(No Model.)

C. E. LUCAS & A. A. WOOD.

REFRIGERATING AND VENTILATING CAR.

No. 400,863. Patented Apr. 2, 1889.

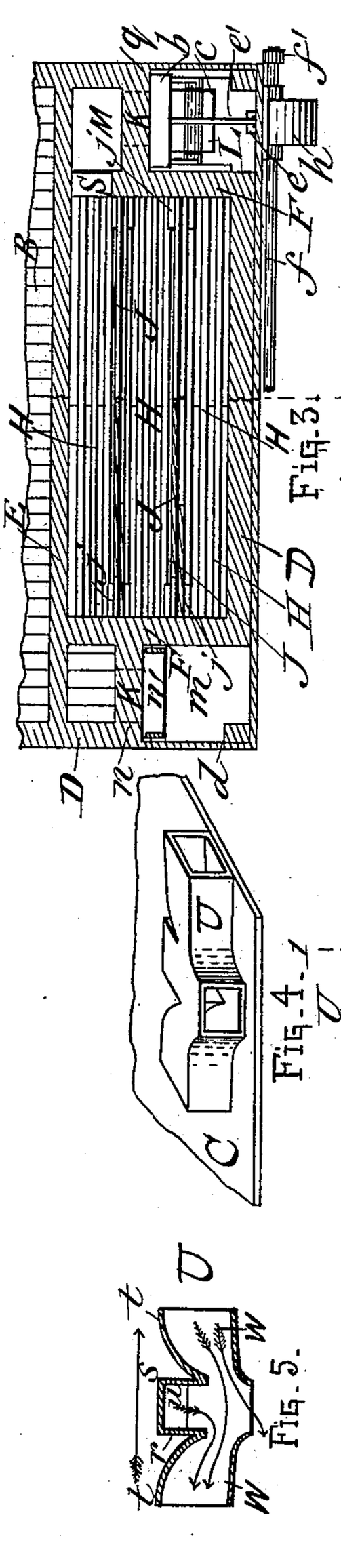

Fig. 3.

