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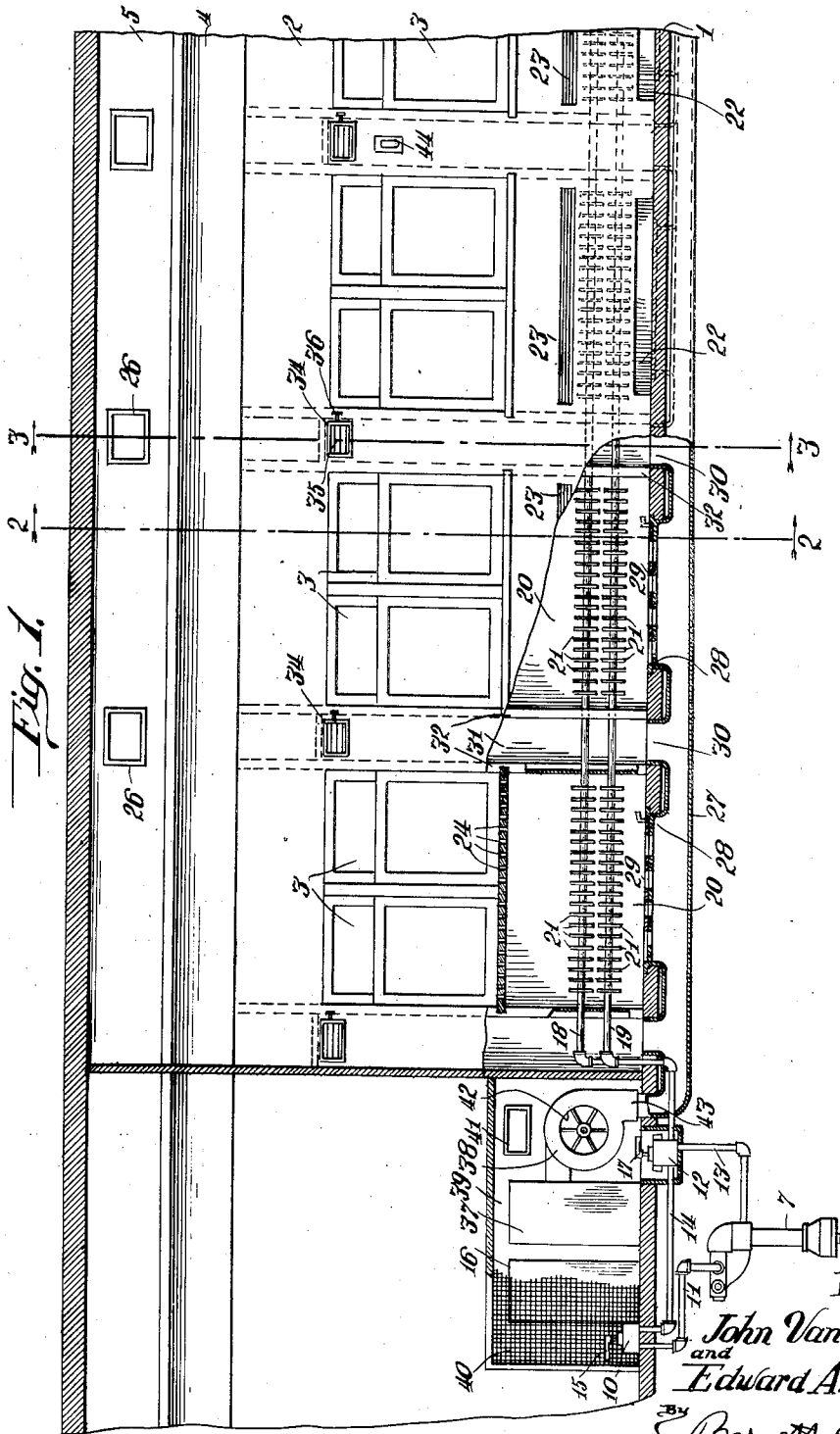
J. VAN VULPEN ET AL

1,884,408

COMBINED HEATING AND COOLING SYSTEM FOR RAILWAY CARS

Filed Jan. 12, 1931

2 Sheets-Sheet 1



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Fig. 3.

