April 12, 1932. J. VAN VULPEN ET AL 1,853,477

AIR CONDITIONING FOR RAILWAY CARS

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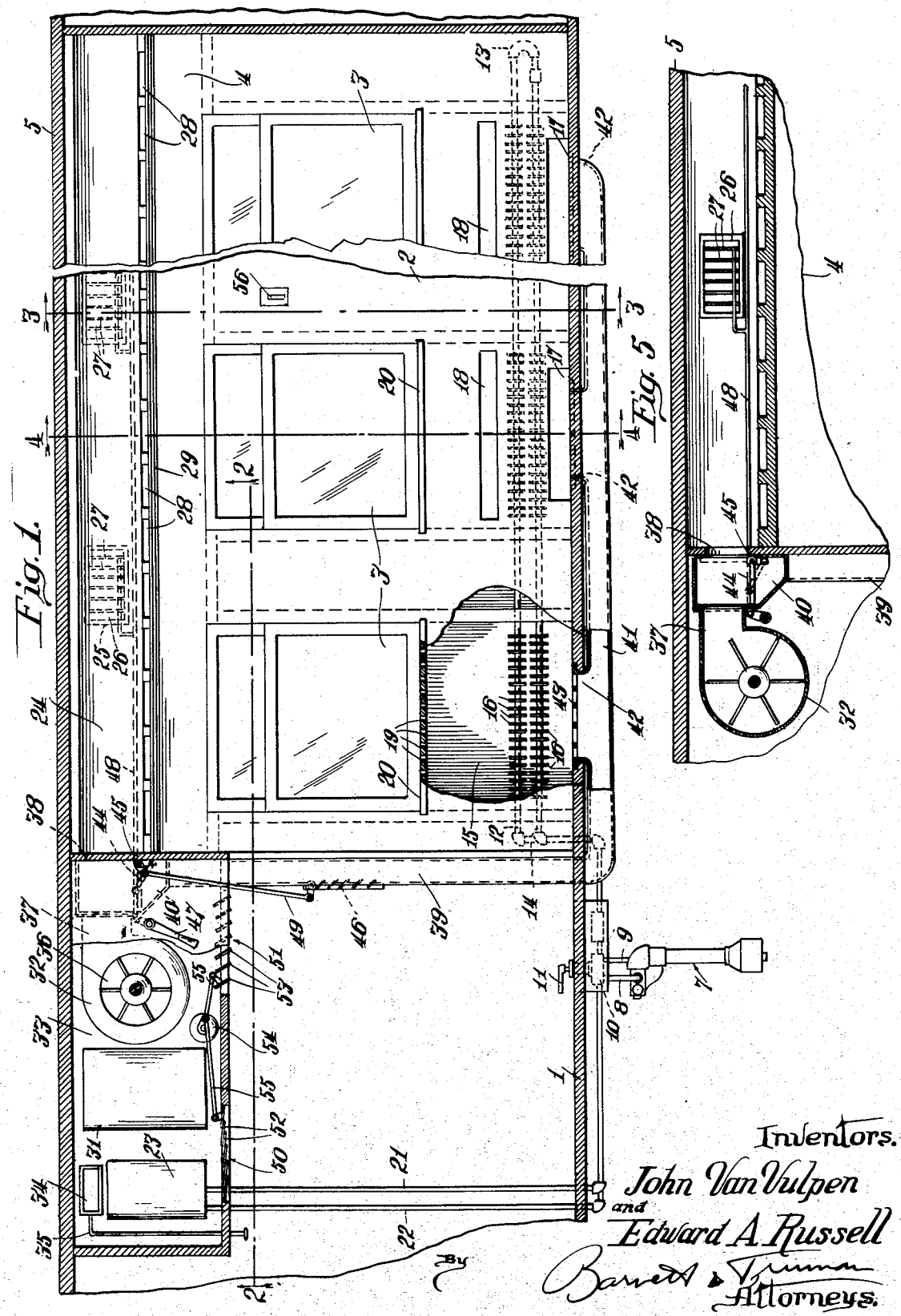

Fig. 1.

Fig. 5

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Fig. 2.

