July 9, 1935. K. F. NYSTROM 2,007,690

APPARATUS FOR COOLING AIR

Filed Aug. 19, 1932 3 Sheets-Sheet 1

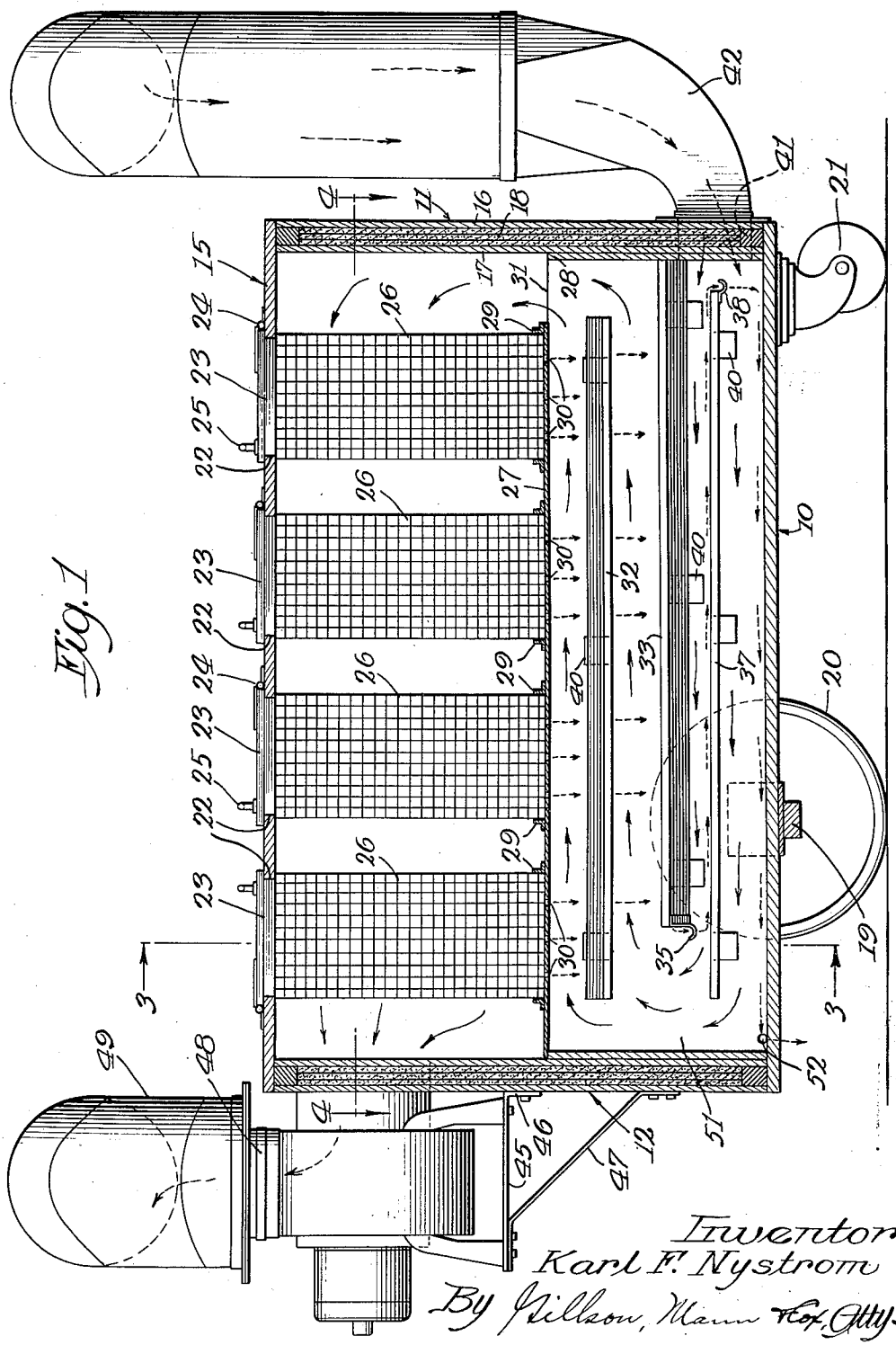

Fig. 1

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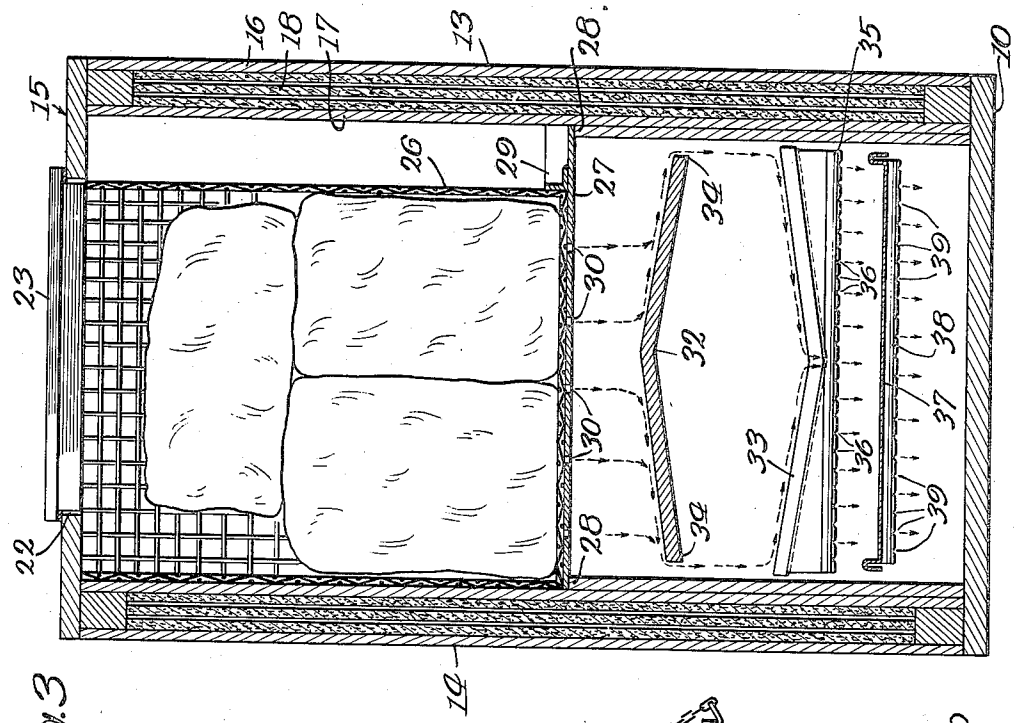

