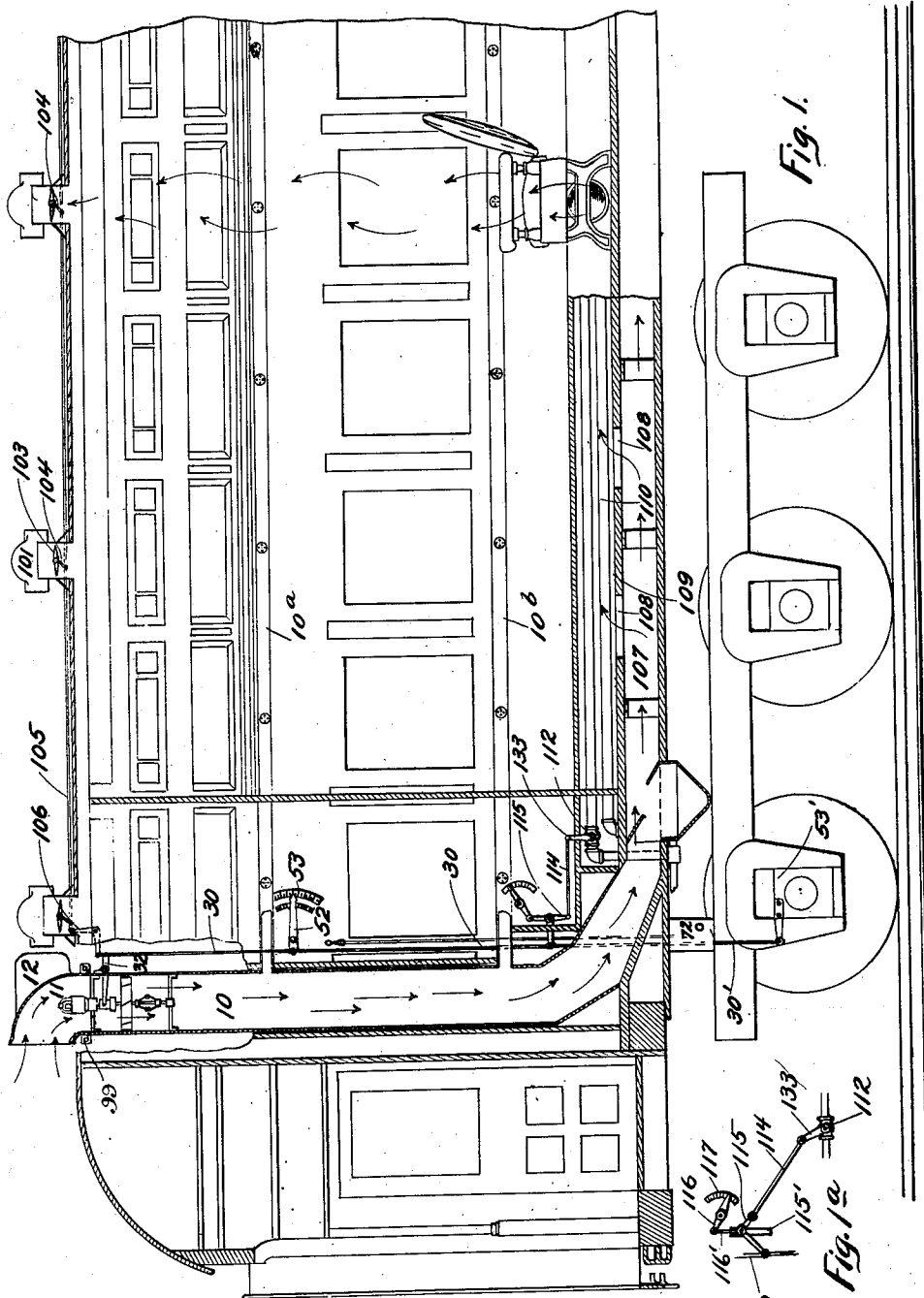


B. W. DAVIS.
 AUTOMATIC VENTILATOR AND HEAT REGULATOR.
 APPLICATION FILED MAY 4, 1909.

1,146,751.

Patented July 13, 1915.