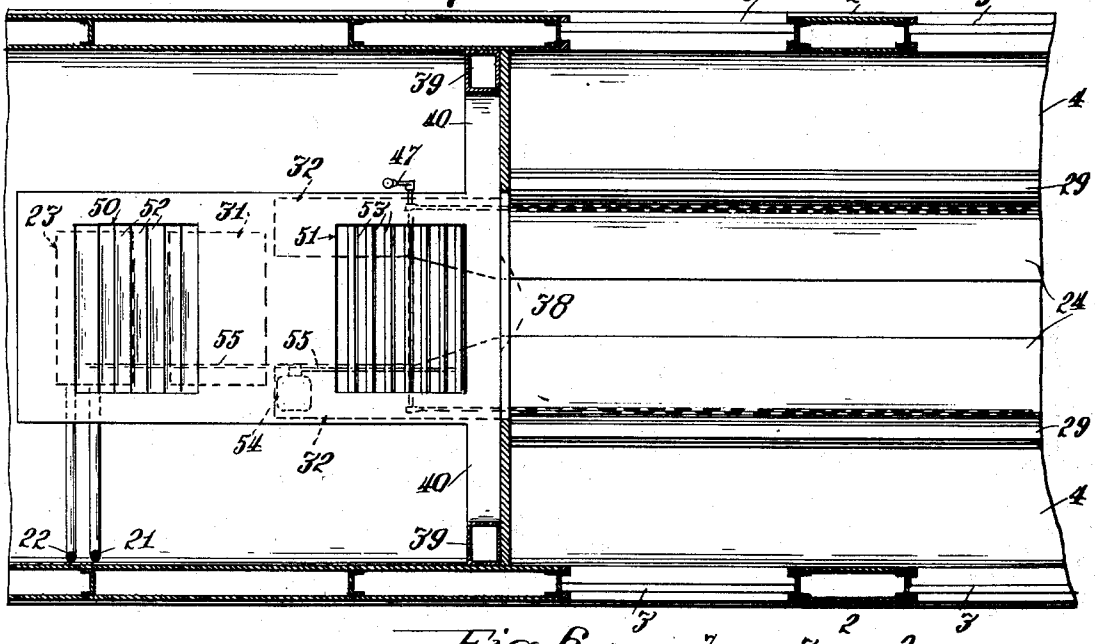
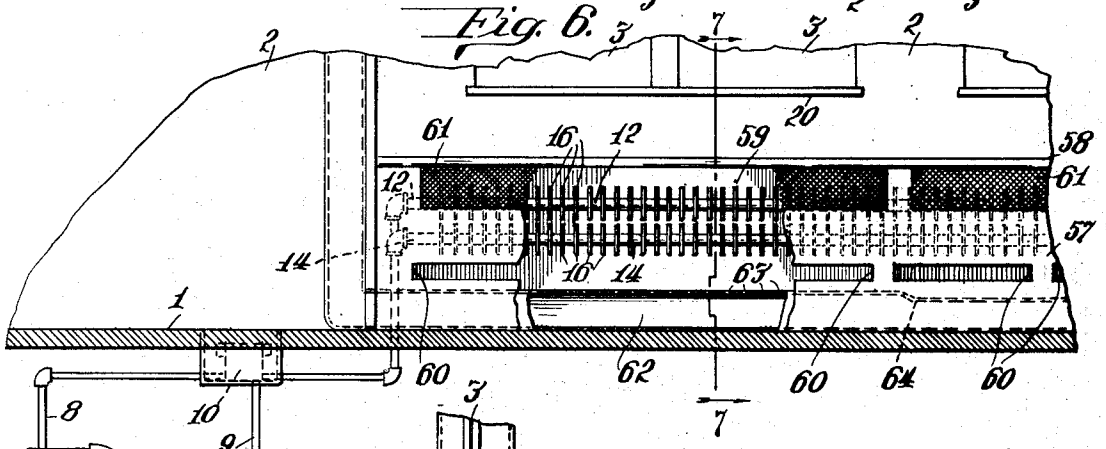


Fig. 6.



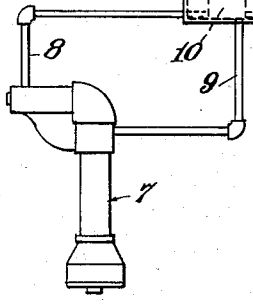


Fig. 7.

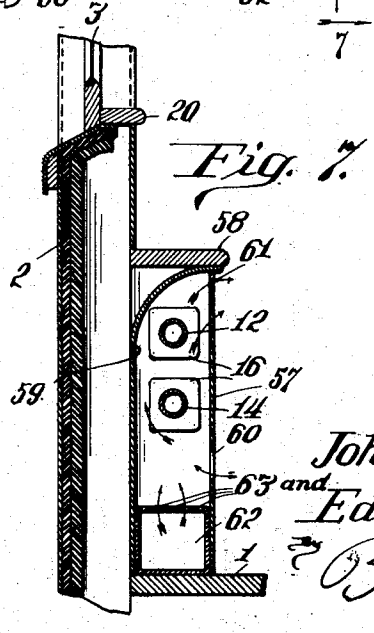


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Fig. 4.

