cars and refilling them with ice, especially where the train is composed of a great number of refrigerator-cars, greatly increases the aggregate time required for shipment and also the cost of transportation; but the more serious difficulty arises from the fact that the mere replenishing of the ice necessarily involves and even itself causes material changes in the temperature of the car, and tends greatly to injure the character and quality of the fresh meats or other perishable goods carried therein; and for this and other reasons with many refrigerator-cars now in use it is found that the changes in the temperature of the car are so great or so varies at different parts of the car that when the car reaches New York, the colder parts of the same which are in contiguity with or in the immediate neighborhood of the ice will be covered with frost or congealed moisture; and when the doors of the car will be thrown open for examination of the meat by the inspectors or different purchasers, and during the time of unloading the car, this frost will soon melt and run down upon the meat, thus greatly injuring its quality and appearance; and this difficulty is of course greatly aggravated if the car of meat happens to remain upon a side track for any considerable time before it is finally disposed of, which is frequently the case.

It is the object of my invention to produce or provide a refrigerator-car in which fresh meat or other perishable articles may be safely carried from Chicago to New York, or even greater distances, without once replenishing the supply of ice from the time the car is loaded until it is unloaded at the point of destination, and one whereby the temperature in the car can be maintained stationary or without fluctuation; and here it may be proper to state that in a car constructed according to my invention I have recently successfully shipped a car-load of fresh beef in hot weather (August) from Chicago to New York, not only without replenishing the supply of ice during the transit, but also kept the car upon a side track in New York for several days after its arrival, and then seven days after the car was loaded and started from Chicago—and no additional supply of ice having been supplied to the car during this whole period—the meat was found perfectly preserved and in an exceptionally fine condition; and the temperature of the car did not vary scarcely at all during the entire time, and there was no frost or condensation of moisture upon any part of the car.

This important result I attain, and herein my invention consists, by the union or combination, in a single car, of a number of different elements or features which contribute to the common end, viz: First, double walls of a peculiarly air-tight and strong construction, so that the racking and wrenching strains to which the car is constantly subjected while in motion, passing around curves, &c., will not produce cracks or crevices in its walls through which the cold air inside may escape and the warm air outside enter; second, a non-heat-conducting or insulating filling between these double walls, composed of woolen rags cut into fine strips or pieces and tightly packed between the double walls at the sides, bottom, and top of the car, which, after numerous experiments, I find to be best adapted to the purpose of any material known to me. The rapid motion of the car through the air tends to produce an interchange of air between the inside and outside of the car through its walls, and for this reason ordinarily the temperature of a car in hot weather would rise while it is in motion and fall when the car remains stationary for some time, other conditions remaining the same. In other words, the car has a continual tendency to "breathe" in

warm air and breathe out cold air through its partially porous walls, and the temperature thus kept fluctuating up and down whenever the car is put under motion or stopped; but I find that by my peculiar construction of double walls, in connection with a packing of woolen rags between them, I can so effectually prevent the communication of heat from the outside to the inside of the car or so control it that the ice in the car will easily and effectually maintain a fixed temperature.

A third feature, which also contributes to the maintenance of a uniform temperature in the car at all times, consists in providing a ventilator or opening at or near the highest point in the car and communicating directly with the ice-chamber. The cold air in the car being heavier than the warm air on the outside, it consequently has no tendency to flow upward through this opening, unless, indeed, there should occur an excess of air-pressure inside the car to force it out. When for any cause the atmospheric pressure inside the car happens to be too great, so that some of the cold air inside would otherwise be forced out through its partially-porous walls, this opening forms a ready means of relief or escape for the excess air, and as the warmer air in the car is of course always found at the highest point it is this warmest air of the car which escapes in preference to the colder portions, which would be forced out but for this opening; and, on the other hand, when for any cause the air-pressure in the car falls too low, so that but for this opening warm air would be forced in through the walls of the car and thus come directly in contact with the meat or preserving chamber and tend to change the temperature, this opening, affording a ready means of access for the air, prevents this, and also being located immediately above the ice-pan leads the current of warm air directly into contact with the ice, and thus cools it before it can have any appreciable effect in varying the temperature of the meat-chamber; and this recently-admitted warm air being lighter than the cold air in the car, has no tendency to descend.

