

(No Model.)

3 Sheets—Sheet 1.

# D. GROESBECK. VENTILATOR.

No. 290,041.

Patented Dec. 11, 1883.

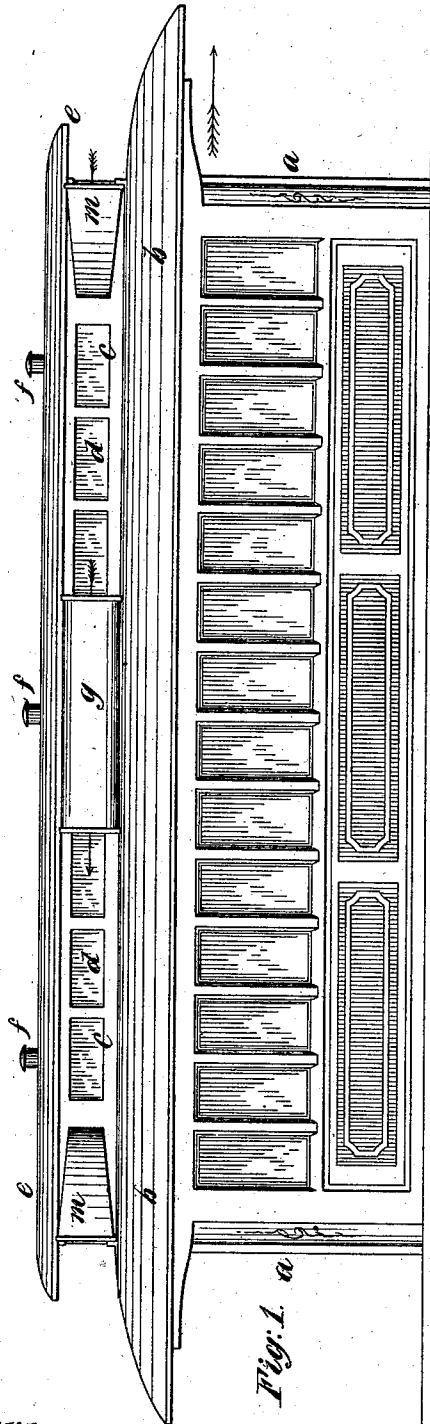


Fig. 1. a.