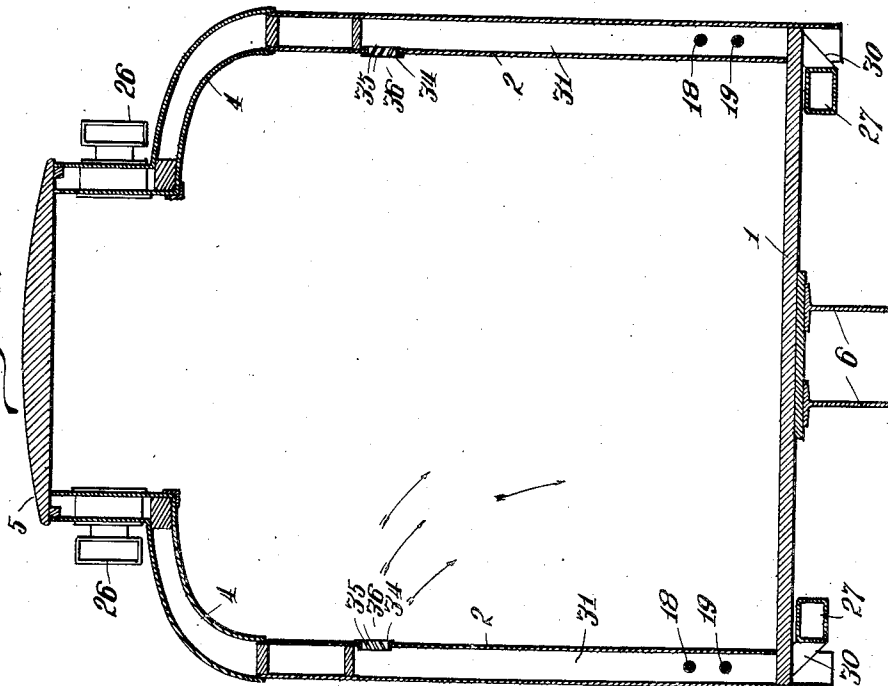
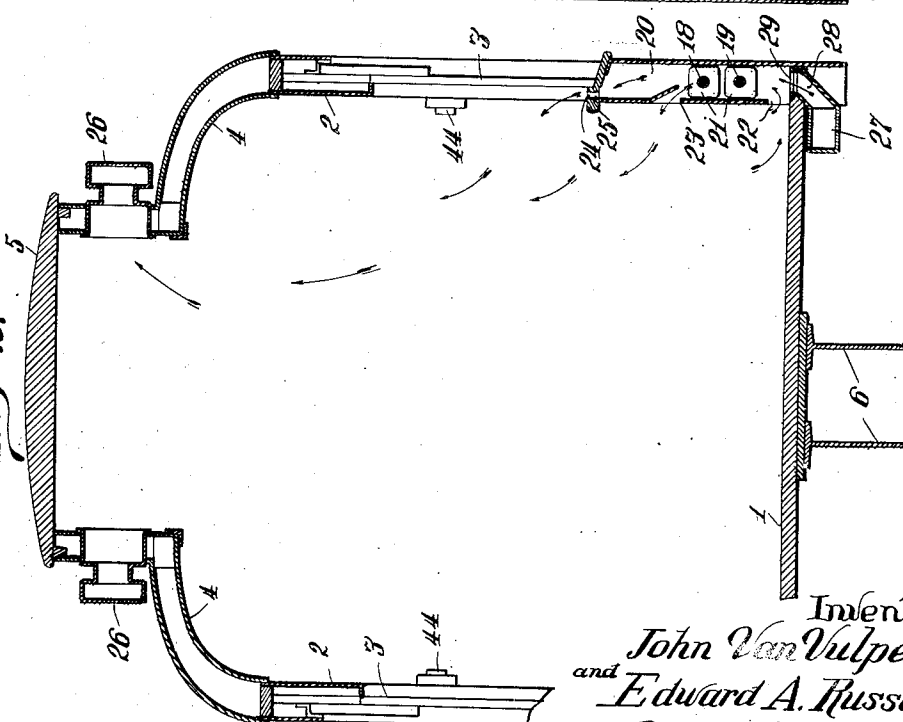


Fig. 2.



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UNITED STATES PATENT OFFICE

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COMBINED HEATING AND COOLING SYSTEM FOR RAILWAY CARS

Application filed January 12, 1931. Serial No. 508,155.

This invention relates to certain new and useful improvements in a combined heating and cooling system for railway cars, and more especially to a system adapted for use in passenger cars of all types, by means of which either heated or cooled air is circulated through the car in the proper direction through a single series of ducts or conduits.