A fourth feature or element, which also contributes largely to the successful accomplishment of the result in view, consists in providing non-heat-conducting or insulating sheathing between the ice-pan above and the meat-chamber below, so that there will be no excessively cold surface immediately surrounding or in contiguity with the meat or preserving chamber of the car. This insulating sheathing is not only an important factor in maintaining a fixed and unvarying temperature in the preserving-chamber, but it also serves to prevent the production of frost or condensation of moisture upon any parts where, if it should again melt, the water would run down upon and wet and injure the meat.

A fifth feature or element of my invention, which, when combined with the other parts, contributes largely to the maintenance of an equal temperature throughout every part of the car, consists in providing a continuous open space or communication between the ice-chamber, and the preserving-chamber, all around the walls of the car, both at sides and ends, so as to avoid currents in particular directions, and in the particular construction of the ice-pan or chamber, which is made to occupy the whole top of the car, and extends from side to side and from one end to the other. The ice-pan is made about thirty inches shorter than the car on the inside, so as to leave an open space of about fifteen inches at each end for communication between the ice-chamber and the preserving-chamber, and about eight inches narrower than the car on the inside, so as to leave a space of about four inches at each side for communication between the ice and preserving chambers.

A sixth feature or element consists in making the bottom of the ice-pan of corrugated metal, the corrugations extending lengthwise of the car from end to end and being slightly raised in the middle, so that the water from the melting ice may be drained off as fast as it forms and leave the ice free and dry, for access of the air in and to and to stand about the whole mass of ice.

A seventh element consists in furnishing this ice-pan with a rack laid on top of this corrugated or grooved bottom, in order to produce a greater and more free space beneath the ice for draining off the water and admitting the air to the ice.

The invention also consists in the novel devices and novel combinations of devices herein described and claimed.

In the accompanying drawings, which form a part of this specification, and in which similar letters of reference indicate like parts, I have shown at Figure 1 a central longitudinal vertical section of part of a car embodying my invention, and by means of which I accomplish the result above named; and Fig 2 is a vertical cross-section of the same. Fig. 3 is a horizontal section taken on line 3 3 of Fig. 1, part of the flooring being removed to show the frame-work beneath; and Fig. 4 is a horizontal section on line 4 4 of Fig. 1.

In the drawings, A and B represent the outer and inner main walls of the car, the same being composed of flat strips *a* and *b*, laid and spiked down one on top of another, and bound firmly together by the vertical bolts or rods, which extend from the bottom frame of the car to the top of said walls. The bottom frame may be of any ordinary construction, but may preferably consist of the longitudinal beams C, united by the cross-beams C′.

D is an insulating-packing filling the space between the outer and inner walls, A B, of the car, preferably composed of woolen rags cut into fine strips or pieces, as I have found after a long series of experiments that they produce the best results of any material known to me practical for the purpose.

The longitudinal beams C are furnished with

strips *c*, nailed thereto, to serve as supports for the bottom or outside floor of the car *c'*.

The floor *c'*, as well as the second floor, c^2, are both composed of short matched boards laid between the longitudinal beams C. The space between the floors *c'* and c^2 is filled with an insulating-packing, D, preferably to a thickness of about three inches, composed of woolen rags cut into fine shreds.