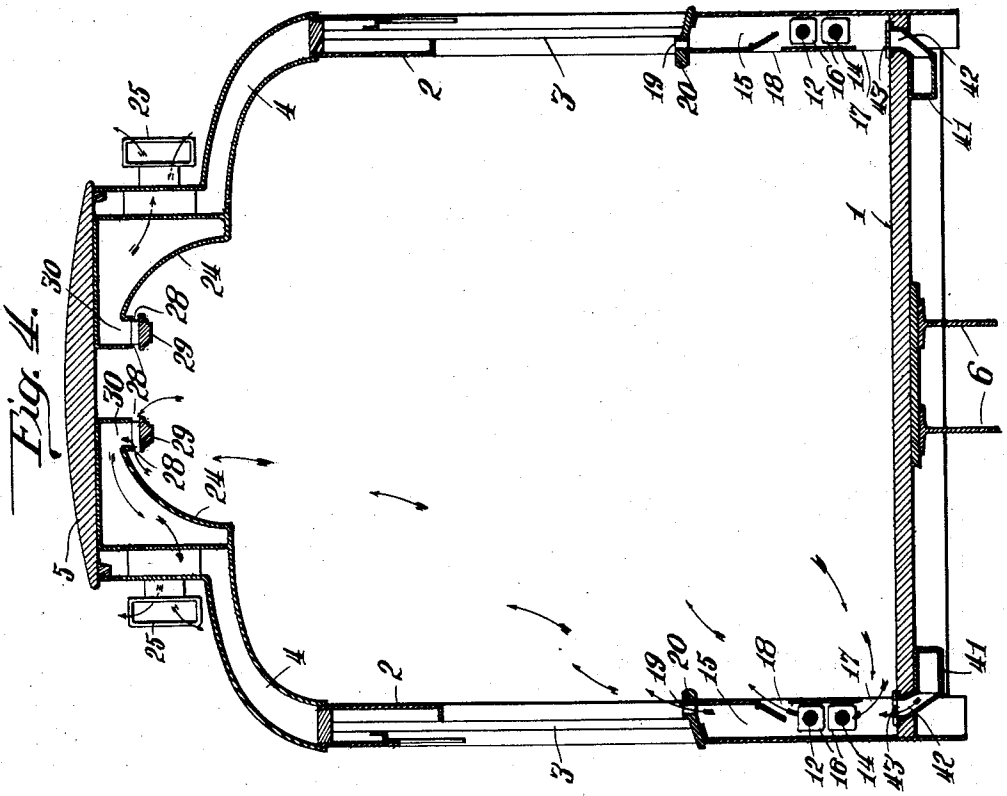
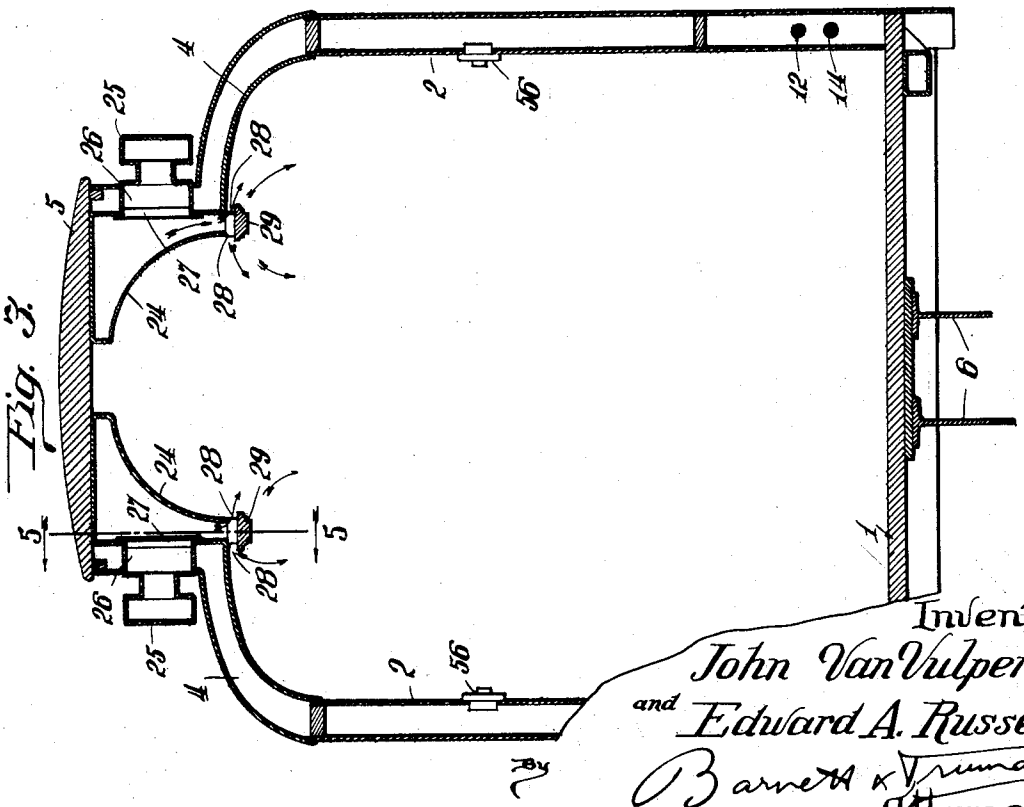


Fig. 3.



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Patented Apr. 12, 1932 1,853,477

UNITED STATES PATENT OFFICE

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AIR CONDITIONING FOR RAILWAY CARS

Application filed January 12, 1931. Serial No. 508,154.

This invention relates to certain new and useful improvements in a temperature controlling and ventilating system for railway cars, especially passenger carrying cars including dining cars, Pullman cars and parlor cars.

The invention contemplates a unitary system by means of which the air within the car may be ventilated, heated or cooled as temperature conditions may require. Briefly described, the system embodies a single air circulating means adapted to draw air through a refrigerating medium and discharge it into the upper portion of the car, or alternatively to withdraw air from within or outside the car and discharge this air over the radiators of the heating system into the car, the air subsequently being exhausted through ventilators in the upper portion of the car. More specifically, an air duct or ducts are provided in the upper portion of the car with which communicate the usual ventilators leading to the outer air, the ducts also having discharge openings communicating with the space within the car. These ducts may be either utilized for exhausting spent air from the car through the ventilators, or for discharging cooled air into the car when the ventilators are closed. The heating system embodies concealed radiators positioned in the lower portion of the car, and passages are provided for either discharging air over the radiators into the car or withdrawing air from the lower portion of the car when the refrigerating system is in operation. Valved connections are provided whereby the air circulating means can either force cooled air from the refrigerating system through the ducts into the car, or force air through the lower passages over the radiators when the heating system is in operation. An air inlet is provided for drawing in air from outside the car, and means is provided for humidifying this air. Thermostatically controlled inlets to the air circulating means control the air circulation so that when the temperature within the car has been sufficiently lowered, the air will be merely circulated without passing through the refrigerating means.

The general object of this invention is to provide a combined temperature controlling and ventilating system of the type briefly described hereinabove and disclosed more in detail in the specifications which follow.

Another object is to provide an improved ventilating system for railway cars.