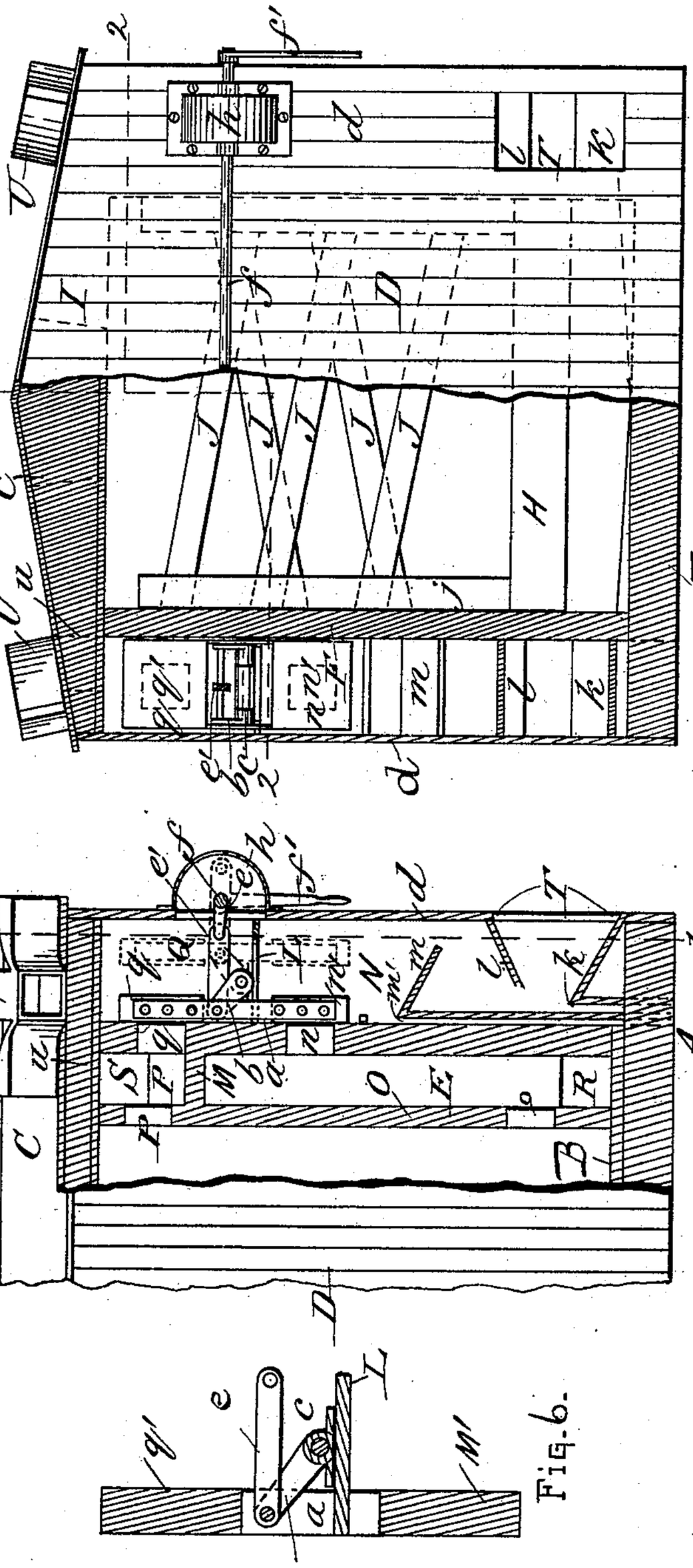

Fig. 2.

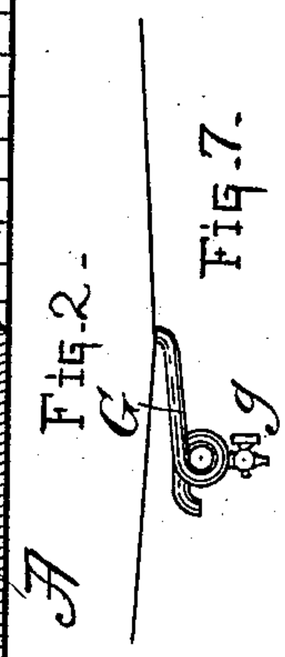

Fig. 7.

Fig. 4.

Fig. 1.

Fig. 5.

Fig. 6.

WITNESSES.

A. D. Wood

P. B. Burroughs

INVENTORS.

Christian E. Lucas

Albert A. Wood

UNITED STATES PATENT OFFICE.

CHRISTIAN E. LUCAS AND ALBERT A. WOOD, OF ATLANTA, GEORGIA.

REFRIGERATING AND VENTILATING CAR.

SPECIFICATION forming part of Letters Patent No. 400,863, dated April 2, 1889.

Application filed July 10, 1888. Serial No. 279,600. (No model.)

To all whom it may concern:

Be it known that we, CHRISTIAN E. LUCAS and ALBERT A. WOOD, citizens of the United States, residing at Atlanta, in the county of Fulton and State of Georgia, have invented a new and useful Combined Refrigerating and Ventilating Car; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as 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 letters of reference marked thereon, which form a part of this specification.

The object of this invention is to overcome the defects in refrigerating-cars as at present constructed, especially those defects that are most apparent in transportation of subtropical fruits to the more northern parts of the country.

It is also our object to furnish a better system of refrigeration for all perishable goods in transit, and we believe that means of changing the refrigeration into ventilation, or the reverse, will prove advantageous under many circumstances, and especially so in case of intentional or unavoidable absence of ice. It is also advantageous to change the air of a refrigerated car occasionally.

This invention consists of the apparatus hereinafter described for the purpose of furnishing refrigeration and ventilation, either alternate or combined, and for purifying the air used in the car.

