(No Model.)

2 Sheets—Sheet 1.

W. E. EASTMAN.

CAR VENTILATOR.

No. 326,411. Patented Sept. 15, 1885.

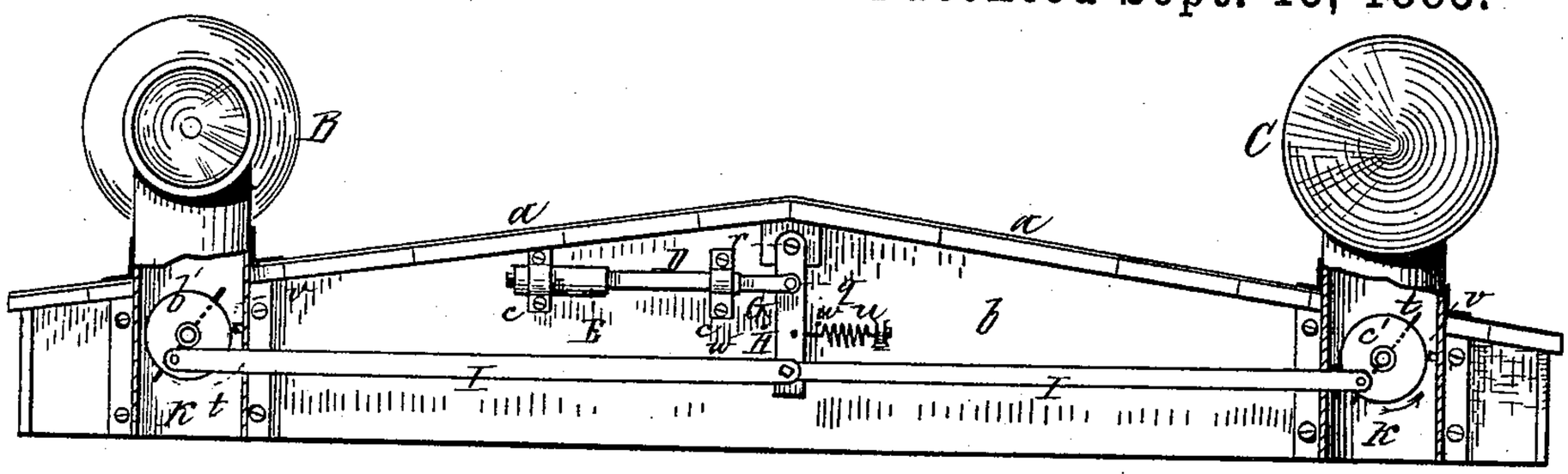

Fig. 1.

