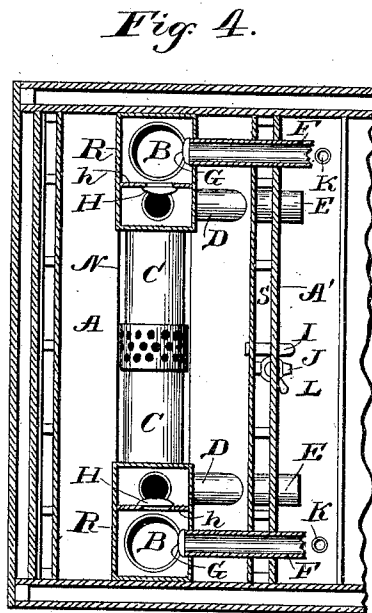
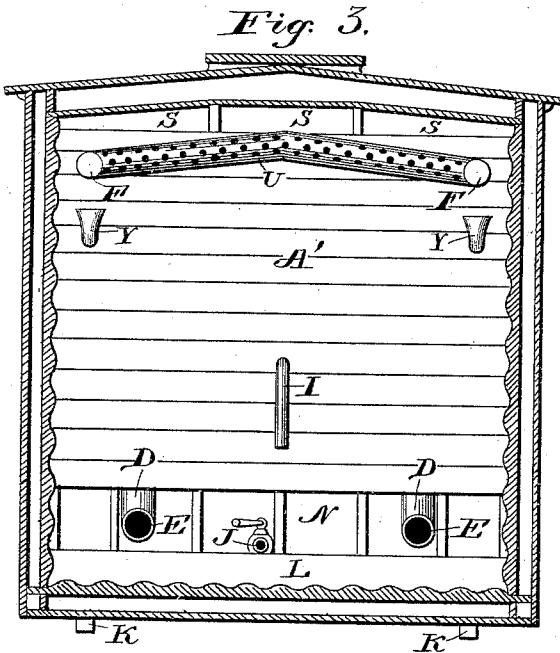
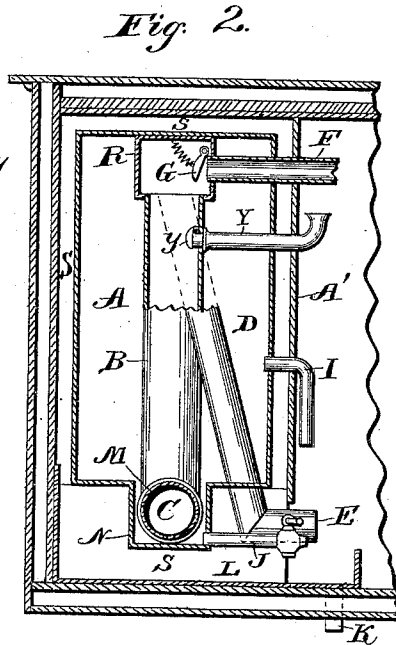
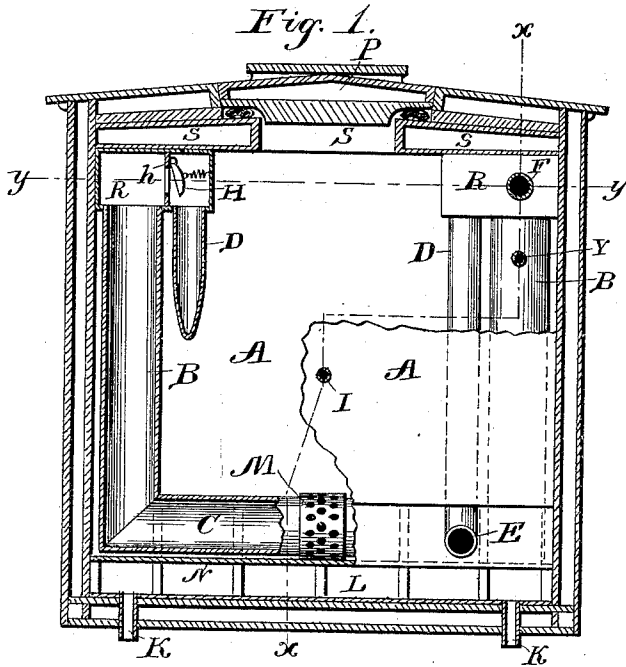


(No Model.)