In constructing the car the supporting-strips are first secured to the longitudinal beams C, about four and one-half inches from their top faces. The first floor, *c'*, is then laid thereon, the insulating material is then filled and packed into the desired thickness, when the second floor, c^2, is laid directly upon the same, this second floor being preferably made just flush with the upper face of the timbers C and C'. I next lay down over the whole surface of the floor thus prepared sheets or coatings of paper or like material c^3, preferably about three thicknesses of the same. I then lay on top of this a floor, c^4, of matched boards, the boards preferably extending lengthwise of the car; and upon top of this floor I lay an additional floor, c^5, also of matched boards, care being taken to break joints with the floor c^4. Sheets of paper c^6 or like material should also be interposed between floors c^4 and c^5. The flat strips *a* of the outer wall, A, are built up directly upon the outside beams, C and C', of the frame, and the strips *b* of the inner wall, B, are built upon the outer margin of the floor c^5, this floor just extending flush with the outer edge of the wall B, so that the insulating material D is packed directly upon the outside frame timbers, C C'. The flat strips *a b* of the side walls should preferably be given a slight curve or camber from one end of the car to the other, as indicated in Fig. 1, by first laying a number of short tapering strips, *a b*, at the bottom until the requisite curve is produced. The elevation of this curve or arch may preferably be about six inches at the middle of the car. The outer wall, A, is lined with matched boards *a'*, preferably extending vertically, and the inner wall, B, has a similar lining, *b'*, upon its inside. Sheets of impervious paper or similar material, a^2 b^2, may also preferably be interposed between the walls A B and the board linings *a' b'*. The strips *a b* may preferably be about one and one half inches wide, and the space between the walls, which is filled with insulating material D, should be about two and one-half inches wide. Stays a^3 are provided between the walls A B at intervals. The openings for the doors at each side of the car are formed, as the walls A B are built up, by vertical posts b^3, provided with shoulders b^4, which project between the walls A B, and afford a bearing or support, to which the strips *a b* may be nailed. A frame, b^5, extends over the doorway and forms the top casing of the same and also closes the space between the walls A B. The insulating material D should be packed in as the walls are being built up, so that the packing in of the filling material may be under inspection and perfectly done throughout. The cross-beams E, which support the ice-pan and also the hook-rods from which the meat is suspended, rest upon and are built into the inner wall, B, as it is laid up. The ends of these beams E should project just through the inner wall, but not beyond, so as to have a firm bearing thereon and still not project into the open space between the walls A B, and thus interfere with the proper packing of the insulating material therein. These beams E are not inserted in the walls B all at the same height or on the same level or horizontal line; but they are arranged on a slight curve from each end toward the middle of the car, the middle one being preferably about an inch higher than those at the ends, so that the ice-pan supported on these beams will have the requisite inclination from the middle toward each end to drain off the water produced by the melting of the ice. A non-heat-conducting or insulating sheathing, F, preferably composed of two layers of matched boards *f* and *f'*, with interposed sheets of paper or like material, f^2, between the two, is laid upon these beams E, in order to insulate in a measure the ice-chamber F' from the preserving chamber F^2 and prevent the production of frost or condensations of moisture upon the lower surface of the ice-pan G. The ice-pan G, preferably made of corrugated galvanized iron, the grooves or corrugations *g* running lengthwise of the car, rests directly upon this insulating floor or sheathing F, and assumes the same curved shape, being highest in the middle, so that the water will readily flow off toward each end.

The floor or sheathing F and the ice-pan G, resting thereon, are made slightly smaller than the car, a space, G', being left all around for a free and open communication without local or particular currents between the ice and preserving chambers F' and F^2. This space should preferably be about fifteen inches at each end of the car and about four inches at each side of the same.

The ice-pan G may, as shown, consist simply of a corrugated sheet of galvanized iron, its side edges, *g'*, being slightly turned up to prevent the water dripping off at the sides when the car tilts, and also to act as shoulders to retain in place the wire screens g^2 at each side of the ice-pan, which serves to hold the ice. The vertical sides of the ice-pan being thus composed of wire screens or other open-work, the air can have access into and through the whole mass of ice, the ice being, of course, ordinarily in the form of blocks of various sizes and shapes.