Fig. 3

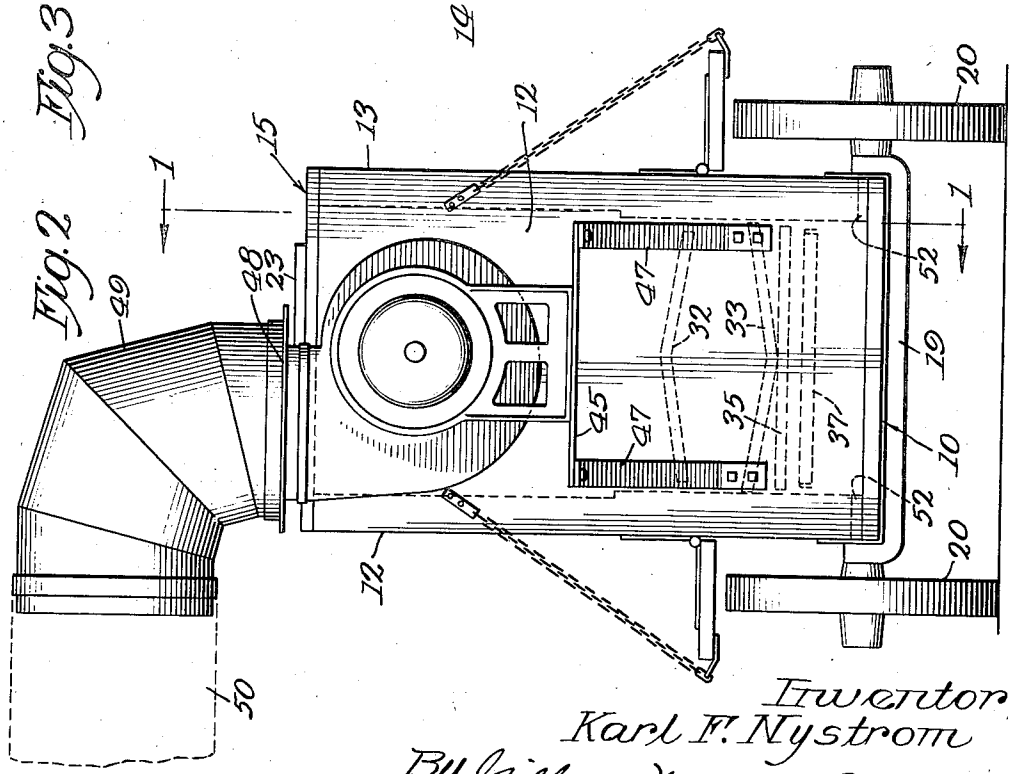

Fig. 2

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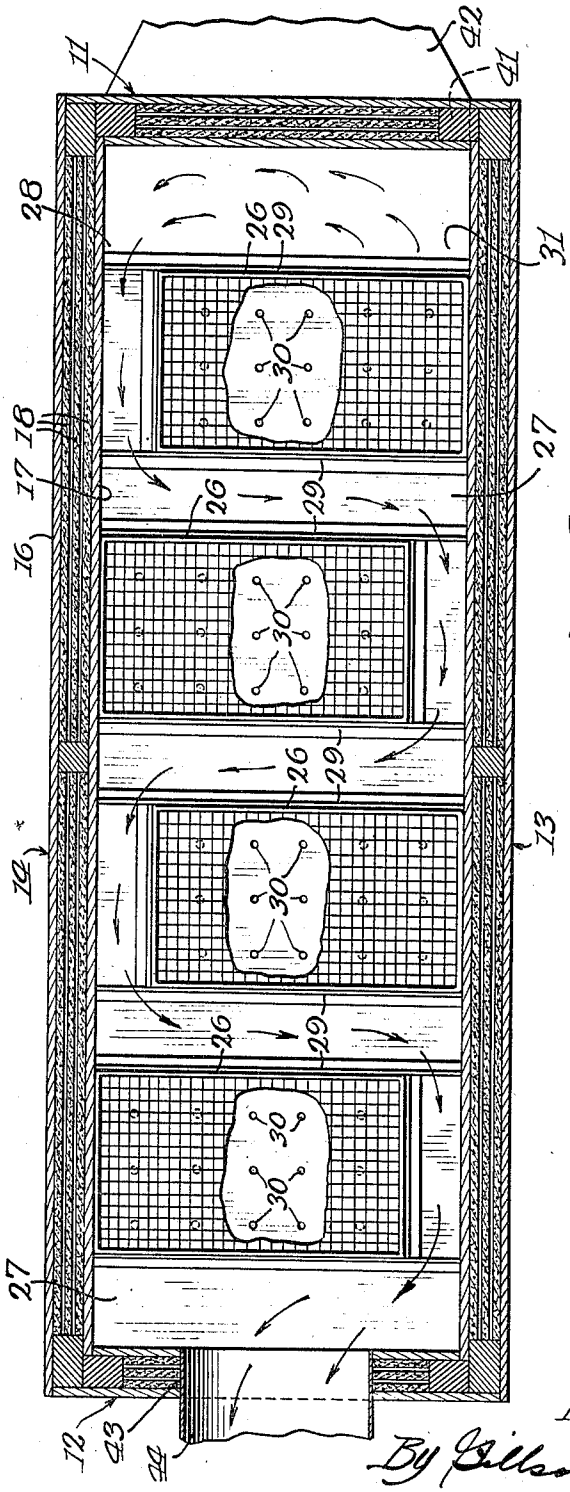

Fig. 4

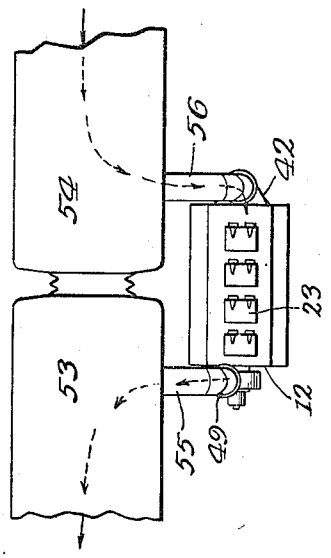

Fig. 5

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UNITED STATES PATENT OFFICE

2,007,690

APPARATUS FOR COOLING AIR

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Application August 19, 1932, Serial No. 629,427

9 Claims. (Cl. 62—133)

This invention relates to cooling cars and has for its principal object to use the cooling effect of ice, and also the cooling and cleaning effects of the drippings from ice, in preparing air supplied to the cars.

The drawings show an embodiment designed for use in cooling sleeping cars, club cars, and the like, such as are commonly found in fast through trains.

Further objects and advantages of this invention will be revealed as the disclosure proceeds and the description is read in connection with the accompanying drawings, in which

Fig. 1 is a longitudinal, vertical section with air connections for two cars indicated diagrammatically;

Fig. 2 is an end elevation, looking from the left in Fig. 1;

Fig. 3 is a vertical section taken on the line 3—3 of Fig. 1;

Fig. 4 is a horizontal section taken on the line 4—4 of Fig. 1, and

Fig. 5 is a diagrammatic plan view showing the relations between the cooling apparatus and two adjacent cars to be treated.