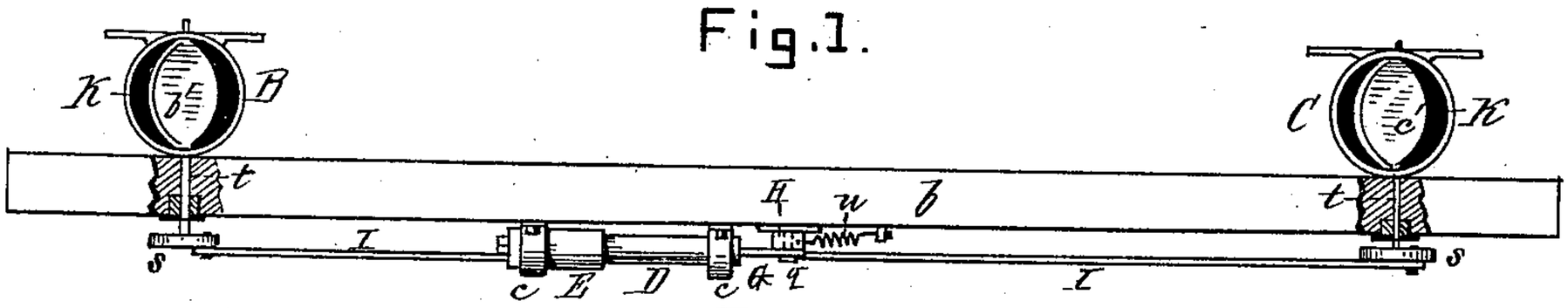

Fig. 2

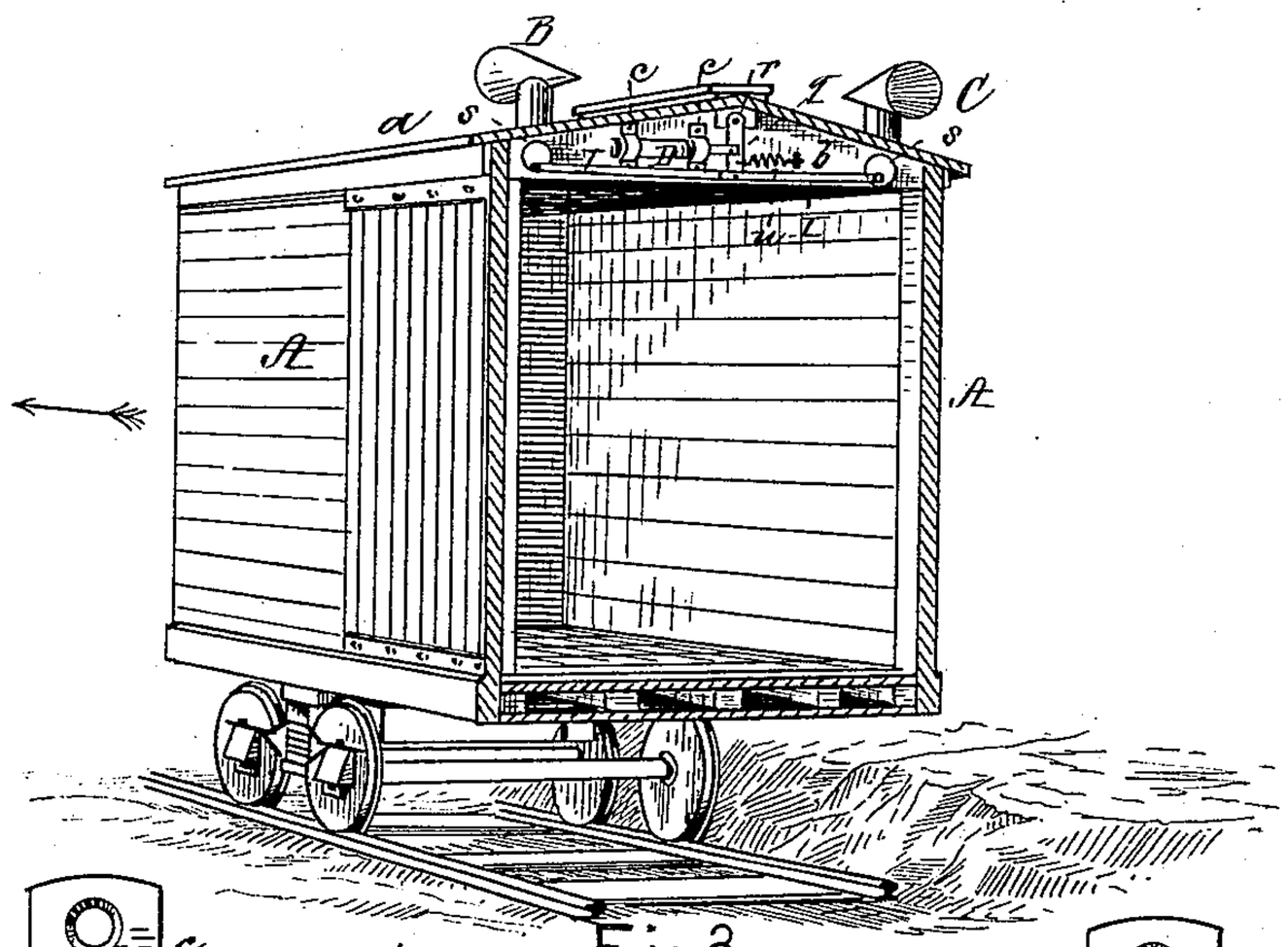

Fig. 3.