Another object is to provide an improved system for circulating heated air through railway cars.

Another object is to provide an improved system for cooling and circulating air in railway cars.

Another object is to provide improved means for regulating the temperature of the air within a railway car.

Another object is to provide improved means for humidifying the air within the railway car.

Another object is to provide an improved system of air circulating passages within a railway car adapted to be used as part of either a heating or cooling system.

Other objects and advantages of this invention will be more apparent from the following detailed description of certain approved forms of apparatus embodying the principles of this invention.

In the accompanying drawings:

Fig. 1 is a longitudinal section through a portion of a railway car, partially broken away, many of the features of this temperature controlling and ventilating system being indicated diagrammatically.

Fig. 2 is an inverted plan view of the upper portion of the car, the view being taken substantially on the line 2—2 of Fig. 1.

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

Fig. 4 is a transverse vertical section taken substantially on the line 4—4 of Fig. 1. In Fig. 4 a modified form of ventilating duct is shown in the top of the car, otherwise the disclosure is the same as in Figs. 1 and 2.

Fig. 5 is a partial vertical section taken substantially on the line 5—5 of Fig. 3.

Fig. 6 is a partial longitudinal section showing a modified form of heating system.

Fig. 7 is a partial vertical section, on a larger scale, taken substantially on the line 7—7 of Fig. 6.

The railway car to which this invention is applied may be of substantially any of the well known types, preferably provided with heat-insulated walls. As shown in the drawings, the body portion of the car is indicated more or less diagrammatically, the floor being shown at 1, the side walls at 2, the windows at 3, the roof at 4, and the clear story at 5. A fragment of the underframe is indicated at 6 but the trucks and running gear are not shown.

Various types of heating systems may be used, but preferably a vapor or steam heating system of the type partially disclosed herein will be incorporated in this combined system. The heating unit herein shown will be positioned at one side of the car for all or a portion of the length thereof depending upon the type of car to which the system is adapted. It will be understood that a similar heating unit is used at the opposite side of the car, and in cars having passenger spaces of considerable length, such as coaches, two such heating systems may be used at one side of the car one leading from each end of the car to a position substantially midway of the car. It will be understood that these same remarks apply to many features of the cooling and ventilating systems hereinafter disclosed.

Referring first to the type of heating system shown in Figs. 1 to 5 inclusive, the vapor regulator 7 positioned beneath the car is connected with the source of steam supply in the usual manner, and is adapted to discharge condensate and non-condensable gases beneath the car in the usual manner. The vapor regulator 7 is connected with the distributing valve 10 by the supply and return pipes 8 and 3 respectively. A manually operated controller 11 is indicated for the distributing valve, but it is to be understood that this valve may be controlled thermostatically in response to temperature changes within the car, in the manner well known in this art. A radiating pipe loop consisting of the upper inlet pipe 12, loop 13 and lower return pipe 14 receives vapor from and discharges gases and condensate back into the distributing valve 10. This radiating loop is mounted within the lower side wall of the railway car, and in each space 15 beneath one of the windows 3 is provided with a plurality of radiating fins 16 to provide extended radiating surfaces at these points. Each heating space 15 is provided with a lower air inlet 17 adjacent the floor 1, and upper air outlets 18 and 19, the outlet 18 discharging heated air outwardly into the body of the car, and the outlet 19 discharging heated air upwardly through the window sill 20. The flow of air into and through the heating space 15 is indicated by the small arrows in Fig. 4. A second heating loop comprising pipes 21 and 22 is shown as extending from distributing valve 10 to the humidifier 23, hereinafter referred to.

Air ducts 24 extend longitudinally of the upper portion of the car. As shown in Figs. 1, 2 and 3, these ducts are built into the corners of the clearstory, and the ventilators 25 of any well known type communicate with the ducts 24 at spaced intervals so as to exhaust air from within the car to the outside air. A closure is provided for each opening 26 between ducts 24 and the ventilators 25 so that communication between the air ducts and the ventilators may be cut off when desired. In the form here shown, each of these closures consists of a plurality of vanes or louvres 27 which may be simultaneously swung together to close the opening or swung out at angles to permit a free passage of air through the opening. In the form here shown, the duct 24 is of generally triangular cross section with a concaved inner side so as to conform to the general outlines of the car roof. As shown in Figs. 1, 2 and 3, this duct communicates with the space within the car along its lower edge through a plurality of openings 28 above and at either side of a bottom closure or baffle member 29. In the modified form shown in Fig. 4, the outlets 28 and baffle 29 are positoned to communicate with an outlet 30 at the upper inner edge of the triangular duct 24. This particular form of air duct is preferable for use in Pullman cars or sleeping cars where it is preferable to discharge the cold air nearer the center of the car and not directly above the upper berths at either side of the car. Except for the position of these air outlets or inlets, the forms of air ducts 24 are the same in both Figs. 3 and 4.