In the accompanying drawings, Figure 1 is a side elevation of one end of a car. This figure is partly in section on line 3, Fig. 3, as regards the walls and partitions, but not in section as regards the valves and the cowl at the top of the car. Fig. 2 is an end elevation of one end of the car, partly in section, on the line 1, Fig. 1. Fig. 3 is a horizontal section on the line 2, Fig. 2. Fig. 4 is a top view of the cowl and a portion of the roof. Fig. 5 is a horizontal section through the cowl, showing by arrows the direction of currents of air. Fig. 6 is a section through the valves, showing the valve-gear. Fig 7 shows a portion of the bottom of the ice-chamber and the drain-pipe.

In the several figures, like reference-marks indicating corresponding parts, A are the sills, B the floor, C the roof, and D the non-conducting outer walls of a car. The floor and roof should also be non-conducting, but the parts of the outer wall (marked *d*) need not necessarily be so. The end portion of the interior of the car is separated from the rest by the wall E, which should also be non-conducting, but may be so to a less extent than the outer walls, as its non-conducting function is simply to prevent such a transmission of heat from the body of the car as would prevent the circulation of air, as will be hereinafter described. The wall E, with the end wall, D, and the walls F, parallel with the side walls of the car, form the ice-chamber. This ice-chamber should be lined with galvanized iron, and the bottom should slope to some point, preferably a central one, and have in connection with it a pipe, G, and a cock, *g*, Fig. 7. The pipe G is for the purpose of draining the ice-chamber, and the cock is for the purpose of drawing the water from the coil *g'* to prevent the freezing of the water and the bursting of the coil in cold weather.

Near the bottom of the ice-chamber is a grating to support the ice, consisting of the bars H, and intermediately between these bars and the opening I, (shown by dotted lines in Fig. 2 at the top of the car,) through which the ice is charged, are the sloping beams J. The beams J are preferably carried by upright pieces *j*. The function of these beams is to break the force of the falling ice while being charged into the chamber and to distribute it crosswise of the car, the latter result being caused by the ice sliding on the sloping beams. These beams and the upright pieces *j* will also prevent the packing of the ice into so solid a mass as to prevent the circulation of air.

At present we will describe but one of the spaces inclosed by the cross-wall E, the walls F, and the walls *d*, as they should be in all respects alike on both sides of the car, and are preferably duplicated, with the ice-chamber and all other details herein described, in both ends of the car. The vertical wall K and the horizontal walls L and M subdivide the space inclosed, as above described, into four air passages or flues, N, O, P, and Q. The flue N is connected with the flue O by the opening *n* in the wall K. The flue O is connected

with the interior of the car by the opening *o* in the wall E. The interior of the car is connected with the flue P by the opening *p*, and the flue P is connected with the flue Q by the opening *q* in the wall K. The openings R, near the bottom of the car, and S, near the top, connect the flues P and O with the ice-chamber.

It will be observed that a common inlet and outlet opening is provided in the wall E for both refrigeration and ventilation, whether used separately or together.

As shown in the drawings, the openings *n* and *q* are covered by the valves *n'* and *q'*. These valves are connected by metal bars *a*, Figs. 1 and 6, and are carried by the arms *b* on a rock-shaft passing through the box *c*. (Best shown in Fig. 6.) These valves are lifted from the position shown and carried to the position shown by the dotted lines, Fig. 1, by the connecting-rod *e'*, crank *e*, rock-shaft *f*, and lever *f'*. The crank *e* is shown as being covered by the cover *h*, and the rock-shaft *f* should extend across the end of the car and have a lever, *f'*, on each side for convenience in operating the valves. The opening T connects the flue N with the exterior of the car, and the flue N is provided with deflectors *k*, *l*, and *m* and the sub-flues *k'* and *m'*.

The cowl U is connected with the flue Q by the opening *u*, (shown by dotted lines in Figs. 1 and 2,) the opening through the bottom of the cowl being shown in Fig. 5. This cowl should be made of thin metal, preferably from sheet-iron, and with a parallel top and bottom. Its sides and openings consist of (see Fig. 5) the parts *r* and *s*, forming a central chamber, into which a current of air flows through the opening *u*, and the curved parts *t* and *w*, that deflect the air and cause a partial vacuum in the central chamber, the course of the currents of air being indicated by the curved arrows and the direction in which the car is supposed to be moving by the straight arrow. Both ends of the cowl being alike, a like result will be produced when the car is moving in the opposite direction.