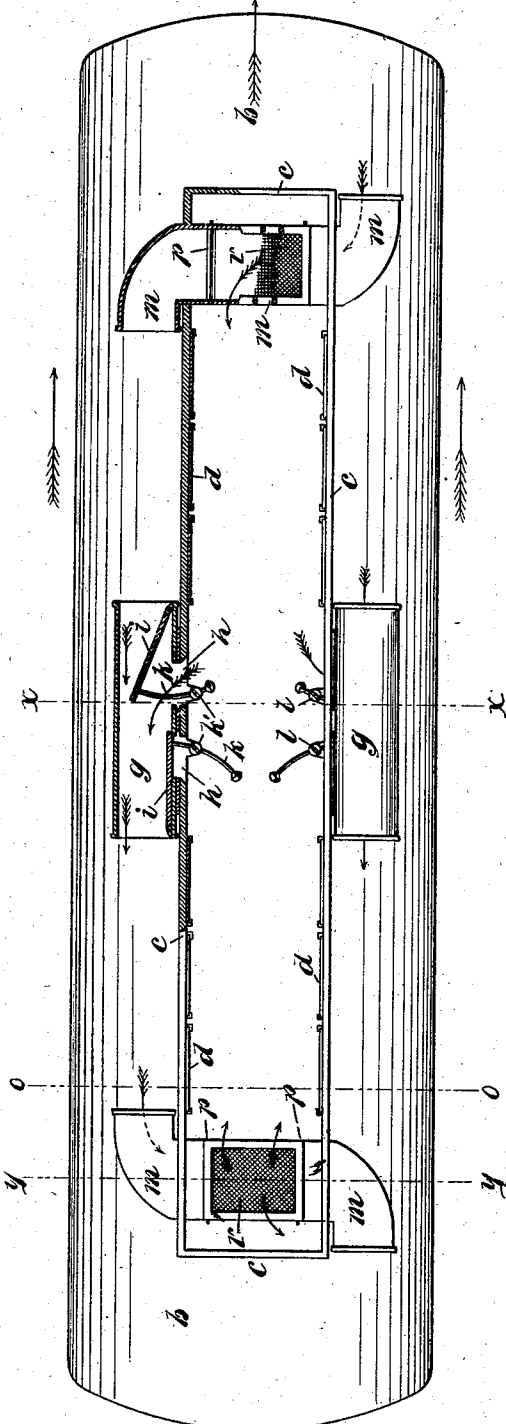


Fig. 2.

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3 Sheets—Sheet 2.

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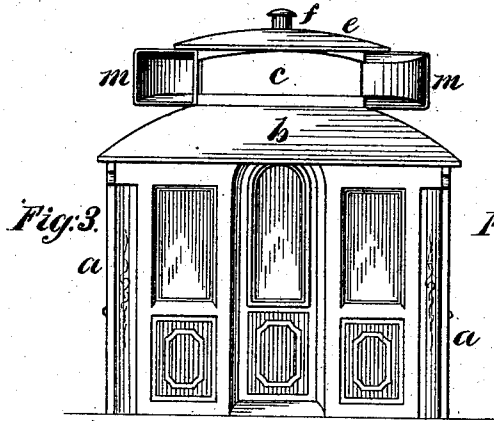


Fig. 3.

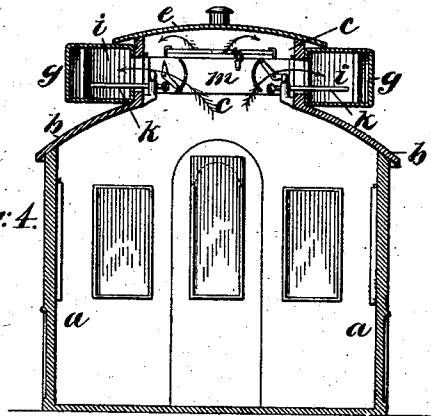


Fig. 4.

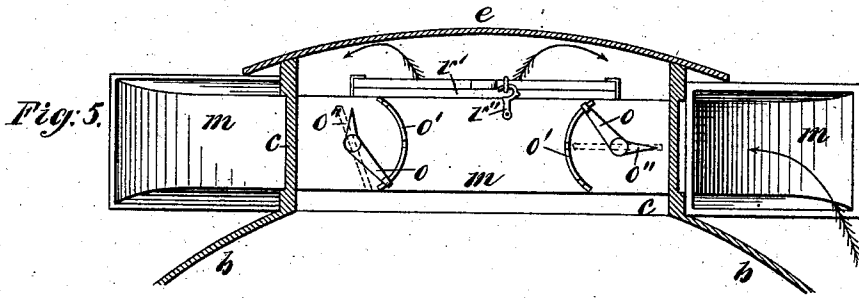


Fig. 5.

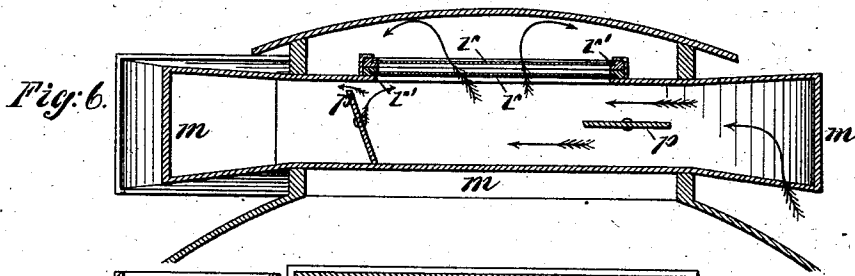


Fig. 6.