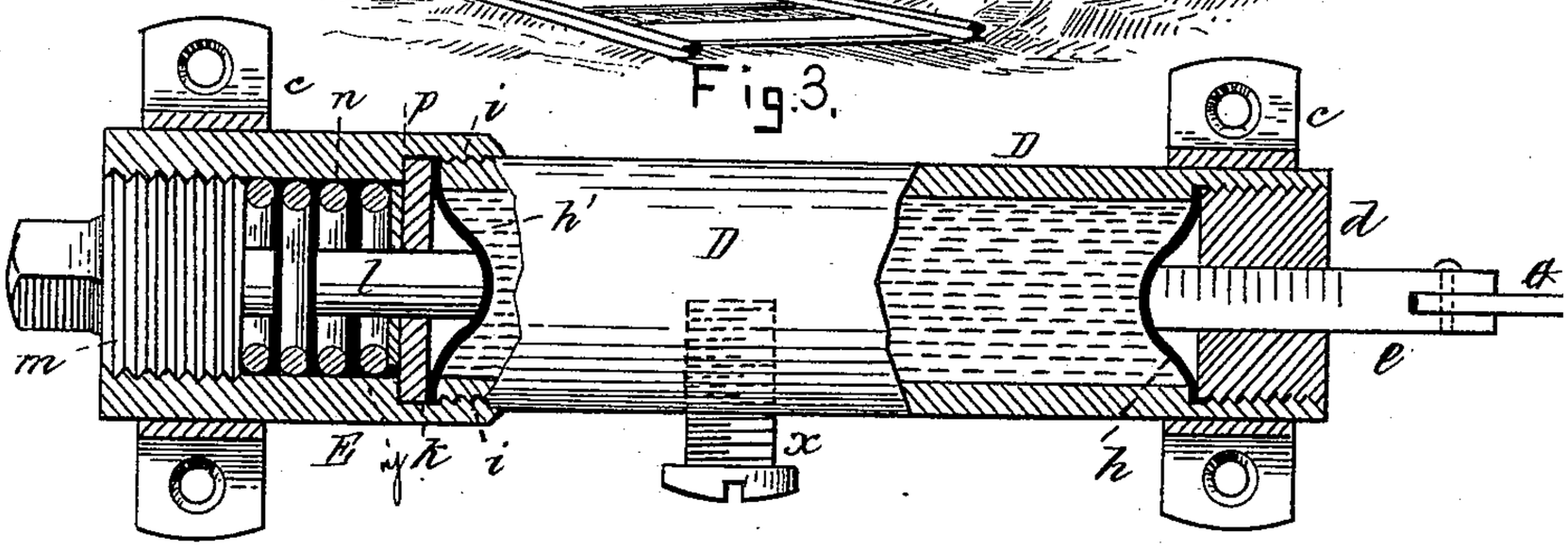

Fig. 4.

Witnesses:
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Inventor,
William E. Eastman,
per Norman W. Stearns,
his Atty

(No Model.) 2 Sheets—Sheet 2.

W. E. EASTMAN.

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Fig. 5.