The invention contemplates a unitary system, preferably built into the car, by means of which the car may be ventilated, heated or cooled as temperature conditions may require. Briefly described, the system embodies an air circulating means adapted to force air through a duct or conduit extending along the lower portion of the car at one side thereof and provided with a plurality of discharge outlets positioned beneath the several radiating units. Alternative passages extend upwardly from the main air duct through the side walls of the car and have outlets into the upper portion of the space within the car. The two sets of outlets from the main air conduit are each provided with closures whereby one set may be cut off when the other set is open and vice versa. When the heating system is in operation, the upper outlets are closed and the lower outlets are open and the air circulating means forces air through the air conduits and over the heating radiators into the lower portion of the car. This air may be exhausted by means of ventilators in the top of the car in the usual manner. When it is desired to cool the air within the car, the lower outlets are closed and the upper outlets are opened, and the air circulating means pumps air through a refrigerating element and through the main and the branch vertical air passages and discharges this air through the open outlets communicating with the upper portion of the car.

The combined heating and cooling apparatus disclosed herein is an additional exemplification of a means for this purpose, other forms of which are shown in our copending

application Serial No. 508,154, filed January 12, 1931, which has matured into Patent No. 1,853,477 issued April 12, 1932 wherein apparatus of this type is broadly claimed.

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 system for alternatively circulating either heated or cooled air through a railway car.

Another object is to provide an 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 the 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 an approved form 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 in which this improved system is installed, many of the features of the temperature controlling and ventilating system being indicated diagrammatically.

Fig. 2 is a transverse vertical section, 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.

The railway car to which the invention is applied may be of substantially well known type, 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 clearstory 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 each side of the car, one leading from each end of the car to a position substantially midway thereof. It will be understood that these same remarks apply to many features of the cooling and ventilating systems hereinafter disclosed.

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 as returned from the radiating system. This vapor regulator 7 is connected with a distributing valve 10 through pipe 11 and with a second distributing valve 12 by means of a return pipe 13. The two distributing valves 10 and 12 are connected by a pipe 14. The distributing valve 10 may be operated either mechanically or thermostatically by the means indicated at 15 and is adapted to supply heating medium to a humidifier indicated diagrammatically at 16. The second distributing valve 12 is adapted to supply heating medium to the radiators within the main body of the car and is controlled by a means indicated at 17 which may be either manually operated or operated by a thermostat in accordance with temperature changes. A radiating pipe loop extends from and back to the distributing valve 12 and consists of an upper pipe 18 and a lower return pipe 19, this radiating loop receiving vapor from the distributing valve and returning gases and condensate back to the valve and thence through pipe 13 to the vapor regulator 7. This radiating loop is mounted within the lower side wall of the railway car, and in each space 20 beneath one of the windows 3 is provided with a plurality of radiating fins 21 to furnish extending radiating surfaces at these locations. Each heating space 20 is provided with a lower air inlet 22 adjacent the floor 1, and upper air outlets 23 and 24, the outlet 23 discharging heated air outwardly into the body of the car, and the outlet 24 discharging heated air upwardly through the window sill 25. The flow of air into and through the heating space 15 is indicated by the small arrows in Fig. 2. Spent

air may be exhausted from the car through the usual ventilators 26 provided in the clearstory 5.

An air duct or conduit 27 extends longitudinally of the car beneath the floor 1 and adjacent the side wall and has outlets 28 communicating with the lower portions of the respective radiator chambers 20. These outlets 28 are provided with closures or dampers 29, so that these outlets may be closed or cut off when the heating system is inoperative and the refrigerating system is in operation. Intermediate outlets 30 from conduit 27 communicate with the vertical spaces or passages 31 formed between the uprights 32 of the side wall between certain of the windows 3. Outlets 34 provided with shutters or any other suitable form of valve or closure operable by hand lever 36, are provided in the upper portion of each passage 31 so that cooled air may be discharged through these outlets into the upper portion of the car.

The humidifier 16 already referred to, a refrigerating element 37, and a suitable fan or other air-circulating means 38, are all located in a chamber 39 which may be provided in any available position in the car usually adjacent one end thereof. The chamber 39 has a screened air inlet 40 leading from the space within the car, and a second valved air inlet 41 for communicating with the outside air. The inlet 42 for fan 38 communicates with the space within chamber 39 and air drawn into chamber 39 through inlet 40 will be drawn through the humidifier 16 and refrigerating element 37 before being forced by fan 38 through outlet passages 43 into the air conduit 27. Additional fresh air may be drawn in when desired through the inlet 41 and thence forced by fan 38 through conduit 27 into the car.

When the heating system is in operation, the valves or closures 29 will be opened and the shutters 35 will be closed so that the air forced into conduit 27 by fan 38 will be discharged through outlets 28 into the spaces 20 containing the radiating units. This air, which may be withdrawn from the interior of the car through inlet 40 or may be withdrawn from the interior of the car through inlet 41 will be heated by its passage over and around the radiating units and discharged into the car through outlets 23 and 24. The used air within the car, or a portion thereof, may be exhausted from the car through the ventilators 26 in the usual manner. This circulating air may be humidified by its passage through or in contact with the humidifier 16, and at such times the refrigerating element 37 will be inoperative.