As additional means of providing free access of the air to the ice, and to prevent the ice from filling or stopping up the channels *g*, and thus damming the water, I provide a rack, H, made in removable sections and composed of rods *h*, inserted in the longitudinal bars *h'* on top of the ice-pan G, to receive

and support the ice. By making these racks in sections they can be taken up and removed and the sawdust or other refuse material left from the ice swept up and removed. These racks also serve as a protection to the ice-pan G when the blocks of ice are dumped into the car through the scuttles or openings at the top. The roof of the car is supported upon the cross-beams K, which rest upon and project through the inner walls, B. These cross-beams are provided with strips or shoulders *k* on their sides near their bottom edges, upon which rests the inner sheathing, *k'*, of the roof, preferably composed of short matched boards. The insulating material D is then packed into the requisite thickness, to make it flush with the upper edges of the beams K. Sheets of paper or like material, k^2, are next laid down over the whole surface of the roof, and then the longitudinal matched roofing-boards k^3 and k^4 are applied, the usual water-proof roofing compound, and preferably, also, sheets of water-proof paper, felt, or like material, k^5, being interposed between the board sheathings k^3 and k^4. Before the outer roof-boards, k^4, however, are applied the nuts are screwed down upon the vertical rods or bolts a^4, which extend from the bottom frame of the car to the top. These bolts are preferably inserted through the space between the walls A and B; but they may be otherwise located. Tie-rods a^5 also extend from side to side across the car at the top between the inner and outer walls of the roof, as shown in Fig. 1. The doors are made double, the outside doors, L and L', being hinged to the door-posts b^3, and the inside door, L^2, being suspended from and sliding upon a suitable guide or way, *l*, secured upon the inside of the car. The outside hinged doors, L and L', each have inwardly-beveled upper and lower edges, as shown in Fig. 2, and their meeting faces or edges overlap each other on an incline, as shown in Fig. 3. These beveled faces or edges of the doors L and L' are furnished with canvas, cloth, rubber, or other elastic lining, so that when the doors are drawn tightly closed the joints will be air-tight.

The door-posts b^3 are provided with vertical grooves b^6, filled with hair or other elastic material, so as to form a tight joint at the hinged edge of the doors.

The doors L and L' are each composed of a suitable frame work, l^2, lined upon the inside and outside with matched boards l^3 and l^4. The space between these linings l^3 l^4 is filled with insulating material D. The inside door, L^2, is preferably composed of diagonally-arranged matched boards l^5 l^6, with sheets of paper or other insulating material, l^7, interposed between them. The outer face of the inside sliding door, L^2, at its margin, where it bears against the inside of the car should be provided with a rubber, cloth, or other elastic lining, so that this door will form a tight joint with the car when pressed outwardly against it.

The means I employ to exert the requisite outward pressure on the inside door, and the requisite inward pressure upon the outside doors to make the joints of the same tight, consists of a threaded bolt or screw, l^8, which extends through the outwardly-overlapping outside door, L, and enters a threaded nut, l^9, seated in the inside door. By this means the two doors are drawn toward each other, and any required pressure may be exerted upon the joints, and any wear upon the edges of the doors can always be easily taken up by simply giving the screw a few additional turns.

The ice pan or chamber is entirely open at each end of the car, as before described; and to prevent the ice from falling down at the ends I provide a grating, M, preferably composed of stout metal rods *m*, inserted through suitable end pieces, *m'*, which extends out to the end wall of the car. This grating may preferably be supported upon cleats nailed or otherwise secured to the inside walls of the car at its ends and sides. This grating may be arranged on the same level with the ice-pan G; but I deem it preferable to arrange the same somewhat below the ice-pan, as shown in Fig. 1, as I thereby obtain additional space for the ice at each end of the car.