3 SHEETS—SHEET 1.



Witnesses:

Wm. Burnap
Henry W. Park

By

Sheridan Wilkinson and Scott

Inventor:

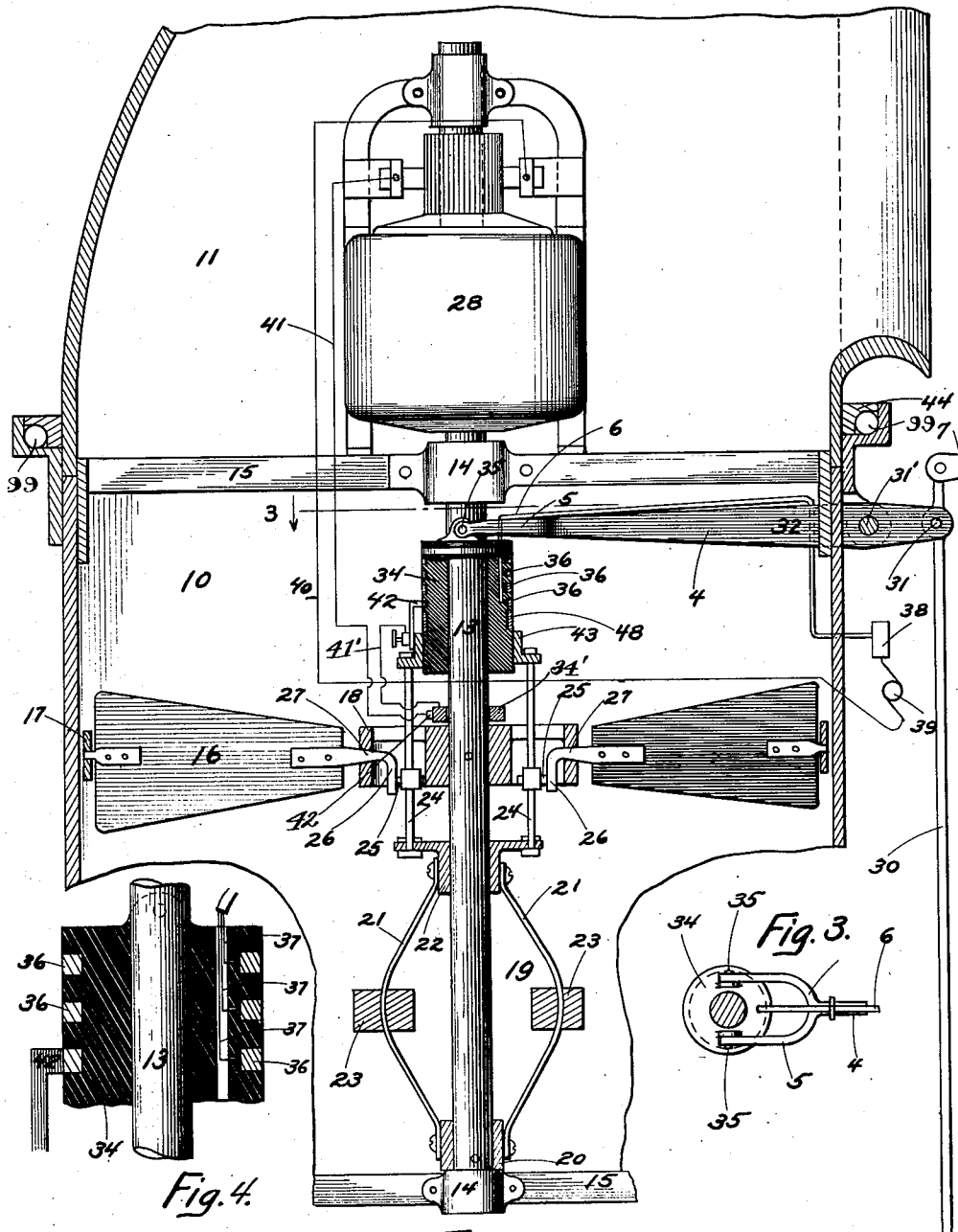
Benjamin W. Davis

Attys

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 3 SHEETS—SHEET 2.