The humidifier 23 already referred to, a refrigerating element 31, and a suitable fan or other air circulating means 32, are all located in a chamber 33 which may be located in any available position in the car, but is desirably located overhead and adjacent the end of the car as indicated in the drawings. Chamber 33 has a suitable air inlet 34 communicating with the outer air and provided with a closure adjustable by any suitable means such as 35 so as to cut off or regulate the inflow of outside air to chamber 33. The humidifier 23 may be of any approved type, preferably comprising a plurality of pans or receptacles containing water and a suitable heating element for expediting the vaporization of the water. The refrigerating element 31 may be of any approved type, either mechanical or cooled by ice. It will be of some open construction so that air may flow through in contact with the refrigerating elements. The fan 32 has an inlet 36 for withdrawing air from chamber 33, and a discharge passage 37 which communicates at 38 with the inlet to air duct 24. A second air passage 39 leads at 40 from the discharge

port 37 of the fan, this passage 39 leading down at one side of the car and communicating with a horizontal passage 41 which passes longitudinally along the car adjacent the floor thereof and has an outlet 42 beneath each radiator or heating chamber 15. Each outlet 42 may be suitably covered by an open grill 43 through which air may be discharged from passage 41 into the space 15 containing the radiating unit, or, conversely, air may be withdrawn from this space 15 into passage 41 when the refrigerating system is in operation. Preferably the lower air passage 41 will decrease in area as it progresses lengthwise of the car from the vertical passage 39 so as to provide a more equal distribution of air through the several outlets 42.

A closure member or valve 44 pivoted at 45 may be swung from a horizontal position closing the air passage 39 from the discharge port 37 of the fan, as shown in solid lines in Fig. 5, to a vertical position as shown in dotted lines in Fig. 5, in which latter position it will cut off the air duct 24 from the discharge port of the fan. An outlet provided with a valve or closure 46 is provided in the upper portion of air passage 39 adjacent the air inlets to chamber 33 hereinafter described. A manually operable lever 47 is connected by means comprising a slide rod 48 with the several closures 27 for ventilators 25, and this same operating mechanism has rod and lever connections indicated generally at 49 with the two valves or closures 44 and 46. When the lever 47 is swung to one position, for example as shown in the drawings, the closures 27 for the ventilators will all be moved to closed position, valve or closure 44 will be moved to cut off the air passage 39 and open the air duct 24 to the discharge of fan 32, and valve or closure 46 in air passage 39 will be opened. When the lever 47 is swung to the other position, closure 46 will be closed, closure 44 will be swung up to open air passage 39 to the discharge of the fan simultaneously cut off the air duct 24, and the closures 27 will be opened so that the ventilators 25 may withdraw air from duct 24 and through this duct from the interior of the car.

A pair of inlets 50 and 51 are provided from the space within the car to the chamber 33. These inlets are provided with closures 52 and 53 respectively, in the form here shown consisting of vanes or louvres which may be shifted from the closed position shown at 52 to the open position shown at 53. An operating motor 54 is connected with these closures through links 55 so that when one closure such as 52 is shifted to closed position the other closure such as 53 will be moved to open position, and vice versa. When closure 53 is open (as shown in the drawings), the air delivered through this inlet from the interior of the car passes directly to the inlet 36 of fan 32. When closure 53 is closed and closure 52 is open, the air passing through inlet 50 must pass through refrigerating element 31 before it reaches the inlet to fan 32. The motor 54 is controlled from a thermostat 56 positioned within the passenger compartment of the car. This same thermostat could be used to control the distributing valve of the heating system.

In the general operation of this system, supposing that temperature conditions are such that it is desirable to supply heat to the car, the control lever 47 will be shifted so that the ventilators 25 will be opened, the closure 44 will be moved to vertical position to cut off the air duct 24 from the fan and open the air passage 39 so that the fan will discharge its air through this air passage. The closure 46 in passage 39 will be moved to closed position, and the air inlet 51 will automatically be moved to the open position shown in the drawings on account of the low temperature existing in the car. The fan 32 will now withdraw air from within the car through inlet 51, and additional outside air may be drawn in through inlet 34, the desired moisture being added by means of the humidifier 23. This air is forced through air passages 39 and 41 and discharged through the outlets 42 into the spaces 15 wherein it is heated by passage over the radiating units and discharged into the interior of the car through outlets 18 and 19. The spent air is discharged from the car through the air ducts 24 and open ventilators 25.

In warmer weather, when the air within the car is to be cooled, lever 47 will be shifted so as to close the ventilators 25 and open the air duct 24 to the discharge port 37 of fan 32. At this time the air passage 39 will be cut off from the fan by closure 44 and the air port 46 in air passage 39 will be opened, as now indicated in Fig. 1. Assuming that the temperature in the passenger compartment of the car is above the desired temperature for which thermostat 56 is adjusted, the motor 54 will have operated to open the valve or closure 52 and close the valve or closure 53. Air will be drawn into chamber 33 through opening 50 (and from the outside air through inlet 34 if desired) and this air will be drawn through the refrigerating element 31 and cooled and then discharged through air duct 24 and outlets 28 into the interior of the car. It will be noted that the ventilators 25 are now closed so that the cold air forced into the duct or ducts 24 will be discharged into the car instead of to the outer air. Air from within the car is drawn into chamber 33 through inlet passage 50, and air will also be sucked from the lower portion of the car through grilles 43, passages 42, air passages 41 and 39 and outlet 46 and thence through inlet 50 into chamber 33. In this manner a downward circulation of the cooled air will be maintained throughout the car. When the

temperature has been lowered to the desired point, thermostat 56 will cause motor 54 to close the opening 50 and open the inlet 51 so that the air drawn from within the car into chamber 33 will pass direct to the inlet 36 of the fan and not through the refrigerating elements 31. In this manner the air circulation within the car will be kept up, but the temperature of this air will no longer be lowered through contact with refrigerating element 31. When the temperature has again risen above the desired point, thermostat 56 will again actuate motor 54 to cause the closures 52 and 53 to be shifted so that the air current will again pass through refrigerating element 31.