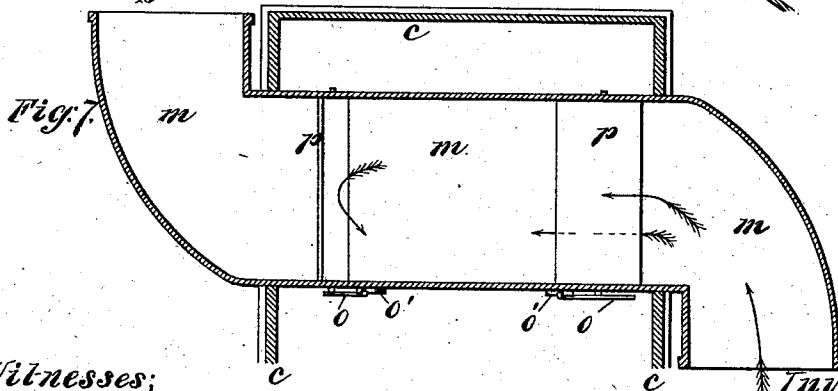


Fig. 7.

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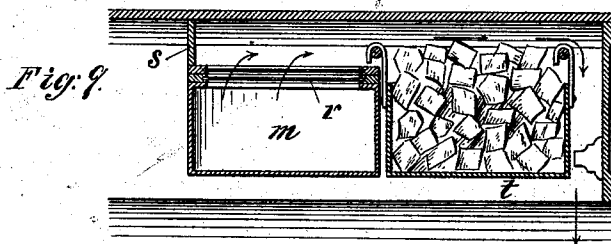
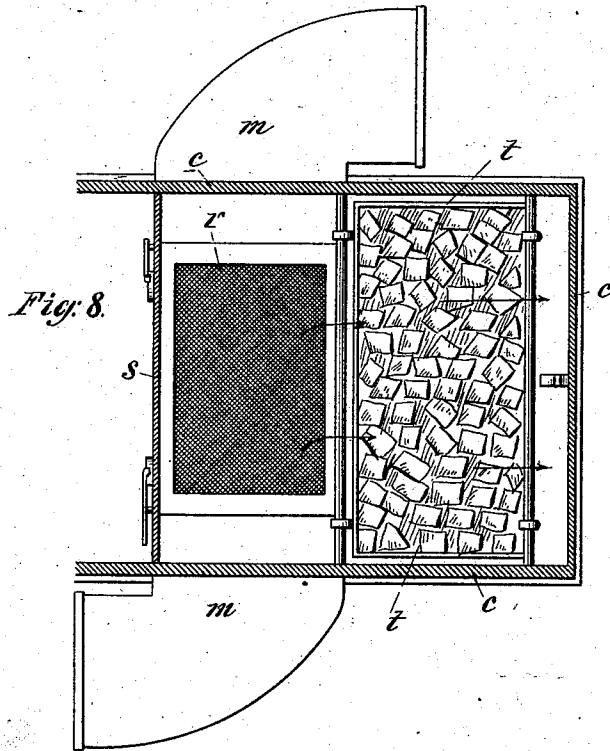
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3 Sheets—Sheet 3.

D. GROESBECK.  
VENTILATOR.

No. 290,041.

Patented Dec. 11, 1883.



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# UNITED STATES PATENT OFFICE.

DAVID GROESBECK, OF NEW YORK, N. Y.

## VENTILATOR.

SPECIFICATION forming part of Letters Patent No. 290,041, dated December 11, 1883.

Application filed October 5, 1881. (No model.)

*To all whom it may concern:*

Be it known that I, DAVID GROESBECK, of New York city, county and State of New York, have invented certain new and useful Improvements in Ventilators, of which the following is a specification.

My invention is more especially intended for the ventilation of structures which are moved rapidly through the air—such as railway-cars, steamboats, ships, or other vessels—but it may be also adapted for the ventilation of buildings or other stationary structures without departing from the principle of my invention. As my invention is, however, especially designed for the ventilation of railway-cars, for which it possesses special and important advantages, it will be described and illustrated with particular reference thereto, its general adaptation to other structures being readily understood.