Witnesses:

C. Burnap

Harry A. Parks

By

Sheridan Wilkinson and Scott Attys

Inventor:

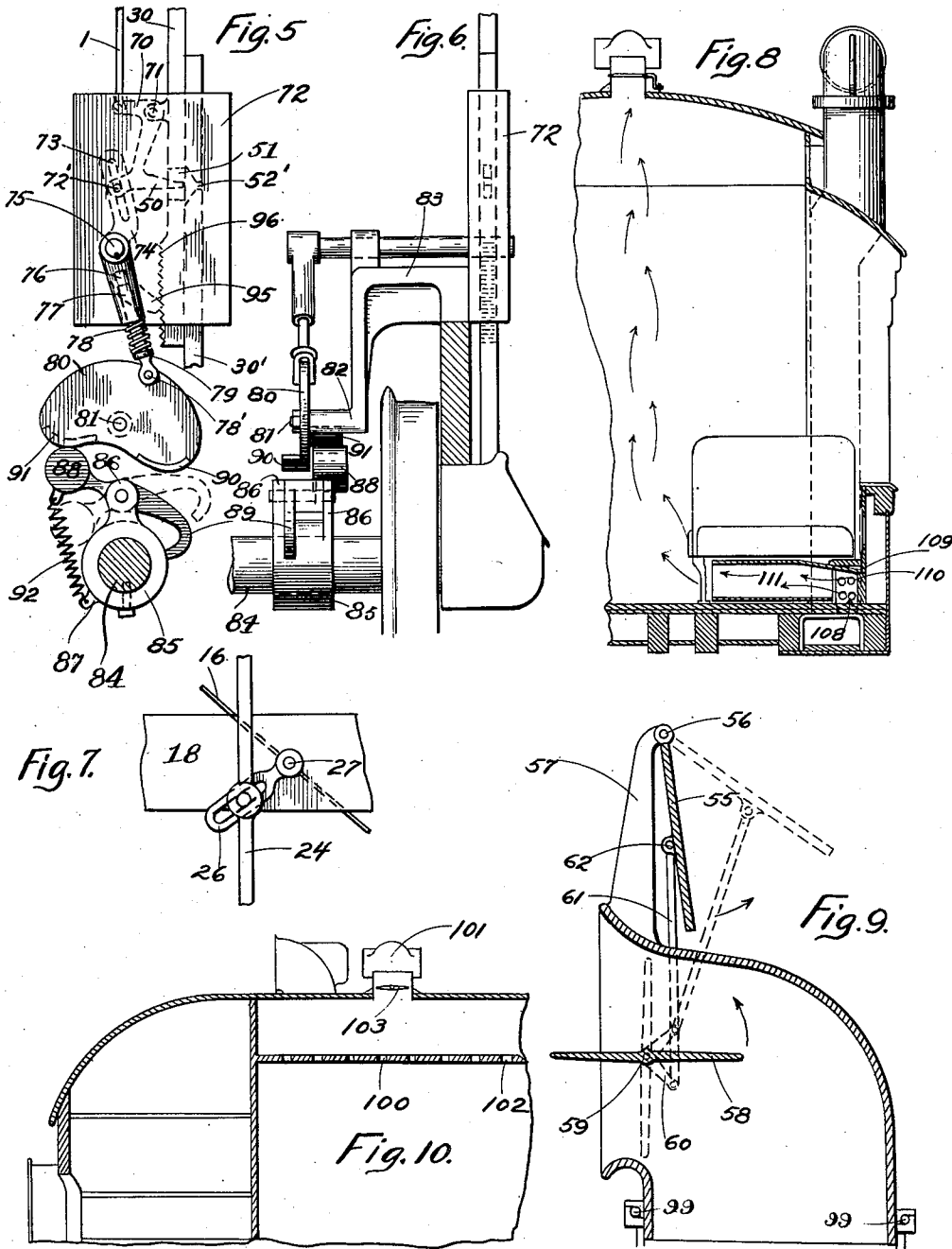
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3 SHEETS—SHEET 3.



Witnesses:

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Henry A. Parker By

Inventor:

Benjamin W. Davis.

Sheridan Wilkinson and Scott Attlys

UNITED STATES PATENT OFFICE.

BENJAMIN W. DAVIS, OF SEATTLE, WASHINGTON.

AUTOMATIC VENTILATOR AND HEAT-REGULATOR.

1,146,751.

Specification of Letters Patent.

Patented July 13, 1915.

Application filed May 4, 1909. Serial No. 493,800.

To all whom it may concern:

Be it known that I, BENJAMIN W. DAVIS, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Automatic Ventilators and Heat-Regulators, of which the following is a specification.

The object of my invention is to provide improved means of ventilation applicable to railway cars, and as to most of its features equally applicable to buildings and other inclosures.

