

April 18, 1944.

C. W. MANN
METHOD AND APPARATUS FOR CONTROLLING THE CIRCULATION
OF AIR IN REFRIGERATOR CARS
Filed Sept. 24, 1942

2,346,931

2 Sheets-Sheet 1

Fig. 1.

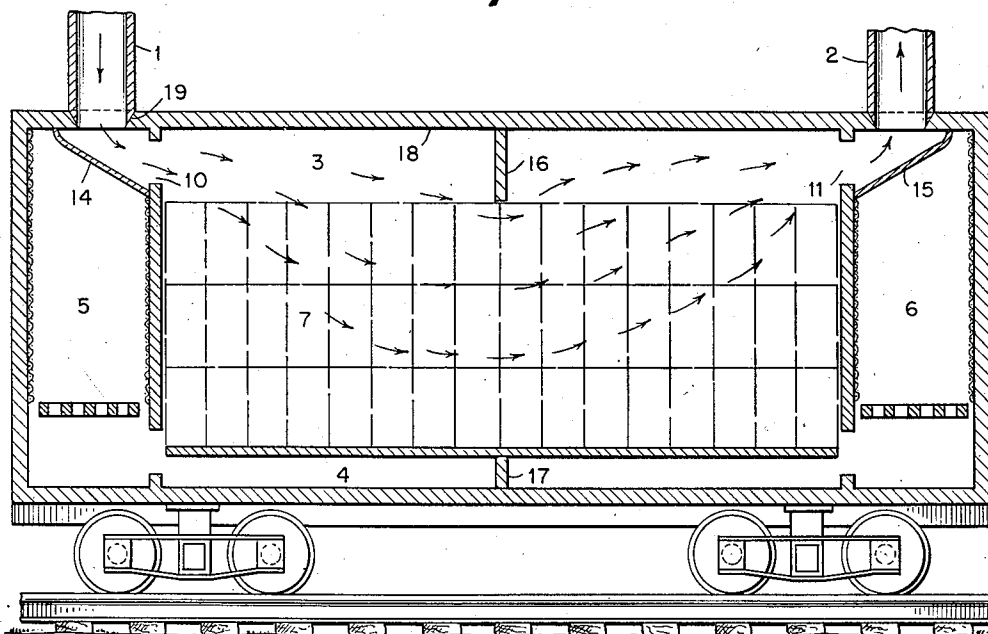
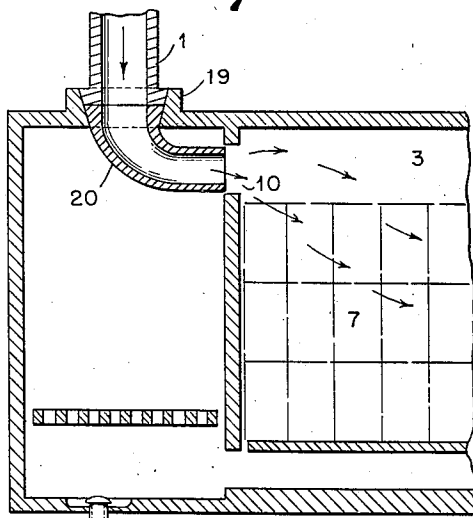


Fig. 2.



INVENTOR
CHARLES W. MANN

BY

H. R. Foss.
J. A. Selquist
ATTORNEYS

April 18, 1944.