My present improvement belongs to that class of ventilators in which an external wind or air current is conducted through a shaft or passage, in which is arranged an inclined deflecting partition or valve, to concentrate the current into an intense blast, which blast is directed across or lateral to an aperture leading from the apartment to be ventilated, so that the inductive action of this blast, usually termed the "inducing-current," causes the air to be sucked or withdrawn through said aperture from the apartment, and to pass off with the inducing-blast, while fresh air will enter the apartment through any free apertures, to supply the place of that removed, thus establishing a circulation of air which gives the needed ventilation. Such an apparatus is shown in the patent previously issued to me under date of September 21, 1880, No. 232,488, on which my present invention is an important improvement.

In my former apparatus the inducing shaft or passage was arranged centrally on the top of the windowed portion of the car-roof, which is termed the "monitor-deck," and but one such shaft or inducer was used, while an air-diffusing inlet was placed in each end of the car, to admit and diffuse the fresh air which was drawn into the car by the action of the inducer. These inlets or diffusers were, however, entirely passive in character, and had no positive action of themselves to enforce the air.

Now, in my present improvement I employ two inducers, which are placed on each side of the monitor-deck at the middle of the car-roof, without protruding above the extreme top of the car-roof, whereby important practical advantages are obtained, and a much more voluminous and efficient ventilation is effected. Furthermore, the air-diffusing inlets are placed at each end of the car; but they extend laterally across the same, and have open trumpet-shaped mouths at opposite ends, which are turned in opposite directions, so that one end always opens in the direction in which the car travels, and thereby assists in positively forcing the fresh air into the car.

My present invention therefore consists, partly, in the main feature here outlined and partly in the detailed construction and arrangement of the inducers and their deflecting-valves, and also in the detailed construction of the air-inlets with their dampers and screens, whereby the apparatus is adapted to meet every condition arising in the practical operation of cars, so as to admit more or less ventilation, as circumstances demand, exclude dust and cinders, or rain or snow, or be adjusted to whichever direction the car travels, and to whatever speed at which it may be run, to which ends the invention embodies a number of novel features, as hereinafter fully set forth.

In the annexed drawings, Figure 1 gives a side elevation of a car-body furnished with my improved ventilating apparatus. Fig. 2 is a plan view thereof with the roof of the monitor-deck removed, and a portion of the deck and parts of the ventilating apparatus shown in section. Fig. 3 is an end elevation of the car; and Fig. 4, a central cross-section on line *x x* of Fig. 2, looking in the direction of the arrow. Fig. 5 is an enlarged cross-section through the roof of the car in front of the rear inlet or diffuser, on the line *o o* of Fig. 2, looking to the left end or rear of the car. Fig. 6 is a cross-section on line *y y* through this air-diffuser, viewed in the same direction. Fig. 7 is a sectional plan of this part on the same scale.

In the drawings, *a a* indicate the body of the car, which is presumed to be of the usual construction, and may be of any of the usual dimensions; but for the purpose of a proper relative proportion of parts, which I shall hereinafter specify, I will here assume that the

internal dimensions of the car are forty-four feet long, seven and one-half feet high, and eight feet wide, which is a common size for large passenger-coaches.

5 *bb* indicate the main roof of the car, and *c* the monitor-deck, which rises from the middle of the main roof, and extends from end to end, being provided on its sides with the usual ventilating and illuminating windows, *d d*.

10 *e* indicates the roof of this windowed deck, which forms the extreme top of the car, and from which the lamp-funnels *f f* project, as usual.

15 Now, *g g* indicate two elongated box-shaped shafts or passages, affixed one on either side of the windowed deck *c* and at the middle thereof, and disposed in horizontal position parallel with the length of the car, and open from end to end. These boxes form the educting shafts or trunks before referred to, and for simplicity I prefer to term them "air-pumps" or "eductors," as they act in effect as air-pumps to withdraw or educt the air from the car by the inducing action of the rapid current of air which passes through them when the car is in motion. These eductors *g g*, in a car of the dimensions named, are preferably eight feet long, twelve inches high, and fifteen inches wide, and are preferably made of sheet metal, and each is so affixed on opposite sides of the windowed deck as to cover and appropriate two of its windows, which will open into the sides of the eductors, as shown at *h h* in Figs. 2 and 4.