As before stated, both ends of the car should be provided with all of the apparatus above described, in order that no disadvantage may result from running the car in either direction. Therefore the movement of the car in either direction will cause the air to enter the front opening, T, through the end wall, *d*, and, the valves *n'* and *q'* being open, to pass into the car and out at the top, being aided by the suction of the cowls. The tendency of cinders and the dust that may enter with the air is to fall to the bottom of the current and strike the deflector *k* and pass out at the bottom of the car through the flue *k'*, the current of air through the flue *k'* being induced by the increased area of the opening T over the opening into the flue O and by the contraction of the air-passage by the deflector *l*. The deflectors also cause the air to take a devious course through the flue N, which promotes the settling of the cinders and dust not discharged through the flue *k'*, nearly all of which will be discharged through the flue *m'*, a current being induced through that flue by the increased area of opening through the flue N over that into the passages into the interior of the car. The ice-chamber being charged with a quantity of ice, the air cooled thereby, becoming heavier by contraction, will pass out into the flue through the opening R and into the interior of the car through the opening *o*, where, on receiving heat from the cargo and being thereby caused to expand, it will rise and pass into the ice-chamber through the openings *p* and S, by reason of which a constant circulation will be produced that will pass the air alternately through the cargo and ice. The air passing constantly through the car will take up the noxious gases arising from the cargo and carry them to the ice-chamber, where they will be absorbed by the water from the melting ice. During the process of refrigeration the valves *n'* and *q'* should be closed, as shown in the drawings, except at such times as it is desirable to change the air in the car; or it might be desirable to open them during refrigeration to neutralize and reduce its effect. In either of the last two cases the openings *o* and *p* are used in common. In all other cases they are used with both processes alternately.

In the transportation of the sub-tropical fruits of this country to a Northern market the cars are usually loaded at points at which ice is not obtainable, and loaded refrigerator-cars are often run, tightly closed, one or two hundred miles before the ice is applied, causing the cargo to be in a heated and unfavorable condition at the time of the application of ice, and without facilities for occasional ventilation of the car for the purpose of discharging the tainted air and supplying its place with pure air, either before or after the refrigeration shall have commenced. We overcome these difficulties by opening the valves *n'* and *q'* to the position shown by the dotted lines in Fig. 1, and leaving them in that position until the ice-chambers shall have been supplied with ice, after which they should be closed, as shown in the drawings, the opening and closing to be done by means of the levers *f'*. These valves may be opened occasionally to allow the outside air to enter the car and drive out any foul air that may be in it, which is often necessary when the cargo is mixed or of meat. The changing of the air, as just described, will be but slightly and temporarily detrimental to the refrigerating process, as it should be continued so short a time as to admit only as much heat as is contained in the fresh air that requires to be admitted. It is therefore beneficial in many instances, as it promotes the preservation of the cargo.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination, in a refrigerating and ventilating car, of an ice-receptacle formed in the end of the car, the chambers on either side of said receptacle containing flues made by vertical partitions placed at right angles to the sides of the car, said flues being separated into upper and lower parts by horizontal partitions, the inner flues connecting with the ice-chamber, the interior of the car, and with the outer flues by openings in the partitions separating them, respectively, and the said outer flues connecting with the exterior of the car, substantially as set forth.

2. In a refrigerating and ventilating car, the chambers on either side of an ice-chamber formed in the car, containing flues formed by vertical partitions placed at right angles to the sides of the car, and horizontal partitions separating them into upper and lower flues, the inner flues connecting with the ice-chamber, the interior of the car, and with the outer flues by openings in the partitions separating them, respectively, the outer flues connecting with the exterior of the car by suitable openings, in combination with the valves for closing the openings in the partitions between said flues, and the mechanism for operating said valves, substantially as set forth.

In testimony whereof we hereunto affix our signatures in presence of two witnesses.

CHRISTIAN E. LUCAS.
ALBERT A. WOOD.

Witnesses:
A. P. WOOD,
NED P. WOOD.