In warmer weather, when it is desired to cool the air within the car, the refrigerating element 37 will be caused to function and the outlets 28 will be closed and outlets 34 opened by suitably moving the closures or shutters

29 and 35. Cooled air drawn through refrigerating unit 37 will now be forced through conduit 27 and discharged through the vertical passages 31 and outlets 34 into the upper portion of the car as shown in Fig. 3. This cooler air will settle and will be recirculated through the system in an obvious manner. Additional fresh air may be drawn in through port 41.

It will be apparent that this entire heating and cooling system is built into the body of the car so as to occupy very little space that would be available for other purposes, and that the air passages are adapted for either discharging warm air upwardly into the car or cool air downwardly from the lower portion of the car as temperature conditions may require.

A thermostat indicated at 44 may be used to automatically control the distributing valve 12 for regulating the flow of heating medium through the radiators.

We claim:

1. In a temperature controlling and ventilating system for railway cars, a heating means positioned in the lower portion of the car, a refrigerating means, an air circulating means, and a duct leading from said air circulating means and having outlets adjacent the floor of the car for discharging air beneath the heating means to be heated thereby, there being branch passages leading from this duct and having outlets in the upper portion of the car for delivering therinto air cooled by the refrigerating means, and closures for the several outlets so that the lower outlets may be closed when the upper outlets are open and vice versa.

2. In a temperature controlling and ventilating system for railway cars, a heating means positioned in the lower portion of the car, a refrigerating means, an air circulating means and a duct leading from said air circulating means and extending longitudinally of the car adjacent the floor thereof and having outlets for discharging air beneath the heating means so as to be heated thereby, there being branch passages leading upwardly from the duct and having outlets into the upper portion of the car for delivering therinto air cooled by the refrigerating means, and closures for the several outlets so that the lower outlets may be closed when the upper outlets are open and vice versa.

3. In a temperature controlling and ventilating system for railway cars, a heating means positioned in the lower portion of the car, a refrigerating means, an air circulating means and a duct leading from said air circulating means and extending longitudinally of the car adjacent the floor thereof and having outlets for delivering into the lower portion of the car air to be heated by the heating means, there being branch passages leading upwardly from the duct and having outlets

into the upper portion of the car for delivering therinto air cooled by the refrigerating means, and closures for the several outlets so that the lower outlets may be closed when the upper outlets are open and vice versa, and separate inlets to the air circulating means for admitting thereto air from within the car or air from outside the car.

4. In a temperature controlling and ventilating system for railway cars, a heating system including radiators mounted in the lower portion of the car, a refrigerating means, an air circulating means, an air inlet leading from the space within the car through the refrigerating means to the air circulating means, a duct leading from the circulating means longitudinally of the car, outlets from said duct to the upper portion of the space within the car, outlets from the duct opening beneath the radiators, and separately operable closures for the two series of outlets.

5. In a temperature controlling and ventilating system for railway cars, a heating system including radiators mounted in the lower portion of the car, a refrigerating means, an air circulating means, an air inlet leading from the space within the car through the refrigerating means to the air circulating means, a valved air inlet leading from the outer air to the air circulating means, a duct leading from the circulating means longitudinally of the car, outlets from said duct to the upper portion of the space within the car, outlets from the duct opening beneath the radiators, and separately operable closures for the two series of outlets.

6. In a temperature controlling and ventilating system for railway cars, a heating system including radiators mounted in the lower portion of the car, a refrigerating means, an air circulating means, an air inlet leading from the space within the car through the refrigerating means to the air circulating means, a duct leading from the circulating means longitudinally of the lower portion of the car, outlets opening from this duct beneath the several radiators, closures for the outlets, passages leading from the duct and opening into the upper portion of the car, and closures for the latter openings.

7. In a temperature controlling and ventilating system for railway cars, a heating system including radiators mounted in the lower portion of the car, a refrigerating means, an air circulating means, a chamber in which these means are positioned, an inlet to the chamber leading from within the car so that air passing therethrough will be drawn through the refrigerating means, a valved inlet to the chamber from the outer air, a humidifier in the chamber, a duct leading from the chamber longitudinally of the car, outlets from the duct to the upper portion of the space within the car, outlets from the duct opening beneath the radiators, and sep-

arately operable closures for the two series of outlets.