35 Now, in each open end of the eductors and at the inner corners thereof is hinged or pivoted a valve or deflector, *i*, the free ends of which valves extend inwardly and approach each other at the middle of the eductor, and each valve overlies one of the openings or windows *h*, so that by swinging out these valves they will uncover these windows, and at the same time assume an inclined position across the eductor in advance of these windows; and, on the other hand, by swinging in these valves they may be placed parallel with the inside of the eductor, so as to closely cover the windows and leave the passage of the eductor unobstructed. The valves are thus operated by a curved bar, *k*, having a knob at the end, which bar slides through a binding-post, *k'*, and may be held at any desired position by a clamp-screw, *l*, so that either valve may hence be adjusted to any position in the eductor, either in its perfectly parallel and inactive position or at its greatest or maximum inclination, as shown in Fig. 2. The valves *i* are of course a close fit for the passage of the eductor in its vertical direction, and are about thirty inches long, and when the valve is adjusted to its maximum position, as in Figs. 1 and 2, its free edge is thrown out to the distance of one foot across the eductor, leaving a free space between this edge and the opposite side of the eductor, measuring three inches wide and twelve inches high, or a quarter of a square foot. Now, pre-

suming that the car is to travel to the right in Figs. 1 and 2, as indicated by the arrows, the valves on the rear end of the eductors are of course closed, while those on the front ends are opened or inclined outwardly, as shown best in Fig. 2.

70 It will now be readily understood that as the car moves through the air a column of air will enter the mouth of the eductor, and this column, by reason of the inclined position of the valve, will be concentrated into a strong blast in the narrow space past the edge of the valve, and thence, rushing energetically through the rear end of the eductor, will discharge or educt the air therefrom, thus tending to produce a partial vacuum therein, which will be constantly supplied by air drawn from the interior of the car through the windows *h*; hence the inducing action of the primary current from the front end of the eductor, passing energetically through the outer and rear portion of the passage, causes a secondary current to be drawn or educted from the interior of the car on the well-known principle of induced currents, thus removing the vitiated air from the car, which will thence be supplied by fresh air entering at suitable openings, thus establishing the desired ventilation. Now, to admit this fresh air, I prefer to provide openings or inlets of special construction, which are indicated by *m m* in Figs. 1 and 2, and are placed in each end of the monitor-deck. These parts I term "diffusers," as they act to admit and diffuse the fresh air into the car, and, in contradistinction from the eductors *g g*, they may be termed "inductors," as they act not merely to passively admit the air, but also serve as an active auxiliary to the eductors *g g*, to positively induct the fresh air into the car to supply the place of the foul air induced or educted therefrom by the eductors. These inductors or diffusers have the form of a hollow trunk or box, preferably rectangular in cross-section, and extend across the monitor-deck within the interior of the car, with each end projecting exteriorly from opposite sides of the deck, near the end corners thereof, and turned in the form of elbows in opposite directions outside the car. These inductors have hence proximately the form of an  $\mathcal{S}$ , and are hollow or open from end to end, the mouths or elbows at each end being preferably flaring or trumpet-shaped, one opening toward one end of the car and the other opening toward the opposite end, as shown best in Figs. 1, 2, 3, 5, 6, and 7, so that one end of each inductor at diagonally-opposite corners of the car will always open forwardly, no matter in which direction the car travels.