N is a water-tank or drip-trough, one arranged at each end of the car and extending transversely across the same. These water-troughs N may preferably be about fifteen inches wide; and a curtain, O, preferably of galvanized iron, is extended from the end of the ice-pan G down near to the trough, to protect the meat from the falling water. The lower edge of this curtain O may be turned up to form an inclined groove or channel, *o*, for the water, so that the same will be delivered into the trough only at the end thereof. Where the grating M is arranged below the level of the ice-pan G this curtain O will also serve to retain the ice thereon. The ends of the car are also provided with a tin or sheet-metal lining, *n*, in order to more effectually protect the walls and the insulating material from the wet and moisture produced by the melting ice, and for this reason also the back wall or edge of the trough N is continued or extended up to the top of the car, as shown at *n'*. An air-space, n^2, however, is left between this tin lining *n* and the galvanized lining *n'*, so that the same may be utilized as a cooling-surface. In order to afford this space, and to continue it under the bottom of the trough N, I place the latter upon cleats n^3, and also insert like cleats between the tin lining *n* and the galvanized iron *n'*.

P represents a ventilator or outlet located near the middle or highest part of the car, and opening directly into the ice-chamber below, so that any air flowing into the car through this ventilator will be led directly upon the mass of ice. Ordinarily I provide two of these ventilator openings—one at each side of the middle line of the car, and they should be about an inch in diameter and covered with perforated caps.

In order to prevent the blood or other taints from the carcasses impregnating the wooden walls or floor of the car, and to enable the car to be easily and quickly washed and cleaned, I provide the floor and also the inner walls of the car, to the height of two feet or such matter, with a slate-lining, R. The plates of slate should be laid in a water-proof cement, so that the water used in washing the car cannot penetrate the floor and dampen the insulating material.

S represents the covers or doors for closing the scuttle-openings in the top of the car, through which the ice is delivered into the same. These covers or doors may be each preferably composed of a beveled wedging-frame, *s*, lined on the inside and outside with matched boards s' s^2 s^3, so as to leave a space between the inner and outer linings for the insulating material D.

The drip-troughs N are each provided with an outlet-pipe, N′, at one end, the lower end of which opens into a removable water-overflow cup, N^2. This removable cup may be secured in place by a bail or clamp hinged at one end to the bottom of the car, and secured at the other by a clasp. By simply swinging back the hinged clasp or bail that supports the cup, the latter may be slipped straight down off the waste-pipe. This construction is of great convenience in cleaning out the waste pipe and cup, especially in cold weather when the water is liable to become frozen therein.

The cross-beams E are provided at their sides, near their lower edges, with notched strips or cleats *e*, in the notches of which rest the hook-rods *e′*, which support the hooks e^2. The hook-rods *e′* should be half round, with their flat faces turned down, as indicated in Fig. 2.

When the car is used for shipping fruits or like articles, the size or number of the ventilators should be ordinarily increased to allow free escape for rarefied or impure air.

I do not herein claim the improved insulating material herein shown and described, consisting of shreded woolen rags, as that forms the subject-matter of my pending application No. 175,516, filed of even date with this application; nor do I herein claim the improved construction of doors for refrigerator-cars herein shown and described, as that forms the subject-matter of my pending application No. 178,519, filed of even date with this application; nor do I herein make claim to the subject-matter of my pending applications No. 178,518 and 178,520, filed of even date with this application, to all which applications and to the patents thereon to be granted reference is hereby made.

I claim—

1. The combination, in a refrigerator-car, of a preserving-chamber with a continuous ice pan or chamber above the same extending from side to side and from end to end of the car, a continuous non-heat-conducting or insulating sheathing between said ice-pan and preserving-chamber, likewise extending from side to side and from end to end of the car, and a continuous space all around said ice-pan and insulating-sheathing both at sides and ends, for communication between said ice and preserving chambers, substantially as specified.

2. The combination, in a refrigerator car, with a preserving-chamber, of an ice-chamber above the same and a ventilator-opening at or near the highest point of the car opening directly into the ice-chamber, said ventilator-opening at said point being the only opening or air-communication between the inside and outside of the car, so as to prevent all drafts or circulation within the car, substantially as specified.