By my invention I provide automatic means whereby the requisite amount of fresh air will be admitted to or forced into a car or other inclosure regardless of the many varying conditions under which a ventilating system must be operated and the vitiated air forced out. The same means may be used for controlling the action of a system whereby the vitiated air is drawn from an inclosure and replaced by fresh air entering through apertures provided for that purpose. Means are provided whereby the intake of air will be proportional to the number of occupants of the car or other inclosure, whereby the admission of an excessive quantity of air due to external conditions such as wind or the motion of a car will be counteracted by mechanism acting to lessen the area of the intake opening.

My invention also embodies means whereby a deficiency in the intake of air is automatically corrected, by increasing the available extent of the intake opening when the inward current is due to wind or the motion of the car, and in the event such external causes are insufficient to produce a sufficient current when the inlet is opened to its widest adjustment, power is applied to a fan through the action of a governor.

It will be obvious that my arrangement for operating the fan either by an air current, in which event the fan will function as an air motor, or propelling the shaft and fan by means of an electric current applied to a motor is applicable to a windmill power plant. When so applied power will be derived from the windmill when the strength of wind is sufficient for that purpose and at other times a suitably arranged governor will act to place the motor in circuit or put into operation any other form of motors, thus insuring rotation of the shaft.

Other and further objects of my invention

will be referred to in connection with the following description, which while confined to one specific embodiment of the principle of my invention sets forth the nature thereof irrespective of the use to which it is put and the particular mechanism by which it is carried out.

In the drawings—Figure 1 is a longitudinal sectional view of one end of a passenger coach equipped with my invention. Fig. 1^a is a detail view. Fig. 2 is a sectional view of the intake pipe showing the motor fan-governor and connected mechanism. Fig. 3 is a cross sectional view on the line 3, 3 of Fig. 2. Fig. 4 is a longitudinal section through the contact rings forming part of the rheostat. Fig. 5 is a detail side elevation of mechanism coacting with the car wheel for disengaging related parts when the car is in motion. Fig. 6 is an edge view of the mechanism illustrated in Fig. 5. Fig. 7 is a detail view of the connection between the fan blades and governor. Fig. 8 is a fragmentary cross sectional view of the car illustrated in Fig. 1. Fig. 9 is a sectional view through the outer end of the intake pipe showing supplemental means for controlling the admission of air thereto. Fig. 10 is a view of a modification in which a perforated ceiling causes the exit of air to be distributed throughout the upper part of the car.

The intake of air when the invention is applied to a car may be through a single intake pipe, although a larger number may be employed if desired. At the upper end and exterior to the car each intake is preferably provided with a rotatable section 11 in which there is a right-angular turn for the purpose of bringing the extreme end of the inlet into a horizontal plane for the purpose of receiving the inrush of air due to either the movement of the car or of the wind. The section 11 is preferably mounted on ball bearings 99, and is provided with a vane 12 for the purpose of keeping the inlet opening toward the point from which the air enters. By providing the intake pipe with a rotatable end, as above explained, it will not be necessary in all cases to provide more than a single pipe as the inlet of the single pipe employed will accommodate itself with the direction of the wind or the direction of the movement of the car to which it is applied.

A vertical shaft 13 is rotatably mounted in bearings 14 supported by spiders 15 extending across the pipe 10. Mounted on the

shaft 13 are a series of blades 16 pivoted at their outer ends in a ring 17 and at their inner ends in a hub 18 secured to the shaft. When sufficient air enters through the pipe 10 due to the wind or motion of the car the blades 16 rotate idly carrying the shaft 13 with them. For the purpose of preventing too strong a current of air through the pipe 10, I provide means for turning the blades 16 upon their axes, thus partially closing the pipe 10 when the air current becomes too great. The said blades thus serve as an adjustable valve in the air passage.

A centrifugal governor, designated generally by the numeral 19, comprises a ring 20 secured to the shaft 13, flexible arms 21 secured at their lower ends to said ring 20 and at their upper ends to a ring 22, which is slidable longitudinally upon the shaft 13. Mounted upon the flexible arms 21 intermediate their ends are weights 23. This mechanism constitutes a centrifugal governor, the weights 23 moving outwardly when the rate of rotation of the shaft 13 becomes sufficiently great, thus drawing the upper ring 22 downward. Extending upwardly from the ring 22 are operating rods 24 provided with outwardly directed forks 25 which lie in operative relation to the crank arms 26 upon the inner ends of the pivots 27 of the fan blades.