125 Now, through the upper side of each inductor within the car, and facing the roof of the monitor-deck, is formed a large opening, which is covered with wire-cloth *r r*, or other perforated or screening material, and across the passage of the inductors are pivoted two dampers, *p p*, at points within the car, but toward either end of the inductors or on op-

posite sides of the screened opening  $rr$ , as shown well in Figs. 2, 5, and 6. These dampers have each an operating lever-handle,  $o$ , arranged in convenient position on the exterior of the inductor, as shown in Figs. 2, 4, 5, 6, and 7, so that it may be easily reached and manipulated by the conductor or passenger within the car, and its operating end works over an arc,  $o'$ , fixed onto the side of the inductor, and provided with notches at suitable points, so that the lever may be sprung out of one notch, moved to and sprung into another notch, thereby adjusting and holding the lever and its connected damper at any desired position. The lever has also an index point or arm,  $o''$ , extending parallel with the blade of the damper, to indicate to the operator the exact position which the damper assumes within the inductor. It will hence be seen that either or both of the dampers in each inductor may be closed or opened to any extent, and their positions will be indicated by the means described.

Now, when the car is advancing, and when the eductors are set to educt the vitiated air from the car, as before described, and shown in Fig. 2, the inductors  $mm$  are also set so as to induct and diffuse the fresh air into the car to supply the place of the vitiated air drawn out by the eductors. This is done by fully closing the damper on the rearwardly-turned end of the inductor, and opening the damper on the forwardly-turned end, as shown partly in Fig. 2, and fully in Figs. 5, 6, and 7. It will hence be seen that as the car advances through the air not only will the foul air therein be educted therefrom at the middle, as before described, but in addition to this a column of fresh air will rush into the mouths of the inductors at both ends of the car, and, being stopped in its course through the same by the closed rear dampers, will thence rise through the screens  $rr$ , which will thus exclude all dust, cinders, or other material floating in the air, and this inflowing fresh and filtered air will thence impinge against the roof of the car, and be thence diffused evenly from each end of the car toward the middle, where the vitiated air is drawn out by the eductors, thus effecting a perfect ventilation of the car, for it will be observed that not only may a very large volume of air be circulated through the car by this system, but in a diffuse and even manner without producing any objectionable sensation of draft, which are the two essentials of efficient ventilation.

The screens  $rr$  are preferably fixed on the outermost sides of two overlying frames,  $r'r'$ , thus leaving a space between the two screen-plates, as seen best in Fig. 6, which frames slide into guides or ways on the edges of the opening in the top of the inductors, and are then secured in position by hooks  $r''$ , as fully shown in Figs. 4, 5, and 6. The screens are thus readily removable for cleansing when required, and may be as readily replaced. It may be also noted that by this construction a

free-air space exists between the two screens, rendering the passage of the inflowing air-current through the screen easy and unobstructed, which is not the case where sponges are used between two screen-plates, as heretofore, yet the two screen-plates effectually arrest particles of dust or other solid matter, for such particles in passing through the first screen will have their velocity so diminished as to fail to pass through the second screen.

It may be noted on reference particularly to Fig. 6 that the construction of the dampers  $p$  of the inductors is such that when either damper is closed to its utmost it assumes a slightly-inclined position, and a space is left between its upper edge and the top side of the inductor. Consequently when the intrushing stream of air enters the open end of the inductor and flows into the body thereof it will first strike the inclined damper  $p$  and be thence deflected up toward the screens  $rr$ , through which the main portion will flow freely into the car, while a portion will pass through the free space over the edge of the closed damper, and thence escape through the backwardly-turned end of the inductor. It will be therefore seen that any dust or cinders entering the inductor with the inflowing air-current may for a time reverberate in the corner between the inclined damper and the screen, but will be eventually and surely carried out by that portion of the air-current which passes through the free space over the edge of the damper, and will be thence discharged through the rearwardly-turned end of the inductor, thus ejecting the dust through the rear end of the inductor without its having a chance to pass through the screens into the car, and thereby producing a most important self-cleansing action, which prevents either the accumulation of dust in the inductor or its entrance to any objectionable extent into the car.