M. S. MILLARD.
REFRIGERATOR CAR.

No. 466,794.

Patented Jan. 12, 1892.



Witnesses;
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UNITED STATES PATENT OFFICE.

MARTIN S. MILLARD, OF KANSAS CITY, MISSOURI.

REFRIGERATOR-CAR.

SPECIFICATION forming part of Letters Patent No. 466,794, dated January 12, 1892.

Application filed September 10, 1891. Serial No. 405,335. (No model.)

To all whom it may concern:

Be it known that I, MARTIN S. MILLARD, a citizen of the United States, residing in Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Refrigerator-Cars; and I 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.

My invention relates to improvements in refrigerator-cars; and the object is to provide means for maintaining a constant circulation of cold air throughout a car.

With this and other ends in view my invention consists of a tank arranged in a suitable compartment in a car and adapted to receive a refrigerant, water-pipes arranged within and communicating with the interior of the tank, pipes for conducting warm air from the upper portion of the car through air-pipes in the tank and back into the car near the bottom thereof, and valves for permitting the passage of air in only one direction through the air-pipes.

My invention further consists in the peculiar construction and arrangement of parts, as will be hereinafter fully pointed out and claimed.

I have illustrated my invention in the accompanying drawings, in which—

Figure 1 is a transverse vertical sectional view through a car provided with my improvements. Fig. 2 is a vertical sectional view on the line $x x$ of Fig. 1. Fig. 3 is a transverse vertical sectional view through a car at one side of the refrigerant-tank, and Fig. 4 is a horizontal sectional view on the line $y y$ of Fig. 1.

Like letters of reference denote corresponding parts in all the figures of the drawings, referring to which—

A designates a metallic tank of any desired size, which is placed in a compartment formed at one end of a car by a partition A' . The compartment in which the tank is placed should be sufficiently large to leave a passage S all around the tank when placed in position. The tank is secured in position within the car in any suitable and desirable manner. The bottom of the tank is provided with a

central depending portion or trough N , in which are fitted pipes C . The inner ends of the pipes C are connected by a perforated band or sleeve M , and to their outer ends are attached vertical pipes B , which extend upwardly and terminate in valve-boxes R , suitably secured in the upper part of the tank A . The valve-boxes R are divided into two parts by a partition h , in which is fitted a check-valve H , and from the inner compartment of said boxes extend air-pipes D , which, as shown in Fig. 2, are inclined and pass through the tank A , near the lower forward corners thereof. To the lower ends of the air-pipes D are attached short pipes E , which extend through the partition A' and open into the car.

Pipes F lead from the outer compartment or chamber of the valve-boxes R through the partition A' and open into the car near the top thereof, the inner ends of said pipes being provided with check-valves G . The valves G and H are normally held slightly open, as shown in Figs. 1 and 2, by suitable springs. The outer ends of the pipes F are connected by a perforated pipe U .

Below the tank A is arranged a drip-pan L , from which short conduits or pipes K lead through the bottom of the car, and in the trough N is arranged a waste-pipe J , provided with a suitable valve and by means of which the tank can be emptied. An overflow-pipe I is also attached to said tank at the desired elevation. Access is had to the tank through a door P , arranged in the top of the car and so constructed as to hermetically seal the tank when placed in position.