As indicated in Fig. 2, a single chamber 33 is positioned in the upper portion of the car midway between the sides, and a pair of fans 32 situated in this chamber are adapted to propel air through the respective sets of ducts or air passages at each side of the car. Alternatively, a separate chamber 33 and a complete set of the elements shown therein in Fig. 1, could be positioned at each side of the car so as to serve the distributing ducts or passages at that side of the car.

In Figs. 6 and 7 is indicated a modified form of heating system adapted for installation in old cars in which it would be impracticable to locate the radiators directly in the side walls of the car. A separate heating chamber extending longitudinally of the car is built into the lower side corner thereof, such chamber comprising a front wall 57, a cover plate or sill 58 and an insulated back wall and reflecting plate 59. In this case the radiating fins 16 may be positioned along the entire length of the pipes 12 and 14 of the radiating loop so as to form a continuous radiator throughout the length of the heating chamber. A plurality of air inlets 60 and air outlets 61 are positioned in the front wall 57 of the heating chamber, respectively below and above the radiating pipes. In the lower portion of the heating chamber is positioned an air passage 62 which corresponds to the air passage 41 of the first described form of the invention. This passage 62 is provided with a multiplicity of discharge ports 63 in its upper side for discharging air upwardly over or through the radiating members, and the passage 62 may be stepped down at intervals as indicated at 64 to decrease this area as it progresses longitudinally of the car thereby providing for a more equal distribution of air throughout the length of the passage. The inlet end of air passage 62 is connected with one of the vertically extending air passages 39, and the operation of this form of the invention is much the same as described in connection with Figs. 1 to 5 inclusive.

It is to be understood that the enclosed fan 32 is intended to represent any suitable form of air-pumping or circulating means, and that the term "blower" as used in certain of the claims which follow is intended to cover any suitable means for maintaining the air circulation through the conduits. Also any suitable form of closures, such as shutters or gates, can be used to control the air flow through the various passages and the general term "valves" as herein used is intended to cover all such alternative forms of closures.

We claim:

1. In a temperature controlling and ventilating system for railway cars, a heating system including radiators in the lower portion of the car, an air duct in the upper portion of the car, ventilators connecting said duct with the outer air, there being a plurality of outlets from said duct to the space within the car, a refrigerating means, an air circulating means, and valved passages whereby air may be circulated by said circulating means either through the refrigerating means and said duct and forced into the upper portion of the car, or circulated in contact with the radiators and exhausted through the duct and the ventilators.

2. In a temperature controlling and ventilating system for railway cars, a heating system including radiators in the lower portion of the car, an air duct in the upper portion of the car, ventilators connecting said duct with the outer air, there being a plurality of outlets from said duct to the space within the car, an air passage leading to the lower portion of the car and having outlets to the space within the car opening beneath the radiators, a chamber having valved connections to the duct and passage, a refrigerating means and an air circulating means positioned in the chamber, and a valved air inlet to the chamber, said valved air passages and ventilators being adjustable whereby air may be circulated from the car through the refrigerating means and air duct and discharged into the upper portion of the car with the ventilators closed, or may be circulated through the air passage and in contact with the radiators and exhausted through the duct and ventilators.

3. In a temperature controlling and ventilating system for railway cars, a heating system including radiators in the lower portion of the car, an air duct in the upper portion of the car, ventilators connecting said duct with the outer air, there being a plurality of outlets from said duct to the space within the car, an air passage leading to the lower portion of the car and having outlets to the space within the car opening beneath the radiators, a chamber having valved connections to the duct and passage, a refrigerating means and an air circulating means positioned in the chamber, and a valved air inlet leading to the chamber from the space within the car, a valved air inlet to the chamber from the outer air, said valved passages and ventilators be-

ing adjustable so that air may be circulated from the car through the refrigerating means and duct and discharged into the upper portion of the car with the ventilators closed, or may be drawn from the outer air, forced through the passage in contact with the radiators and exhausted through the duct and ventilators.

4. In a temperature controlling and ventilating system for railway cars, a heating system including radiators in the lower portion of the car, an air duct in the upper portion of the car, ventilators connecting said duct with the outer air, there being a plurality of outlets from said duct to the space within the car, an air passage leading to the lower portion of the car and having outlets to the space within the car opening beneath the radiators, a chamber having valved connections to the duct and passage, a refrigerating means and an air circulating means positioned in the chamber, and a valved air inlet leading to the chamber from the space within the car, a valved air inlet to the chamber from the outer air, a humidifier in the chamber between the latter inlet and the air circulating means, said valved passages being adjustable so that air may be circulated from the car through the refrigerating means and duct and discharged into the upper portion of the car, with the ventilators closed, or may be drawn from the outer air through the humidifier and forced through the passage over the radiators and exhausted through the duct and ventilators.

5. In a temperature controlling and ventilating system for railway cars, a heating system including a plurality of radiators in the lower portion of the car, an air duct in the upper portion of the car provided with a plurality of outlets leading to the space within the car, a plurality of ventilators connecting the duct with the outer air, a refrigerating means and an air circulating means and a chamber in which said means are located, said air duct leading from said chamber, an air passage leading from the chamber to the lower portion of the car and having outlets to the interior of the car beneath the several radiators, a closure for the opening between the chamber and air duct, a closure for the opening from the chamber to the air passage, means for opening the closure leading to the duct, closing the closure leading to the passage and closing the ventilators, or alternatively closing the ventilators, opening the closure leading to the duct and closing the closure leading to the passage, an air inlet to the chamber through which air withdrawn from within the car will pass through the refrigerating means, and a thermostatically operated closure for this inlet.