In operation when the rate of rotation of the fan 16 reaches a predetermined point, fixed in accordance with the strength of current desired through the pipe 10, the downward movement of the ring 22 causes the forks 25 to bear against the cranks 26, thus turning the blades 16 upon their axes in such a direction as to progressively close the passage through the pipe 10. When the fan runs idly by the natural draft due to wind or motion of the car there is a slight load due to friction of the bearings and brushes on the rings. Moreover, when the blades are partly or nearly closed their power is decreased. These facts tend to retard the speed and prevent racing when the governor acts in closing the vanes. The governor 19 also operates in a manner hereafter to be explained to regulate the current passing through the motor 28, the armature of which, not shown, is mounted upon the shaft 13.

Referring to Figs. 1 and 2, the rod 30 extends from its pivotal connection 31 with lever 32 to some part of the car structure not affected by the movement of the car body upon the truck springs, the purpose of this part of the mechanism being to regulate the intake of air in accordance with the weight in the car, thus securing an amount of fresh air proportional to the number of passengers. The lever 32 is pivoted at 31' to the side wall of the intake pipe 10 or to some other convenient part of the car structure,

and at its forked end 5 pivotally engages a sleeve 34 through trunnions 35. The sleeve 34 is slidably mounted upon the shaft 13 and carries a series of electrical contact rings 36. These contact rings are connected by separate wires 37 with a rheostat 38 located in any convenient place, and the rheostat is in circuit with a generator 39 or other source of electricity and with the motor 28 through the wires 40 and 41. Wire 41 leads to the fixed brush 42' which bears on the slip ring 34' mounted on, but insulated from shaft 13. Wire 41' is connected to a slip ring 34' and to a contact brush 42 which is secured to but insulated from a ring 43 which has a sliding and rotating engagement with the sleeve 34. The ring 43 is supported upon the upper ends of the operating rods 24 of the governor 19. It will be apparent that the outward movement of the governor weights 23 will draw the contact brush 42 downwardly over the contact rings 36, the mechanism being so arranged that the brush 42 may be drawn down away from the contact rings to a ring 48 of insulating material, thus cutting the motor out of circuit.

The relation of the brush 42 to the rheostat contact rings 36 is not only regulated by the action of the governor 19, but also by the movement of the sleeve 34, which carries the contact rings. The sleeve 34 is actuated through its connection with the lever 32 and rod 30. The rod 30 at its lower end lies in proximity with an extension 30' and is adapted to be locked in engagement therewith by means of a tooth 50 which may pass through an aperture 51 in the rod 30 and into engagement with a notch 52' in the rod 30'. The rod 30' at its lower end is connected either to the journal-box 53' or to some other part of the truck frame, it being essential only that the rod 30' be secured to some part of the truck which does not partake of the spring action of the car body.

Considering for the time being that the rods 30 and 30' are rigidly secured together it will be apparent that as the car settles upon its springs the outer end of the lever 32 will be thrust upwardly and at the inner end will move downward carrying with it the sleeve 34 and thus tending to move the contact rings 36 successively beneath the brush 42. The contact rings 36 are so arranged that when the brush 42 is in contact with the lower ring the whole of the resistance of the rheostat 38 will be in circuit with the motor, the resistance being progressively cut out as the brush 42 comes in contact with the upper rings. From this it will be apparent that the greater the number of passengers in the car the lower the sleeve 34 will be moved, thus starting the motor and cutting out resistance in proportion to the weight in the car. In case, owing to the stiffness of the car springs and the

weight of the car body as compared with the weight of the passengers, there is not sufficient movement of the car body upon its springs in all cases to accomplish the desired result and when the device is used in a building or other inclosure, the rod 30 may be set by hand through the lever 52, which is connected at one end to the rod 30 and pivoted intermediate its ends. The lever 52 may act in conjunction with the scale 53, which may bear marks indicating the proper position of the lever for different numbers of passengers.

From the foregoing it will be apparent that the fans 16 may operate as an idler when there is a natural draft through the inlet pipe 10; that when the draft through the pipe 10 becomes too great the centrifugal governor will operate to turn the pivoted vanes upon their axes, thus causing them to act as a damper to partially close the pipe. Furthermore, the sleeve 34 carrying the contact rings having been properly set either through the weight in the car or by means of the hand lever 52, if the current through the pipe 10 due to the action of the motor 28, together with the natural draft becomes too great the centrifugal governor will draw the brush 42 down upon the insulating ring 48, thus cutting the motor out of circuit. Upon a decrease in the current through the intake pipe 10, on the contrary, the spring arms 21 of the governor, being unopposed by sufficient centrifugal force will raise the brush 42 progressively across the contact rings 46, thus giving the motor 28 sufficient current to bring the apparatus again into equilibrium with mutual respect to speed and ventilation requirements.