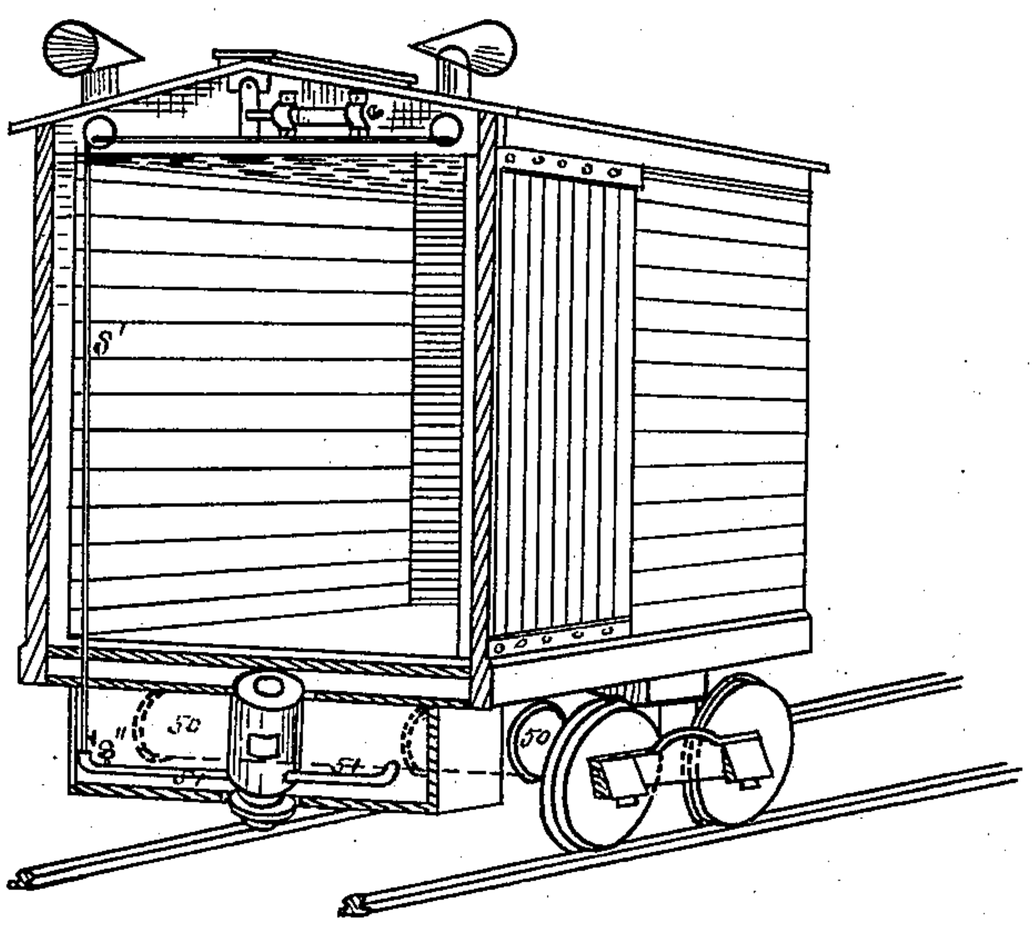
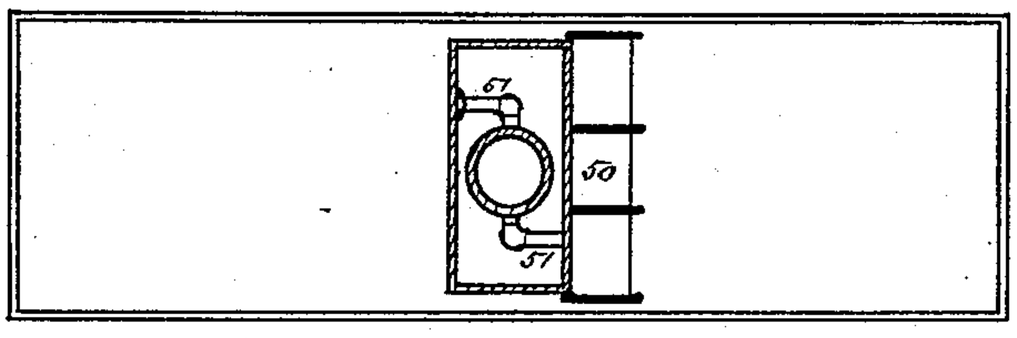


Fig. 6.



WITNESSES.

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UNITED STATES PATENT OFFICE.

WILLIAM E. EASTMAN, OF BOSTON, MASSACHUSETTS.

CAR-VENTILATOR.

SPECIFICATION forming part of Letters Patent No. 326,411, dated September 15, 1885.