6. In a temperature controlling and ventilating system for railway cars, a heating system including a plurality of radiators in the lower portion of the car, an air duct in the upper portion of the car provided with a plurality of outlets leading to the space within the car, a plurality of ventilators connecting the duct with the outer air, a refrigerating means and air circulating means and a chamber in which said means are located, said air duct leading from said chamber, an air passage leading from the chamber to the lower portion of the car and having outlets to the interior of the car beneath the several radiators, a closure for the opening between the chamber and air duct, a closure for the opening from the chamber to the air passage, means for opening the closure leading to the duct, closing the closure leading to the passage and closing the ventilators, or alternatively closing the ventilators, opening the closure leading to the duct and closing the closure leading to the passage, air inlets to the chamber from the space within the car, one inlet leading directly to the air circulating means and the other leading through the refrigerating means, closures for these inlets, and thermostatic means for alternatively opening and closing these inlets in accordance with temperature conditions within the car.

7. In a temperature controlling and ventilating system for railway cars, a heating system including a plurality of radiators in the lower portion of the car, an air duct in the upper portion of the car provided with a plurality of outlets leading to the space within the car, a plurality of ventilators connecting the duct with the outer air, a refrigerating means and air circulating means and a chamber in which said means are located, said air duct leading from said chamber, an air passage leading from the chamber to the lower portion of the car and having outlets to the interior of the car beneath the several radiators, a closure for the opening between the chamber and air duct, a closure for the opening from the chamber to the air passage, means for opening the closure leading to the duct, closing the closure leading to the passage and closing the ventilators, or alternatively closing the ventilators, opening the closure leading to the duct and closing the closure leading to the passage, air inlets to the chamber from the space within the car, one inlet leading directly to the air circulating means and the other leading through the refrigerating means, closures for these inlets, a motor for closing one inlet and simultaneously opening the other or vice versa, and thermosatic means for controlling the motor.

8. In a temperature controlling and ventilating system for railway cars, a heating system including a plurality of radiators in the lower portion of the car, an air duct in the upper portion of the car provided with a plurality of outlets leading to the space within the car, a plurality of ventilators connecting the duct with the outer air, a refrigerating means and an air circulating means and

a chamber in which said means are located, said air duct leading from said chamber, an air passage leading from the chamber to the lower portion of the car and having outlets to the interior of the car beneath the several radiators, a closure for the opening between the chamber and air duct, a closure for the opening from the chamber to the air passage, means for opening the closure leading to the duct, closing the closure leading to the passage and closing the ventilators, or alternatively closing the ventilators, opening the closure leading to the duct and closing the closure leading to the passage, an air inlet to the chamber through which air withdrawn from within the car will pass through the refrigerating means, a thermostatically operated closure for this inlet, a valved inlet to the chamber from the outside air and a humidifier in the chamber between this inlet and the air circulating means.

9. In a temperature controlling and ventilating system for railway cars, a heating system including a plurality of radiators in the lower portion of the car, an air duct in the upper portion of the car provided with a plurality of outlets leading to the space within the car, a plurality of ventilators connecting the duct with the outer air, a refrigerating means and an air circulating means and a chamber in which said means are located, said air duct leading from said chamber, an air passage leading from the chamber to the lower portion of the car and having outlets to the interior of the car beneath the several radiators, a closure for the opening between the chamber and air duct, a closure for the opening from the chamber to the air passage, means for opening the closure leading to the duct, closing the closure leading to the passage and closing the ventilators, or alternatively closing the ventilators, opening the closure leading to the duct and closing the closure leading to the passage, an air inlet to the chamber through which air withdrawn from within the car will pass through the refrigerating means, a valved outlet from the air passage opening adjacent the air inlet, said valved outlet being opened when the opening to the passage from the air circulating means is closed, and a thermostatically operated closure for the air inlet to the chamber.

10. In a ventilating system for railway cars, a duct extending along the upper portion of the car, ventilators between said duct and the outer air, said duct having a plurality of air outlets leading to the space within the car, a second duct having outlets communicating with the lower portion of the space within the car, an air circulating blower, outlets leading from the blower to each of the ducts, valve means for opening and closing each blower outlet and for opening and closing the ventilators, and connections whereby the ventilators will be closed when the outlet from the blower to the upper duct is open at which time the blower outlet to the lower duct will be closed, and when the blower connection to the upper duct is closed and the connection to the lower duct is opened, the ventilators will be opened.

11. In a ventilating system for railway cars, a duct extending along the upper portion of the car, ventilators between said duct and the outer air, said duct having a plurality of air outlets leading to the space within the car, a second duct having outlets communicating with the lower portion of the space within the car, an air circulating blower, outlets leading from the blower to each of the ducts, valve means for opening and closing each blower outlet and for opening and closing the ventilators, and connections whereby the ventilators will be closed when the outlet from the blower to the upper duct is open at which time the blower outlet to the lower duct will be closed, and when the blower connection to the upper duct is closed and the connection to the lower duct is opened, the ventilators will be opened, and valved inlet passages to the blower whereby air may be withdrawn either from the space within the car or from the outer air.