3. The combination, in a refrigerator-car, of double walls A B, packing D between the same, cross-beams E, non-heat-conducting or insulating sheathing F, laid upon said cross-beams, ice-pan G, resting on said insulating-sheathing, an open space, G′, surrounding said ice-pan and insulating-sheathing, for communication between the ice and preserving chambers, and side walls, g^2, for said ice-pan, consisting of wire screen or open-work, substantially as specified.

4. The combination, with a flat corrugated ice-pan, G, extending from one end of the car to the other, of a rack, H, laid thereon for supporting the ice, substantially as specified.

5. The combination of a flat ice-pan, G, extending from one end of the car to the other, and a wire screen, g^2, forming the side walls of the ice-chamber, substantially as specified.

6. In a refrigerator-car, the combination, with an ice-pan, G, having wire screen side walls, g^2, of open gratings M at each end of the car to support the ice, substantially as specified.

7. In a refrigerator-car, the combination, of an ice-pan, G, having wire screen side walls, g^2, with gratings M at each end of the car arranged below the ice-pan, to increase the space for the ice, substantially as specified.

8. In a refrigerator-car, the combination with ice-pan G, of wire screens g^2, gratings M, troughs N, and curtains or guards O, substantially as specified.

9. In a refrigerator-car, the combination of an ice-pan, G, extending nearly from one end of the car to the other, with a water-trough, N, and curtain or guard O, depending from the end of said ice-pan having a groove or channel, *o*, at its bottom edge, substantially as specified.

10. The combination, with the walls of a refrigerator-car, of cross-beams E and insulating or non-heat-conducting sheathing F laid thereon, ice-pan G, having side walls composed of wire screens g^2, an open space, G′, surrounding said ice-pan G and sheathing F at sides and ends, and open gratings M at the ends of the car, substantially as specified.

11. The combination, with the walls of a refrigerator-car, of cross-beams E, and insulating or non-heat-conducting sheathing F

laid thereon, ice-pan G, having side walls composed of wire screens g^2, an open space, G′, surrounding said ice-pan G and sheathing F at sides and ends, open gratings M at the ends of the car, and water-troughs N, substantially as specified.

12. The combination of the double walls A B of a refrigerator-car, having non-heat-conducting packing D between the same, with preserving-chamber F^2, ice-chamber F′, non-heat-conducting sheathing F between said preserving and ice chambers, ice-pan G, having open side walls, g^2, and gratings M at each end, sheet-metal linings n at each end of the car, water-troughs N, having galvanized iron sheathing n', extended up to the top of the car, with a space, n^2, between the same, and said sheet-metal lining n at the end of the car, said space communicating with the preserving-chamber under the water-trough N, substantially as specified.

13. A refrigerator-car having a ventilator-opening and ventilated only at or near the highest point thereof, to preserve equilibrium of gaseous pressure between the air inside and outside the chamber, whereby the liability of currents passing through the walls of the chamber is diminished, said car having no other opening or communication with the outside air, and said ventilator opening operating neither as an injector nor an ejector, substantially as specified.

14. A refrigerator-car having a preserving-chamber and an ice-chamber, and having a ventilator opening communicating only with the ice-chamber near the highest point thereof, and said car having no other communication with the outside air, substantially as specified.

15. A refrigerator-car provided with a preserving-chamber, an ice-chamber above the same having a free and open communication with said preserving-chamber all round the inside walls of the car, and a ventilator-opening communicating only with the ice-chamber near the highest point thereof, said car having no other communication with the outside air, substantially as specified.

16. The refrigerator-car having double walls A B, composed of flat pieces a b, laid one on top of another without frame-work, insulating material between said walls, composed of woolen rags D, a preserving-chamber, F^2, an ice-chamber, F′, and a ventilator-opening, P, communicating directly with said ice-chamber near the highest point thereof, said car having no other communication with the outside air, substantially as specified.