The operation of my invention is as follows: The tank A is partially filled with water, broken ice, and salt. The ice and salt surround the pipes B , D , and C , and the water passes through the perforated band or sleeve M and rises in the vertical pipes B to a level with the waste-pipe I in the tank. By closing the door P the ice within the tank is hermetically sealed, and as direct contact with the hot air is impossible the ice will last for a long period of time. When the car is not in motion, the exposure of such a great surface of cold iron keeps up a secondary circulation through the pipes F , D , and E , the valves G and H being, as before stated, normally held slightly open. The air-passages S also permit of the warm

air in the car circulating around the exterior of the tank A. When the car is in motion, the oscillation of the tank causes the water to alternately rise in one of the pipes B and fall in the other. As the water rises in one of the pipes B, the air in such pipe is forced up into the valve-box R, and as it cannot escape through the pipe F, because the valve G closes instantly upon receiving any pressure from that side, such air passes through the valve H and the pipes D and E and is discharged into the car near the bottom thereof. This discharge of cold air into the bottom of the car forces the warm air up into the top thereof, and from there it passes through the perforated pipes U into the pipes F and down through the pipes D and E. The perforations in the pipe U prevent clogging of the pipes F and also serve to receive warm air from all portions of the car.

I have described but one tank and one set of circulating-pipes; but in practice I employ two of such systems, one in each end of the car.

Although I have described my improvements as applied to a car, I am aware that it can easily be adapted to all other places requiring a forced and purified circulation—such, for instance, as cold-storage houses, hospitals, mines, packing-houses, &c. Hence I do not limit myself to the particular construction herein described, but reserve the right to make such changes and alterations as fairly fall within the scope of my invention.

To reduce the evaporation of the water in the vertical pipes B and lubricate the interior of such pipes, I introduce a small amount of oil into such pipes. The oil is introduced into the pipes B by means of pipes Y, which extend from the vertical pipes to the interior of the car. The inner ends of the pipes Y are closed by suitable valves y. I have also found that by introducing mercury into the pipe C the effectiveness of the apparatus is increased.

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

1. In a refrigerator, the combination of a tank adapted to contain a refrigerant, water-pipes arranged within and communicating with the interior thereof, air-pipes arranged within and communicating with the air outside of the tank, and valves for permitting passage of air in one direction through the air-pipes, substantially as shown and described.

2. In a refrigerator, the combination of a tank adapted to contain a refrigerant, water-pipes arranged in said tank and communicating with the interior thereof, valve-boxes receiving the upper ends of the water-pipes,

air-pipes extending from said valve-boxes through the tank near its lower end, pipes connecting the valve-boxes with the surrounding air, and valves arranged in the valve-boxes, substantially as shown and described, for the purpose specified.

3. In a refrigerator, the combination of a tank, water-pipes arranged in and communicating with the interior of the tank, and air-pipes for conducting the air outside the upper portion of the tank through the tank and discharging the same near the bottom of the tank when it is oscillated, substantially as shown and described.

4. The combination of a tank adapted to receive a refrigerant, water-pipes arranged in a trough formed in the bottom of said tank, a perforated band or sleeve connecting the adjacent ends of said pipes, valve-boxes arranged in the upper portion of the tank and provided with a check-valve, pipes extending from the valve-boxes to the water-pipes in the bottom of the tank, air-pipes extending from the valve-boxes through the tank near the bottom thereof, suction-pipes connecting the valve-boxes with the air outside of the tank, and check-valves arranged at the inner ends of said pipes, substantially as shown and described.

5. The combination of a tank, water-pipes arranged in said tank and having their inner ends connected by a perforated coupling and their other ends entering valve-boxes in the tank, air-pipes leading from the valve-boxes through the tank, suction-pipes leading from the valve-boxes to the surrounding air, a perforated pipe connecting the outer ends of the suction-pipes, and check-valves arranged in the valve-boxes and at the inner ends of the suction-pipes, as and for the purpose described.

6. The combination of a tank, water-pipes arranged in said tank and having their inner ends connected by a perforated coupling and their outer ends entering valve-boxes in the tank, air-pipes leading from the valve-boxes through the tank, suction-pipes leading from the valve-boxes to the surrounding air, a perforated pipe connecting the outer ends of the suction-pipes, valves arranged in the valve-boxes and at the inner ends of the suction-pipes, and pipes for conveying oil to the interior of the water-pipes in the tank, substantially as shown and described.

In testimony whereof I affix my signature in presence of two witnesses.

MARTIN S. MILLARD.

Witnesses:

E. T. PAGETTE,
JOHN PORTER.