It will be seen that the apparatus is duplex, or is duplicated on each side and on each end of the car, this being preferable, although not essential, as it insures a more voluminous and better diffused ventilation. It can be also seen that the inductors or the eductors might be used separately, although their joint action is much more efficient, and it is obvious that the inductors might also be used as eductors by reversing their position or action.

In lieu of having two eductors on the top of the car, one eductor of twice the capacity might be placed under the floor of the car, at the middle thereof, so as to withdraw the vitiated air out of the bottom of the car, while the inductors or diffusers might remain on the car, as already described and shown. This position of the eductor would, however, be open to some objection in allowing the entrance of noises from the wheels and track; but in smooth-running railways it might be adopted with advantage.

To apply the apparatus to ferry-boats, steam-boats, or steamships, the construction and arrangement of parts will be substantially the

same as that for railway-cars, the eductors and inductors being placed, preferably, on the hurricane-deck, and communicating with the cabins, saloons, engine-rooms, and other apartments of the vessel in practically the same manner as with the interior of the car, and by providing a sufficient number of the eductors and inductors all apartments of the vessel could be conveniently supplied with fresh air.

10 In some cases I prefer to combine with the ventilating apparatus a means for cooling the fresh air as it enters the car, which means is shown in Figs. 8 and 9. In this case the inductors *m* will be placed at a farther distance from the ends of the monitor-deck than is shown in the previous figures, so as to leave a good space between the two, as shown in Figs. 8 and 9. In this space is placed the cooler *t*, which may consist of a simple galvanized iron box of about the same size as the body of the inductor—say six inches deep, twenty-four inches wide, and about sixty inches long—so formed and arranged that it may be safely hung in the position shown, and easily taken down and refilled. This box may be filled with ice, covered by felt or other suitable material, to prevent the water therefrom being discharged by the motion of the car, as will be understood. The space between the inner side of the inductor and the roof of the deck must be closed, as shown at *s*, Figs. 8 and 9, to prevent the entering air from flowing that way, and, on the contrary, compel it to flow over the ice-box, and thence down in the space between the same and the end of the deck, as illustrated by the arrows, so that the fresh air entering through the inductor is thus cooled by flowing over the ice-box, and descends in the ends of the car near the car-door, and thence diffuses itself toward the middle of the car. When the weather is very warm, or when the car is traveling through a very sultry climate, the temperature of the air in the car can by this means be sufficiently reduced to be very agreeable, and in addition to this result the diffusion of the air in the car will be rendered more perfect than otherwise, for the admitted air being always much colder and heavier than that in the car, it will descend to a greater

depth in the car before diffusing itself toward the center than would otherwise be the case, thus obtaining a better distribution of the fresh air in the body of the car, as will be readily understood.

What I claim is—

1. The combination, with a railway-car or similar movable structure, of an air trunk or passage extending transversely through the same, and opening at its middle, or thereabout, into the interior of the car, with its opposite ends placed exterior to the car, and provided with one or more internal deflecting dampers or partitions, substantially as and for the purpose set forth.

2. In a ventilating apparatus, a filtering-screen for covering air-inlets, consisting of two distinct overlying frames fitting closely together around their entire margins, combined with a screening material fastened on the outer sides of the frames, forming an enclosed dust-space between them, substantially as and for the purpose set forth.

3. The combination, with a ventilating-trunk, *m*, to admit air, substantially such as described, of a damper or dampers, *p p*, arranged in said trunk, and so formed that when either is fully closed it presents an inclined plane to the draft, with a free space at the top of the incline, to allow a portion of the inflowing air-current to escape rearwardly without entering the apartment, and thereby carry with it the cinders or dust entering with the air-current, substantially as herein shown and described.

4. The combination, with the air shaft or passage *g*, of the hinged valve *i*, curved operating-bar *k*, and binding-post *k'*, substantially as herein shown and described.

5. The combination, with an air-ventilating trunk or passage, of a pivoted damper movable within the same, and an external operating lever-arm, *o*, with a notched arc, *o'*, to engage the same at different positions, substantially as herein shown and described.

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