C. W. MANN

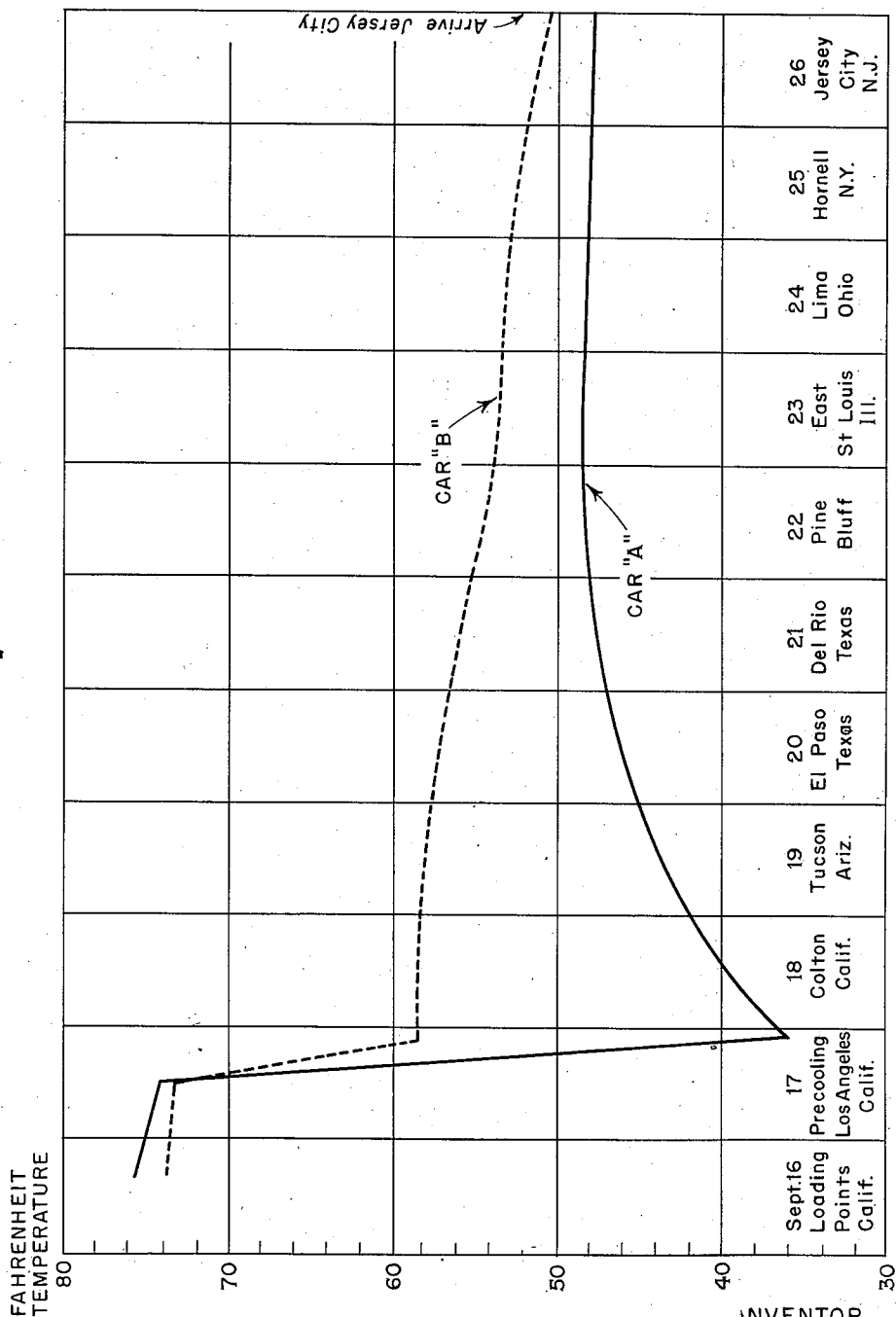
2,346,931

METHOD AND APPARATUS FOR CONTROLLING THE CIRCULATION
OF AIR IN REFRIGERATOR CARS

Filed Sept. 24, 1942

2 Sheets-Sheet 2

Fig. 3.



INVENTOR
CHARLES W. MANN

BY

H. R. Jones
S. A. Silgquist
ATTORNEYS

UNITED STATES PATENT OFFICE

2,346,931

METHOD AND APPARATUS FOR CONTROLLING THE CIRCULATION OF AIR IN REFRIGERATOR CARS

Charles W. Mann, Pomona, Calif., assignor to Claude R. Wickard, as Secretary of Agriculture of the United States of America, and his successors in office

Application September 24, 1942, Serial No. 459,512

1 Claim. (Cl. 62—24)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This application is made under the act of March 3, 1883, as amended by the act of April 30, 1928, and the invention herein described and claimed, if patented, may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment to me of any royalty thereon.

My invention relates to methods of controlling the direction of cold air currents introduced into standard refrigerator cars. It is applicable particularly during stationary precooling, when fresh fruits and vegetables are stacked in standard refrigerator cars, so that air movement can be effected within and throughout the load, causing the temperature in the upper layers of the lading to be rapidly lowered.

My invention is directed to a more efficient and positive control of cold air introduced into and within standard refrigerator cars during the commercial process of stationary precooling. It can be practiced without change in car structure, and without the use of expensive or complex equipment.

During the ordinary pursuit of precooling refrigerator cars by introducing refrigerated air into the car body, but from a source outside thereof, little attention is given to control of the direction of the air after its introduction, or the path which it follows in passing through and out of the car. In the precooling technique applicable to my invention, cold air is forced through hatch openings at one end of the car by means of portable ducts attachable to hatch frames, and the air allowed to circulate within the car body and lading. Two similar ducts are attached to the after hatches of the car and the air which has come in contact with the lading is drawn out of the car body and returned to be refrigerated and recirculated in the car. In present practice, the control of passage of the air within the car is given little consideration, and, therefore, it will follow the channel of least resistance, which will vary with the type and size of lading. In some cases attempts are made to force the air through the lading, such as by closing the top bulkhead opening at the exit end of the car, but with no definite control of such diverted air being made. I have also learned that lading cooled by this method does not reach the desired temperature within the prescribed time, due to the fact that when cold air is forced over a wide area, it is not as effective as when it is confined within a plurality of lesser areas. My invention is an improvement over these established methods.