But these drawings and the specific description that follows are used for the purpose of disclosure only, and not to define the scope of the invention.

The body of the apparatus is a rectangular box-like framework including a bottom 10, ends 11 and 12, sides 13 and 14 and a top 15. The sides and ends are made with double walls 16 and 17, providing a space to be filled with insulating material 18, shown in the form of sheets, many kinds of which are readily available on the market.

The body is supported adjacent to one end by a drop axle 19, having two wheels 20, and adjacent to the other end by two swivel casters 21.

The top is provided with a plurality of hatch openings, closed by hatch plugs 23, hinged at 24, and provided with handles 25 to assist in opening and closing them. The hatch openings and the hatch plugs are constructed after the approved practice in refrigerator cars. Beneath each hatch there is an ice basket 26, made of stout wire fabric with openings of considerable size.

The baskets rest upon a stout steel partition 27 supported on a ledge 28 somewhat less than half the height of the box-like body. The partition is provided with pairs of spaced flanges 29 that loosely receive and hold the baskets in place. Between the flanges of each pair the partition is provided with a large number of holes 30. The partition stops short of the right end of the body in Fig. 1 a sufficient distance to provide a passage 31 for admitting air from the lower chamber to the upper chamber of the body.

A roof shaped sheet steel baffle 32 extends lengthwise to the lower chamber spaced below the partition 17, terminating a considerable distance from each end 11 and 12, and a less distance from each side 13 and 14. (Compare Figs. 1 and 3.)

A second trough-like baffle 33 also extends lengthwise to the lower chamber, and is spaced below the baffle 32. The sides of the baffle 31 are sufficiently wide to extend beneath what may be called the eaves 34 of the baffle 32. (See Fig. 3.) The right end of the baffle 33, Fig. 1, engages the end wall 11, but the left end is spaced a long ways from the end wall 12 and provided with a transverse trough 35, having a series of perforations 36, (see Fig. 3).

A third flat pan-like sheet steel baffle 37 is beneath the baffle 33, and spaced from both sides and both ends, and is inclined from the left to the right, Fig. 1. Its right end delivers to a supply trough 38, having a series of openings 39.

The three baffles are supported from the sides of the body by suitable brackets 40.

The right end 11, in Fig. 1, is provided with a rectangular inlet opening 41 adjacent to the bottom, which is fitted with an upwardly turned inlet spout 42. The left end wall 12 near the top is provided with a large outlet 43, fitted with an outlet tube 44.

On the outside of the end 12, below the outlet is a shelf 45 carried by brackets 46 and braces 47. This shelf forms a support for a blower assembly. That illustrated in the drawings is the American Blower Corporation, Series 30, No. 2½ Sirocco fan blower, driven by 1½ H. P., 220 volts, D. C. motor. The details of construction are well known, as are also similar blowers made by many others. It will suffice to say that it consists of a Sirocco fan having many curved blades arranged in a circle aligned with the outlet 43, which forms the inlet of the blower. The outlet of the blower generally indicated at 48, is directed upwardly, and connected by an elbow 49 and piping 50 with the car.

In operation the fan causes the air to enter the inlet spout 42 and flow into the lower chamber above and below the baffle 37. Upon reaching the left end of the chamber 51, it turns upwardly and to the right, flowing under and over the baffle 32. Upon reaching the right end of the lower

chamber again, it rises through the passage **31** and then travels around and through the baskets to the outlet **43**. The flow of water from the partition **27** to the discharge openings **52** is shown by arrows in Figs. 1 and 3 better than it can be described.

It will be obvious that in passing through the lower chamber the air unavoidably traverses sprays, or showers, and sweeps along surfaces cooled with ice water, with the result that it is cooled and cleaned. Rising into the upper chamber it comes in direct contact with the ice in the baskets and is further cooled, and cleaned. The baskets, as will be noted in Fig. 4, are in staggered relation, whereby the air is made to travel partly in a zigzag path and partly through the baskets, all of which promotes an intimate contact with the surfaces of the ice, thus causing the ice to be melted and the air cooled.

The contact between the air and the ice in the upper chamber deals, for the most part, with the transfer of the latent heat of the melting of the ice and leaves the water dripping from the ice very close to the temperature of freezing. By subjecting the incoming air to the repeated contact with these drippings, much of the heat units in the air is transferred to the water before it escapes from the bottom of the body through the openings **52**. From this it will be seen that the apparatus shown utilizes, to a very great extent, the cooling capacity of the ice.