A further control of the amount of air admitted through the intake 10 may be secured through the mechanism illustrated in Fig. 9, in which 55 is a vane pivoted at 56 to an arm 57 extending upwardly from the intake pipe. 58 is a damper or valve pivoted at 59 in the intake pipe and provided with an arm 60 pivoted at its outer end to a link 61, which extends upwardly to a pivotal connection 62 with the vane 55. The arm 60 as shown in Fig. 9 may be arranged as a crank attached to the outer end of the extended axis 59 of the damper 58 so as to avoid perforating the pipe 10 for the link 61. The pivot 56 is arranged parallel with the plane of the inlet opening in the pipe 10 thereby subjecting the vane 55 to the same pressure due to the wind or motion of the car. The effect of air pressure upon the vane 55 is to lift the same toward the dotted line position, shown in Fig. 9, thereby moving the damper 58 toward the dotted line position thereof. The movement of the vane 55 may be regulated by means of a spring or otherwise in order to effect the proper movement of the damper 58 when the air current

through the intake 10 becomes excessive. In some cases it may be found desirable to connect the vane 55 with the contact brush 42, thereby regulating the action of the motor in accordance with the wind pressure upon the vane 55 instead of in accordance with the rotation of the vanes 16.

In Figs. 5 and 6 I have illustrated mechanism whereby the rod 30 may be rendered inactive while the car is in motion, my object being to adjust the position of the sleeve 34 when the car is at rest, and at the same time to render said sleeve free from vibration due to the movement of the car body upon its springs in passing over crossings or rough track. The tooth 50 by which the rods 30 and 30' are adapted to be locked together forms part of an irregular lever 70, which is pivoted at 71 in the casing 72 mounted beneath the car. At its lower end opposite the tooth 50 the lever 70 is provided with a projection carrying a stud 72', which engages a slot 73 in an arm 74, which is pivoted at 75 in the casing 72. At its lower end beyond the pivot 75 the arm 74 is formed with a cylindrical cavity 76. A plunger 77 is fitted in the cavity 76 and is outwardly pressed by a spring 78 bearing at one end against the lower end of the lever 74 and at the opposite end against the collar 79 upon the plunger 77. The plunger 77 at its lower end is pivoted at 78' to a cam rocker 80, which in turn is pivoted at 81 to a stud 82, which may be supported by an arm 83 extending downwardly and inwardly from the casing 72. Keyed to the car axle 84 is a collar 85 to an ear 86 of which is pivoted intermediate its ends a lever 88—89 carrying at one end a weight 88 and at the other end an unweighted actuating finger 89. The cam rocker 80 is provided with two lateral off-set bearing surfaces 90 and 91, the surface 90 being in registry with the finger 89 and the surface 91 in registry with the weight 88. A spring 92 secured at one end to the stud 87 on the collar 85 and at the opposite end to the weight 88 normally tends to draw the weight 88 toward and to thrust the finger 89 outwardly from the axle 84. The spring 92 is of such strength that when the car is moving at a predetermined rate, say three or four miles an hour, centrifugal force will throw the weight 88 outwardly, thus causing it to strike the bearing surface 91 of the cam rocker 80 and throw it over into the solid line position in Fig. 5. The effect of the spring plunger 77 is to carry the cam rocker to its extreme throw when the pivotal point 78' has been carried in either direction beyond the straight line between the pivots 75 and 81. The effect of the pressure of the weight 88 upon the cam rocker 80 in moving it to the solid line position shown in Fig. 5 is to rotate the lever 75 upon its pivot 74 in counter-clockwise di-