12. In a ventilating system for railway cars, a duct extending along the upper portion of the car, ventilators between said duct and the outer air, said duct having a plurality of air outlets leading to the space within the car, a second duct having outlets communicating with the lower portion of the space within the car, an air circulating blower, a chamber in which the blower is positioned, air inlets leading to said chamber from the outer air and from the space within the car respectively, means for separately controlling said inlets so that either or both may be opened, outlets leading from the blower to each of the ducts, valve means for opening and closing each blower outlet and for opening and closing the ventilators, and connections whereby the ventilators will be closed when the outlet from the blower to the upper duct is open at which time the blower outlet to the lower duct will be closed, and when the blower connection to the upper duct is closed and the connection to the lower duct is opened, the ventilators will be opened, and valved inlet passages to the blower whereby air may be withdrawn either from the space within the car or from the outer air.

13. In a ventilating system for railway cars, a duct extending along the upper portion of the car, ventilators between said duct and the outer air, said duct having a plurality of air outlets leading to the space within the car, a second duct having outlets communicating with the power portion of the space within the car, an air circulating blower, a chamber in which the blower is posi-

tioned, a humidifier in said chamber, air inlets leading to said chamber from the outer air and from the space within the car respectively, means for separately controlling said inlets so that either or both may be opened, outlets leading from the blower to each of the ducts, valve means for opening and closing each blower outlet and for opening and closing the ventilators, and connections whereby the ventilators will be closed when the outlet from the blower to the upper duct is open at which time the blower outlet to the lower duct will be closed, and when the blower connection to the upper duct is closed and the connection to the lower duct is opened, the ventilators will be opened, and valved inlet passages to the blower whereby air may be withdrawn either from the space within the car or from the outer air.

14. In a heating and ventilating means for railway cars, a heating system comprising radiators mounted in the lower side portions of the car, an air duct having openings beneath the radiators, an air-circulating blower, and alternative connections between the blower and duct whereby air may either be forced through the duct and over the radiators or drawn through the duct from the lower portion of the enclosed space within the car.

15. In a heating and ventilating means for railway cars, a heating system comprising radiators mounted in the lower side portions of the car, an air duct having openings beneath the radiators, an air-circulating blower, a passage through which air may be forced from said blower into the upper portion of the space within the car, and valve means for alternatively opening said duct to either the inlet or outlet of the blower and for opening or closing the passage leading from the blower, whereby air may be forced through the duct and over the radiators, or may be drawn from the lower portion of the car and projected through the passage into the upper portion of the car.

16. In a cooling and ventilating system for railway cars, an air duct extending through the upper portion of the car and provided with a plurality of spaced outlets leading into the space within the car, a refrigerating element, an air-circulating blower, two air inlets to the blower, one leading directly from the space within the car, and the other leading through the refrigerating element, and means for alternatively opening and closing these inlets.

17. In a cooling and ventilating system for railway cars, an air duct extending through the upper portion of the car and provided with a plurality of spaced outlets leading into the space within the car, a refrigerating element, an air circulating blower, two air inlets to the blower, one leading directly from the space within the car, and the other leading through the refrigerating element, and thermostatically controlled means for alternately opening one inlet and closing the other in accordance with temperature conditions existing within the car.

18. In a cooling and ventilating system for railway cars, an air duct extending through the upper portion of the car and provided with a plurality of spaced outlets leading into the space within the car, a refrigerating element, an air circulating blower, a chamber in which the refrigerating element is positioned having an outlet leading through the blower and an inlet leading from the space within the car, a second air inlet leading directly from the space within the car to the blower, closures for the two inlets, a motor for alternatively opening one closure and simultaneously closing the other, and a thermostat positioned within the car for controlling the motor.

19. In a temperature controlling and ventilating system for railway cars, a heating system including radiators positioned in the lower portion of the car, an air duct in the upper portion of the car, there being a plurality of outlets from the duct to the space within the car, a refrigerating means, an air circulating means, and valved passages through which air may be forced by said circulating means either to the refrigerating means and said duct into the upper portion of the car, or discharged into the lower portion of the car after passing in contact with the radiators.

JOHN VAN VULPEN.
EDWARD A. RUSSELL.

DISCLAIMER

1,853,477.—*John Van Vulpen* and *Edward A. Russell*, Chicago, Ill. AIR CONDITIONING FOR RAILWAY CARS. Patent dated April 12, 1932. Disclaimer filed August 8, 1934, by the assignee, *Vapor Car Heating Company, Inc.*

Hereby enters this disclaimer to claims 16, 17 and 18 of said patent, which are in the following words, to-wit:

"16. In a cooling and ventilating system for railway cars, an air duct extending through the upper portion of the car and provided with a plurality of spaced outlets leading into the space within the car, a refrigerating element, an air circulating blower, two air inlets to the blower, one leading directly from the space within the car, and the other leading through the refrigerating element, and means for alternatively opening and closing these inlets.

"17. In a cooling and ventilating system for railway cars, an air duct extending through the upper portion of the car and provided with a plurality of spaced outlets leading into the space within the car, a refrigerating element, an air circulating blower, two air inlets to the blower, one leading directly from the space within the car, and the other leading through the refrigerating element, and thermostatically controlled means for alternately opening one inlet and closing the other in accordance with temperature conditions existing within the car.

"18. In a cooling and ventilating system for railway cars, an air duct extending through the upper portion of the car and provided with a plurality of spaced outlets leading into the space within the car, a refrigerating element, an air circulating blower, a chamber in which the refrigerating element is positioned having an outlet leading through the blower and an inlet leading from the space within the car, a second air inlet leading directly from the space within the car to the blower, closures for the two inlets, a motor for alternatively opening one closure and simultaneously closing the other, and a thermostat positioned within the car for controlling the motor."

[*Official Gazette September 4, 1934.*]