The particular form shown has been found very efficient, but of course, a variety of other forms can be readily designed to utilize the same principles.

In treating a train of cars it is preferable to establish the relationship shown in Fig. 5, where **53** and **54** indicate two adjacent cars. **55** and **56** indicate piping connecting the inlet and the outlet of the machine with the respective ends of the cars. In this way the car **54** is utilized as a large still air chamber from which a supply may be drawn practically free from dust. At the same time the air in that car will be gradually changed to substantially the same temperature as the air in the car shed. After treating the car **53** and reducing its temperature to a suitable degree the apparatus would be moved to the right in Fig. 5, and connected with the right end of the car **54** and the adjacent end of the next car in the train.

In treating a single car, the inlet air can be taken from any convenient place though, of course, it is well to make sure that the inlet air is as clean as is available under the particular circumstances.

I claim as my invention:

1. In apparatus of the class described, a body divided into upper and lower chambers in communication at one end, and having an inlet for air to the lower chamber and an outlet for air from the upper chamber, means for passing air through the chambers, means for supporting ice in the upper chamber in segregated quantities spaced apart to form air passages and delivering ice water to the lower chamber, a roof-shaped baffle receiving the ice water and a trough-like baffle receiving the ice water from the roof-shaped baffle.

2. In apparatus of the class described, a body divided into upper and lower chambers in communication at one end, and having an inlet for air to lower portion of the lower chamber and an outlet for air from the upper chamber, means for passing air through the chambers, means comprising containers spaced apart for supporting ice in the upper chamber and delivering ice water to the lower chamber, and baffles in the lower chamber washed by the water and swept by the air, all of said baffles being swept by air on both sides thereof, one of the baffles having means to deliver water in a spray.

3. In apparatus of the class described, a body having an air inlet below and an air outlet above divided into upper and lower chambers communicating at one end, and ice baskets in the upper chamber spaced apart and arranged in staggered relation to form a zig-zag air passage and having perforations to deliver water into the lower chamber.

4. Apparatus of the class described, a box-like body, a series of ice containers supported in the body in staggered relation and having perforations at the bottom, means between the containers for dividing the body into upper and lower communicating chambers, and means for passing air into the lower chamber and out through the upper chamber.

5. In apparatus of the class described, a body having an inlet for air below and an outlet for air above, a perforated partition between the inlet and the outlet dividing the body into upper and lower chambers in communication at one end, staggered ice containers in the upper chamber exposing their contents to the air and supplying water to the lower chamber, and baffles in the lower chamber causing the water to form sprays and the air to pass through the sprays.

6. In apparatus of the class described, a body having an air inlet below and an air outlet above, means causing air to flow from the inlet to the outlet, a baffle delivering a spray of water adjacent to the air inlet, a second baffle delivering a spray onto the first baffle, and directing air through that spray, a third baffle delivering water to the second, means for exposing ice to the air and delivering ice water in a spray transverse to the movement of the air over the third baffle, and means at the end of one of said baffles to ensure a uniform curtain of water transversely to the travel of said air.

7. In apparatus of the class described, a body having an air inlet below and an air outlet above, a blower having its suction side connected to the outlet, ice containers in the upper portion of the body arranged in staggered relation to form a zig-zag air passage along said containers, directing the air and water in contrary streams, and delivering the water from one to another in sprays.

8. In apparatus of the class described, a body divided into upper and lower chambers in communication at one end, and having an inlet for air to the lower chamber and an outlet for air from the upper chamber, means for passing air through the chambers, means for supporting ice in the upper chamber and delivering ice water to the lower chamber, a roof-shaped baffle receiving the ice water, a trough-like baffle receiving the ice water from the roof-shaped baffle, and a pan-like baffle receiving the ice water from the trough-like baffle, and delivering it in a spray adjacent to the inlet for air.

9. In an apparatus of the class described, a body divided into upper and lower compartments in communication at one end, and having an inlet for air in one end thereof, said inlet extending substantially across one end of said body adjacent its lower wall, an outlet in the other end adjacent the top wall, a baffle attached to an end wall

adjacent to but above said inlet and extending toward the opposite wall and spaced therefrom, and a baffle above and one below said first-named baffle and spaced from said end walls, the lower baffle being opposite said inlet and having means thereon to assure a uniform curtain of water transversely to the direction of movement of the air entering through said inlet, whereby a portion of said air will pass through said curtain for cooling the same, means for containing a refrigerant in the upper compartment, and means for circulating air through said compartments.

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