recession, thus withdrawing the tooth 50 from engagement with the notch 52' in the rod 30', and to throw the pawl 95 into engagement with the ratchet 96, which is formed upon the lower end of the rod 30. The pawl 95 is formed rigidly with the lever 74 and thus serves to hold the rod 30 stationary when the car is in motion at the predetermined rate mentioned. The same movement which throws the pawl into engagement with the ratchet 96 disengages the tooth 50 from the rod 30' and vice versa. By this means when the car is in motion the sleeve 34 is locked against movement. When the car slows down below the predetermined speed the finger 89 moves outwardly under the force of the spring 92 and contacts with the bearing surface 90, thus throwing the cam rocker to a position opposite to that shown in Fig. 5, thus withdrawing the pawl 95 from the ratchet 96 and moving the tooth 50 into engagement with the notch 52' of the rod 30', thereby locking the sections 30 and 30' together. Sufficient registration of the notches 51 and 52' is assured by the load remaining constant while the car is in motion and the foreside of the notch 52 being funnel shaped to most readily receive the tooth 50. This has the effect of again placing the mechanism in such adjustment that the position of the sleeve 34 will be adjusted in accordance with the weight in the car. As it is during stops that the weight in the car changes the mechanism above described is effective for adjusting the sleeve 34 when the car is stationary, but causes the sleeve 34 to be locked against movement due to the jarring of the car body when in motion at a rate above a predetermined limit of say three or four miles an hour.

In Fig. 10 I have shown a ceiling beneath the roof of the car with an intervening air space. The ceiling is perforated and the perforations 100 in proximity to the outlets 101 are smaller than the perforations 102 more remote from the outlets. The perforations may also be more numerous at the parts of the ceiling remote from the outlets than adjacent thereto. This variation in the size and the distributing of the perforations is for the purpose of causing an even distribution of air throughout the car rather than strong currents directed to the outlets.

The outlets 101 are controlled by means of valves or dampers 103, and as shown in Fig. 1, the valves are pivotally mounted and provided with crank arms 104. A longitudinal connecting rod 105 is pivoted to the cranks 104 and at its end is pivoted to one arm of a bell crank lever 106, the other arm of which is pivoted to the rod 30. The valves 103 are by this connection caused to open and close in accordance with the weight in the car, thus securing outlet openings of graduated size to correspond with the gradu-

ated inlet. It is of course obvious that the circulation of air through the car may be the reverse of that described, in which case the openings controlled by valves 103 would be inlet openings instead of outlet openings.

Branch pipes 10^a and 10^b communicate with the air inlet pipe 10 and serve to distribute fresh air throughout the interior of the car adjacent the upper and lower berths respectively, when the apparatus is applied to a sleeping car, and when the invention is applied to other than sleeping cars such branch conduits serve to distribute fresh air throughout the interior of the car at different levels.

The air admitted through the pipe 10 is received in a duct 107 at the lower part of the car, this duct being connected by openings 108 with a heating duct 109. The heating duct 109 is traversed by steam pipes 110. The air from the duct 109 may, as shown in Fig. 8, be delivered to the interior of the car through outlet pipes 111 located beneath the car seats and have their open ends directed toward the aisle. The valve 112 controlling the admission of steam to the pipes 110 is provided with an arm 113 to which is pivoted a connecting rod 114 having its opposite end pivoted to one arm 115 of a bell crank lever. The other arm of the bell crank is pivoted to the rod 30, the effect of these connections being to regulate the admission of steam to the pipe 110 in accordance with the weight in the car.

In order that the temperature of the car may be varied according to the atmospheric temperature, I preferably vertically adjustably support the fulcrum of the bell crank lever 115, as shown in Fig. 1^a. A vertical guide 115' is provided in which the fulcrum of the bell crank lever may be vertically adjusted by any suitable means, such for instance as a link 116' connected to the fulcrum of the bell crank lever at one end and at its other end to a lever 116, said latter lever being fulcrumed intermediate of its ends and cooperating with a graduated scale 117. By manually moving the lever 116 the fulcrum of the bell crank lever 115 may be vertically adjusted, and consequently the throw of the valve 112 varied to admit more or less steam to the heating coil 110. By this means the temperature of the car is not only automatically varied according to its loaded condition, but the limit of such variation may be fixed to accord with the atmospheric conditions and the consequent need of more or less artificial heat in the car.

Of course, it is obvious that other sources of heat than steam may be utilized in connection with my invention and may similarly be controlled through the movement of the rod 30. It will also be obvious that while I have shown my invention as applied to a passenger car that it is capable of prac-

tical application of freight cars which carry perishable freight, such for instance as fruits, meats, etc., the preservation of which requires that a circulation of air should occur through the car.

While I have herein shown and particularly described some embodiments of my invention, I do not wish to limit myself to the precise constructions as herein shown and particularly described, as many modifications may be made by those skilled in the art without departing from the spirit of my said invention.