17. The refrigerator-car having double walls A B, composed of flat pieces a b, laid one on top of another without frame-work, insulating material between said walls, composed of woolen rags D, a preserving-chamber, F^2, an ice-chamber, F′, and a ventilator-opening, P, communicating directly with said ice-chamber near the highest point thereof, and a non-heat-conducting or insulating sheathing, F, interposed between said ice-chamber and said preserving-chamber, said car having no other communication with the outside air, substantially as specified.

18. The refrigerator-car having double walls A B, composed of flat pieces a b, laid one on top of another without frame-work, insulating material between said walls, composed of woolen rags D, a preserving-chamber, F^2, an ice-chamber, F′, and a ventilator-opening, P, communicating directly with said ice-chamber near the highest point thereof, and a non-heat-conducting or insulating sheathing, F, interposed between said ice-chamber and said preserving-chamber, said non-heat-conducting sheathing having an open space, G′, surrounding the same at its sides and ends, for communication between said ice-chamber and said preserving-chamber, substantially as specified.

19. The refrigerator-car having double walls A B, composed of flat pieces a b, laid one on top of another without frame-work, insulating material between said walls, composed of woolen rags D, a preserving-chamber, F^2, an ice-chamber, F′, a ventilator-opening, P, communicating directly with said ice-chamber near the highest point thereof, and a non-heat-conducting or insulating sheathing, F, interposed between said ice-chamber and said preserving-chamber, said non-heat-conducting sheathing having an open space, G′, surrounding the same at its sides and ends, for communication between said ice-chamber and said preserving-chamber, and said ice-chamber having a bottom or pan, G, provided with longitudinal grooves or corrugations g, extending from one end of the car to the other, substantially as specified.

20. The refrigerator-car having double walls A B, composed of flat pieces a b, laid one on top of another without frame-work, insulating material between said walls, composed of woolen rags D, a preserving-chamber, F^2, an ice-chamber, F′, a ventilator-opening, P, communicating directly with said ice-chamber near the highest point thereof, and a non-heat-conducting or insulating sheathing, F, interposed between said ice-chamber and said preserving-chamber, said non-heat-conducting sheathing having an open space, G′, surrounding the same at its sides and ends, for communication between said ice-chamber and said preserving-chamber, and said ice-chamber having a bottom or pan, G, provided with longitudinal grooves or corrugations g, extending from one end of the car to the other, and open or wire screen sides g^2, substantially as specified.

21. The refrigerator-car having double walls A B, composed of flat pieces a b, laid one on top of another without frame-work, insulating material between said walls, composed of woolen rags D, a preserving-chamber, F^2, an ice-chamber, F′, a ventilator-opening, P, communicating directly with said ice-chamber near the highest point thereof, and a non-heat-conducting or insulating sheathing, F, interposed between said ice-chamber and said preserving-

chamber, said non-heat-conducting sheathing having an open space, G′, surrounding the same at its sides and ends for communication between said ice-chamber and said preserving-chamber, and said ice-chamber having a bottom or pan, G, provided with longitudinal grooves or corrugations *g*, extending from one end of the car to the other, and open or wire screen sides g^2, and gratings M, substantially as specified

22. The refrigerator-car having double walls A B, composed of flat pieces *a* *b*, laid one on top of another without frame-work, insulating material between said walls, composed of woolen rags D, a preserving-chamber, F^2, an ice-chamber, F′, and a ventilator-opening, P, communicating directly with said ice-chamber near the highest point thereof, and a non-heat-conducting or insulating sheathing, F, interposed between said ice-chamber and said preserving-chamber, said non-heat-conducting sheathing having an open space, G′, surrounding the same at its sides and ends, for communication between said ice-chamber and said preserving-chamber, said ice-chamber having a bottom or pan, G, provided with longitudinal grooves or corrugations *g*, extending from one end of the car to the other, and open or wire screen sides g^2, gratings M, and racks H, substantially as specified.

CARLETON B. HUTCHINS.

In presence of—
W. M. LILLIBRIDGE,
E. R. HUTCHINS.