8. In a temperature controlling and ventilating system for railway cars, a heating system including radiators mounted in the lower portion of the car, a refrigerating means, an air circulating means, a chamber in which these means are positioned, an inlet to the chamber leading from within the car so that air passing therethrough will be drawn through the refrigerating means, a valved inlet to the chamber from the outer air, a humidifier in the chamber, a duct leading from the chamber longitudinally of the lower portion of the car, outlets opening from the duct beneath the radiators, closures for these outlets, passages leading from the duct and opening into the upper portion of the car, and closures for the latter openings.

9. In a temperature controlling and ventilating system for railway cars, a heating system including radiators mounted in the lower portion of the car, ventilators in the upper portion of the car, a refrigerating means, an air circulating means, an air inlet leading from the space within the car through the refrigerating means to the air circulating means, a duct leading from the circulating means longitudinally of the car, outlets from said duct to the upper portion of the space within the car, outlets from the duct opening beneath the radiators, and separately operable closures for the two series of outlets.

10. In combination with a railway car formed with hollow walls having enclosed spaces beneath the windows and vertically extending passages in the space between adjacent windows, a heating system including radiators concealed in the spaces beneath the windows, there being inlet and outlet air passages leading to these spaces from the space within the car, a duct extending longitudinally beneath the floor of the car and having outlets opening to the space beneath the several radiators, closures for these openings, connections from the duct to the vertical passages, openings from these passages to the upper portion of the space within the car, closures for these openings, ventilators in the upper portion of the car leading to the outer air, a refrigerating system, and a circulating means for drawing air from within the car through the refrigerating means and discharging it through the duct.

11. In combination with a railway car formed with hollow walls having enclosed spaces beneath the windows and vertically extending passages in the space between adjacent windows, a heating system including radiators concealed in the spaces beneath the windows, there being inlet and outlet air passages leading to these spaces from the space within the car, a duct extending longitudinally beneath the floor of the car and having outlets opening to the space beneath the sev-

eral radiators, closures for these openings, connections from the duct to the vertical passages, openings from these passages to the upper portion of the space within the car, closures for these openings, a refrigerating system, and a circulating means for drawing air from within the car through the refrigerating means and discharging it through the duct.

12. In combination with a railway car formed with hollow walls having enclosed spaces beneath the windows and vertically extending passages in the space between adjacent windows, a heating system including radiators concealed in the spaces beneath the windows, there being inlet and outlet air passages leading to these spaces from the space within the car, a duct extending longitudinally beneath the floor of the car and having outlets opening to the space beneath the several radiators, closures for these openings, connections from the duct to the vertical passages, openings from these passages to the upper portion of the space within the car, closures for these openings, ventilators in the upper portion of the car leading to the outer air, a refrigerating system, and a circulating means positioned to alternatively draw air from within the car through the refrigerating means, or air from outside the car, and force such air through the duct.

13. In combination with a railway car formed with hollow walls having enclosed spaces beneath the windows and vertically extending passages in the space between adjacent windows, a heating system including radiators concealed in the spaces beneath the windows, there being inlet and outlet air passages leading to these spaces from the space within the car, a duct extending longitudinally beneath the floor of the car and having outlets opening to the space beneath the several radiators, closures for these openings, connections from the duct to the vertical passages, openings from these passages to the upper portion of the space within the car, closures for these openings, ventilators in the upper portion of the car leading to the outer air, a refrigerating system, an air circulating means, a chamber in which these means are positioned having an outlet to the air duct, an inlet to this chamber from the space within the car, and a valved inlet to the chamber from the outer air.

14. In combination with a railway car formed with hollow walls having enclosed spaces beneath the windows and vertically extending passages in the space between adjacent windows, a heating system including radiators concealed in the spaces beneath the windows, there being inlet and outlet air passages leading to these spaces from the space within the car, a duct extending longitudinally beneath the floor of the car and having outlets opening to the space beneath the

the several radiators, closures for these openings, connections from the duct to the vertical passages, openings from these passages to the upper portion of the space within the car, closures for these openings, ventilators in the upper portion of the car leading to the outer air, a refrigerating system, an air circulating means, a humidifying means, a chamber in which these means are positioned having an outlet to the air duct, an inlet to this chamber from the space within the car, and a valved inlet to the chamber from the outer air.

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CERTIFICATE OF CORRECTION.

Patent No. 1,884,408.

October 25, 1932.

JOHN VAN VULPEN ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, lines 62, 63 and 64, claim 3, strike out the words "delivering into the lower portion of the car air to be heated by the heating means" and insert instead "discharging air beneath the heating means so as to be heated thereby"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 20th day of December, A. D. 1932.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.