Application filed May 7, 1884. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. EASTMAN, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Car-Ventilators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of the same, in which—

Figure 1 represents the roof of a freight-car having two ventilators located transversely opposite each other and with my automatic means applied thereto for controlling the dampers thereof. Fig. 2 is a plan looking down the ventilators and representing the mechanism which connects its dampers with my automatic means of governing the same. Fig. 3 is a perspective view of the interior of the said car with my improvements applied thereto. Fig. 4 is an enlarged sectional elevation representing the interior of the prominent portion of my damper-actuating mechanism. Fig. 5 is a perspective view of the interior of a car, showing an oil-stove located thereunder and a connection extending between a ventilator-damper and the stop-cock which regulates the feed of the liquid fuel from the oil-tank to the stove. Fig. 6 is a sectional plan representing the oil-tank and the oil-stove, the latter inclosed within a box.

In the transportation by rail of fruit, vegetables, and general produce—such as apples, potatoes, &c.—it is desirable to maintain an even temperature within the car containing them, and in cold weather said temperature must be kept above a certain point to prevent the freezing of their contents. Cars of this class have been provided with an ordinary stove located therein above the floor; but this means of heating was objectionable, for the reason that the heat was not evenly distributed, the produce near the stove being unduly heated, while that remote therefrom was frequently frozen; and, furthermore, said stove required the constant care of an attendant. The endeavor to overcome the aforesaid objections became a subject of much interest, and resulted in numerous experiments. By the application of my previous inventions, set forth in Letters Patent of the United States Nos. 253,521 and 269,189, I have succeeded in providing reliable means for securing the desired object, said means consisting in the location of an oil-heater under the floor of a car of this class provided with suitable flues, the flow of the oil, and consequently the condition of the fire, being regulated by an automatic valve-actuating governor constructed of two kinds of metal susceptible of different degrees of expansion and contraction, and located in the heater-box. The application of my aforesaid inventions produces very good results; and to still further improve and perfect the means of maintaining a uniform predetermined temperature within said cars is the purpose of my present invention, which consists in an automatic governor located in or on the car and connected with the damper of one or more ventilators projecting from the floor, side, or, preferably, the roof of the car; and one prominent feature of this invention consists in a quantity of mercury or spirits located within a suitable receptacle, in combination with and for actuating a connection interposed between it and the damper of a ventilator of a car, the expansion of the mercury or spirits, caused by the increase of heat above a determined temperature within the car, causing the damper of a ventilator to commence to open the inlet-passage for the admission of the outside air, and to open the exhaust-passage for the heat within the car to flow out therefrom until the temperature is reduced to the lowest point desired, when the contraction of the contents of the receptacle produced by the reduction of the temperature will gradually cause the passages to close, the said governor being nicely adjusted and endowed with the ability to commence to open or to commence to close the ventilator-passages when the desired maximum and minimum temperatures have been reached within the car.

To enable others skilled in the art to understand and apply my invention, I will proceed to describe the manner in which I have carried it out.

In the said drawings, A represents a produce-car; *a*, its roof; *b*, a transverse beam for supporting the same at or near its center, the said car belonging to that class provided with suitable heating apparatus and circulating-flues—not here shown, but fully described

and illustrated in Patents of the United States Nos. 253,251 and 269,189, granted me in the year 1882, and No. 308,955 in 1884.

B C are two ventilators leading from the interior of the car through its roof at points transversely opposite its center. When the car is moving in the direction of the arrow, Fig. 3, B is the inlet-ventilator for the supply to the interior of air from the outside, and C is the outlet-ventilator for exhausting the impure and overheated air from the inside.

D is a strong metallic cylindrical receptacle for the reception of a quantity of mercury, the said cylinder being supported in bearings *c*, secured to the side of the roof-beam *b*.