The annexed drawings and the following de-

scription set forth in detail means for carrying out my invention, such, however, illustrating the various ways in which the principle of my invention may be accomplished.

Referring to the drawing,

Figure I is a longitudinal sectional diagrammatic view of a standard refrigerator car with railroad ice plant precooling ducts shown attached to the roof hatch frames of the car, with the hatch covers and plugs being removed, bunkers empty and typical loading arrangement with air deflectors suspended in the bunkers and baffles placed in the air passages above and below the lading, and with arrows illustrating the direction of air during the precooling process.

Figure II is a cross-sectional view of a standard refrigerator car bunker, showing an elbow type of air deflector.

Figure III is a graph showing the comparison of temperatures recorded in the uppermost layers of two standard refrigerator cars precooled simultaneously, one under standard practice, and the other under my arrangement as shown in Figure I, with the temperatures recorded en route.

Similar numerals refer to similar parts.

Referring again to Figure I, railroad ice plant precooling ducts 1 and 2 are attached to refrigerator car hatch frames 19 after the refrigerator car hatch plugs and covers (not shown) have been temporarily removed for this servicing. As indicated by the direction of the arrows, the cold air enters through duct 1 into the upper portion of plenum chamber 5, but by angular resistance and subsequent deflection of deflector 14, said cold air flows through top bulkhead opening 10 and into space 3, formed by upper part of lading 7, and ceiling 18 of the car body. The air coming in contact with baffle 16 is prevented from passing further along space 3, but flows down into, through and around lading 7, the while flowing under and beyond baffle 16. Whatever portion of the initial volume of air entering the car finds its way to the lower space 4 at the forward half of the car, is prevented from flowing unobstructed through said space 4 by baffle 17. Therefore, no short circuit of cold air can become possible around the lading, but instead it must pass down, through, in and around lading 7. When the air has passed the baffles 16 and 17 by its diverted route, it continues to move within the lading until it flows upward into and then along the after section of space 3 through top bulkhead opening 11, into upper section of empty bunker (or plenum chamber) 6, contacting deflector baffle 15 at an angular direction and subsequently deflecting up, into and through precooling duct 2.

It can be readily seen that, because of the direction and flow of air as produced by the arrangement of baffles and deflectors in Figure I, the upper confines of the lading 7 receive the major volume of air initially introduced into the car from precooling duct 1, and that the effect of the cooling action by this air would be greatest in this area. Hence, as hereinbefore described, the primary purpose and intent of my precooling process is more readily accomplished. To support these contentions and graphically illustrate the differences in precooling actions of the two methods as described herein, and the superiority of my method over the standard practice, I refer to Figure III, wherein is illustrated by means of temperature graph the actual temperature trend of the lading during the precooling process of two identical refrigerator cars with identical size loads and at the same initial temperature, processed at the same precooling plant simultaneously.

Referring in detail to Figure III, temperature line B is that recorded in the top layer of the car as precooled by standard practice, and temperature line A is that recorded in the top layers of the car precooled by my method.

To accomplish this feat, I have employed deflectors 14 and 15 of suitable material, removably and angularly mounted at the top and across each ice bunker 5 and 6, and baffles 16 and 17 above and below the lading 7 and at a point situated half way between the bulkheads; said baffles 16 and 17 applied in a temporary fashion to obstruct the space 3 from the ceiling 18 of the

car to the top plane of the lading 7 to obstruct the space from the floor to the bottom plane of the lading; the deflectors 14 and 15 and baffles 16 and 17 to be removed upon termination of the precooling process to allow natural circulation to take place within the car during transit.

Figure II illustrates another means for accomplishing the teachings of my invention. Demountable elbow type deflector 20 engages standard refrigerator car hatch frame 19. Precooling duct 1 fits above elbow 20 in hatch frame 19. The refrigerated air is by this means forced directly through top bulkhead opening 10 into space 3 above lading 7, and is controlled by means of baffles 16 and 17, as set forth above.

Having thus described my invention, what I claim for Letters Patent is:

A method of precooling lading in a refrigerator car having an ice bunker at one of its ends with top and bottom bulkhead openings communicating with the lading and with another opening at its top communicating with the outside of the car, and having a corresponding bunker at its other end, comprising circulating precooled air into the outside opening of the first-mentioned bunker, thence deflecting it through its top bulkhead opening, thence circulating it across, downward, into and around the lading and out of the top bulkhead opening of the second-mentioned bunker, and thence deflecting it out of the outside opening of the second-mentioned bunker.

CHARLES W. MANN.