I claim:

1. In combination, a supporting structure, a chamber supported thereon and movable relative thereto, said chamber being provided with a ventilating passage, means controlling the flow of air through said passage, said means being operable by the movement of said chamber relative to said supporting structure due to change of weight in said chamber to vary the flow of air through said passage.

2. In combination, a supporting structure, a chamber supported thereon and movable relative thereto, said chamber being provided with a ventilating passage, a valve member controlling the flow of air through said passage, and operable by movement of said chamber relative to said structure due to change in weight in said chamber to vary the flow of air through said passage.

3. In combination, a supporting structure, a chamber supported thereon and having an air inlet pipe, said chamber being movable relative to said supporting structure, a fan in said inlet pipe, a motor adapted to drive said fan, and means to vary the action of said motor, said means being operable by movement of said chamber relative to said supporting structure due to change in weight in said chamber.

4. In combination, a supporting structure, a chamber supported thereon, said chamber being provided with an inlet pipe, a fan, a governor, a rotatable shaft, said fan and governor being attached to said shaft, a motor arranged to drive said shaft and means for regulating the action of said motor in accordance with the weight in said chamber and the rate of rotation of said governor.

5. In combination, a supporting structure, a chamber supported thereon, an air inlet pipe communicating with said chamber, a fan mounted therein, a motor arranged to drive said fan, an air duct leading into said chamber from said inlet pipe, said chamber being provided with apertures leading outwardly from the interior thereof, valves in said apertures, means operated by the weight carried in the chamber for regulating the action of said motor, said means being arranged to operate said valves.

6. In combination, a supporting structure, a chamber supported thereon, an air inlet pipe communicating therewith, a fan therein, a motor, said fan being arranged for rotation by a current of air through said pipe, or by said motor, the blades of said fan being pivotally mounted, and a governor actuated by said fan, and operable to move said vanes about their pivotal mounting.

7. In a car, an air inlet pipe, a shaft mounted in said pipe, a fan mounted on said shaft, a motor operatively related to said shaft, a centrifugal governor driven by said shaft, a rheostat adapted to control the speed of said motor, a series of contact plates slidably mounted on said shaft, a contact brush slidably mounted relative to said shaft and connected to said governor, said brush and contact plates being mutually slidable and coacting and adapted to vary the motor rheostat connections, a lever pivoted to the car body and connected at one end of said contact plate, and a member connected at one end to said lever and at the other end to a part of the car beyond the springs.

8. In a car, an air inlet pipe, a fan therein, a motor operatively related to said fan, a rheostat in circuit with said motor, an actuating connection extending from said rheostat, all of said parts being mounted on the car body, and a mechanical actuating connection adapted to change the rheostat connections, said mechanical actuating connection being connected to a part of the car beyond the truck springs.

9. In a car, an air inlet pipe, a fan therein, a motor operatively related to said fan, a rheostat in circuit with said motor, an actuating connection extending from said rheostat, all of said parts being mounted on the car body and one end of said actuating connection being connected to a part of the car beyond the truck springs, and means dependent upon the rotation of one of the car wheels for interrupting said actuating connection.

10. In a car, an air inlet pipe, a fan therein, a motor operatively related to said fan, a rheostat in circuit with said motor, an actuating connection extending from the contact element of said rheostat, all of said parts being mounted on the car body and one end of said actuating connection being connected to a part of the car beyond the truck springs, and means for preventing vibrations of the car body operating said actuating connection to affect the rheostat.

11. In combination, a supporting structure, a chamber supported thereon, an air inlet pipe communicating with said chamber, a rotatable shaft located in said pipe, air propelled blades operatively connected to said shaft, a motor arranged to rotate said shaft and automatic means for varying the power of the motor inversely as the

power applied to said shaft by said blades varies.

12. In a ventilating system, an inlet pipe, a fan adapted to drive air through said pipe, said fan being capable of adjustment to vary the amount of air driven thereby, a governor member, a motor operatively connected with said fan and said governor, a rheostat arranged to control said motor, said governor being arranged to adjust said fan as to its

driving effect and also to adjust said rheostat, and means to adjust said rheostat, said last named means being operable by change of weight in said car.

In testimony whereof, I have subscribed my name.

BENJAMIN W. DAVIS.

Witnesses:

GEO. L. WILKINSON,
ANNIE C. COURTENAY.