d is a screw-plug fitted into and forming a head for the end of the cylinder D nearest the center of the car, said head having a centrally-located circular aperture extending through it for the reception of the inner end of a short cylindrical piston, *e*, which abuts against a flexible diaphragm, *h*, having its periphery securely clamped between the head and the contiguous end of the cylinder D. The exterior of the opposite end of the cylinder D is provided with a screw-thread, *i*, over which is turned the inner end of a short auxiliary cylinder, E, a circular plate, *k*, being securely clamped between them and forming this head of the cylinder D, as also the inner head of the auxiliary cylinder E, the said head also having a circular aperture at its center for the reception of the inner end of a short cylindrical piston, *l*, projecting from the inside of a screw-plug, *m*, fitted into and forming the head of the outer end of the auxiliary cylinder E, a chamber or space, *y*, between the plug *m* and the plate *k* being formed of a size sufficient to accommodate the piston *l* and its surrounding spring *n*. The inner end of the piston *l* bears against a flexible diaphragm, *h'*, (similar to *h*,) having its periphery secured between the plate *k* and the contiguous end of the cylinder D, the employment of the two diaphragms *h h'* being necessary to insure tight joints. The piston *l* is surrounded by a stiff spiral spring, *n*, the inner end of which bears on a circular flange, *p*, of the said piston, the outer end of the spring bearing on the inner side of the plug or head *m* of the cylinder E, the pressure of the spring on said flange insuring its being squarely and firmly seated on the outer surface of the plate *k* until overcome by a greater pressure exerted outward by the mercury within the cylinder D when the diaphragm *h'* forces the piston *l* outward, which carries the flange *p* away from its seat against the resistance of the spring, for a purpose presently to be explained.

To the outer end of the piston *e* is pivoted one end of a short arm, G, the other end of which is pivoted at *g*, Figs. 1 and 3, to a lever, H, pivoted at *r* to the roof-beam *b* at or near the under side of the roof, the lever extending downward and having pivoted at its lower end the inner ends of a pair of horizontal rods or other connections, I I, the outer ends of which are secured to crank-wheels *s s* on the ends of the spindles *t t* of the dampers *b' c'* of the passages K K of the ventilators, said passages being represented in Figs. 1 and 2 as open one-half way, in which position they are held by a spiral spring, *u*, connected with the lever, which is vertical in this its normal position.

The mean between the desired maximum and minimum temperatures of the air within the car keeps the dampers and their connections in the positions represented in Figs. 1 and 2; but as the temperature rises the mercury expands and forces outward the piston *e*, when the lever H is inclined to the right of the vertical and the dampers commence to rotate in the direction of the arrows, and when they have reached a vertical position the ventilator-passages are both open, whereby air from the outside is admitted through the inlet, and the heat from the inside drawn out by the partial vacuum through the outlet-passage, thus reducing the temperature; when, immediately before reaching the minimum, the dampers are gradually rotated back beyond their previous inclined position into a horizontal position, being arrested by stops *v v*, either located in the ventilator-passages or by stops *w w* on each side of the lever H, thus preventing any further rotation of the dampers in this direction. After the temperature within the car has reached the maximum degree desired, an increase of heat (with the dampers at a dead-stop) will cause the mercury to continue to expand and press the diaphragm *h'* so forcibly against the inner end of the piston *l* as to carry it outward and remove the flange *p* from its seat *k*, against the lesser resistance of the spring *n*, thus relieving the receptacle of the increased pressure, and preventing the bursting thereof, the auxiliary cylinder E, its flanged piston *l*, and the spring surrounding the latter together constituting and performing the office of a safety-valve. When the mercury commences to contract by the fall of a temperature higher than 70°, the flange *p* will commence to approach and gradually return to its seat. When the temperature reaches the mean desired, the parts are in equilibrium. On falling below the mean temperature the spring *u* is free to assert itself, and, through the connections hereinbefore described, presses the piston *l* farther into the receptacle D against the elastic diaphragm *h'*, the latter pressing against the contracting volume of mercury and forcing the other piston, *e*, farther outward from its previous position in the inner end of the said receptacle D, whereby the lever H is gradually vibrated into an inclined position to the left of the vertical, and rotating the dampers in a contrary direction, and closing the ventilator-passages, to enable the temperature within the car to be restored to the higher mean or maximum degree desired.

The safety-valve herein described, besides allowing of the expansion of the mercury

when the dampers are closed and the temperature inside the car is increasing beyond 70° or other fixed maximum, is also necessary for the relief of the receptacle D when the temperature outside the car in hot weather is rising above 70°.

By an extremely simple operation I am enabled to maintain a uniform predetermined degree of temperature within the car. I prefer to keep the temperature of the heated air not higher than 70° nor lower than 60° Fahrenheit, as a difference of 10° between the maximum and minimum at such high temperature is not injurious to the class of produce to be transported.

Passing snugly through the side of the receptacle D is a screw, *x*, which I turn in sufficiently to insure the opening of the passages of the ventilators at a temperature of 70°, and also insures the closing of the same at 60° within the car. This means of governing the inside temperature I have discovered by experiment. After being adjusted as described, the still further turning in of the screw *x* diminishes the capacity of the receptacle and causes the mercury to open the ventilator-passages at a higher temperature than 60°. The turning outward of said screw beyond said adjusted position increases the capacity of the receptacle, and the mercury occupying the enlarged area formed thereby will not commence to open the ventilating-passages until the temperature in the car falls below 60°.

It is evident that my invention is adapted for application to all cars, whether heated by the apparatus described in the aforesaid patents granted me or by any other means which may be found practical and desirable.

My aforesaid automatic governor may also be located in any car not provided with a heating apparatus; but when applied to a car having an ordinary stove the ventilating-damper may be connected by a rod with the damper which controls the draft of the stove-fire; or the ventilator-damper may be connected by a rod, *s'*, with the cock *s''*, which controls the feed of the liquid fuel of an oil-heater constructed in accordance with a portion of my previous inventions set forth in Patents Nos. 253,251, 269,189, and 308,955, (see Fig. 5,) 50 being the oil-tank, and 51 the supply-pipe leading from its bottom to the bottom of the rod *s'*, where the cock *s''* is located, the contraction of mercury due to a decrease of temperature below the desired point causing the supply-cock *s''* to further open the feed-passage to the heater, and the expansion of mercury due to the increase of temperature above the determined point causing the cock to shut off the liquid flow and thereby reduce the intensity of the fire.

I have herein referred to the application of the expansion and contraction of mercury for operating the dampers of the ventilators of produce-cars, &c.; but the same invention may, without change of construction, be applied to passenger-cars. The expansive and contractive properties of spirits may be utilized for operating the dampers of car-ventilators, and two different metals having different capacities of expansion and contraction may be located in or on the car and be connected with the said dampers for opening and closing the same.

Instead of two rods or connections, *i*, one only may be substituted therefor; but I prefer two independent rods, as less friction arises from their movement than would be the case with but one.

The pistons *e l* and damper-spindles *t t*, with their bearings, should be made of non-corrosive metal, to preclude the possibility of the formation of rust, which might interfere with the proper working of the parts.

My improved governor may be employed with a single ventilator having a single passage only, controlled by a single damper, in which case the ventilator should be provided with an adjustable flaring mouth-piece; or the single ventilator may have an inlet and an outlet passage, each controlled by a separate damper; or my governor may be used in connection with the dampers of two or more separately-located ventilators.

I claim—

1. The auxiliary cylinder E and receptacle D, connected with each other and with a space intervening between them, in combination with a flanged piston, *l*, and spiral spring *n*, both located within said space, a piston, *e*, and diaphragms *h h'*, for the mercury or spirits to act on in pressing the pistons outwardly, for the purpose set forth.

2. The diaphragms *h h'*, located in and near the ends of the receptacle D, in combination with the pistons *e l*, the liquid interposed between them for actuating the pistons outwardly, and the spring *n*, for pressing the piston *l* inwardly, said piston *e* being connected with and operating the damper-actuating mechanism, as specified.

3. The screw *x*, in combination with the receptacle D, for increasing and reducing the capacity of the same, and by which, through suitable connections with a ventilator-damper, the action of the liquid within the receptacle is so controlled and regulated as to commence to open and to commence to close a ventilator-passage at the desired predetermined temperatures to be maintained within the car, for the purpose specified.

Witness my hand this 3d day of May, 1884.

WILLIAM E. EASTMAN.

In presence of—
N. W. STEARNS,
JAS. W. CHAPMAN.