

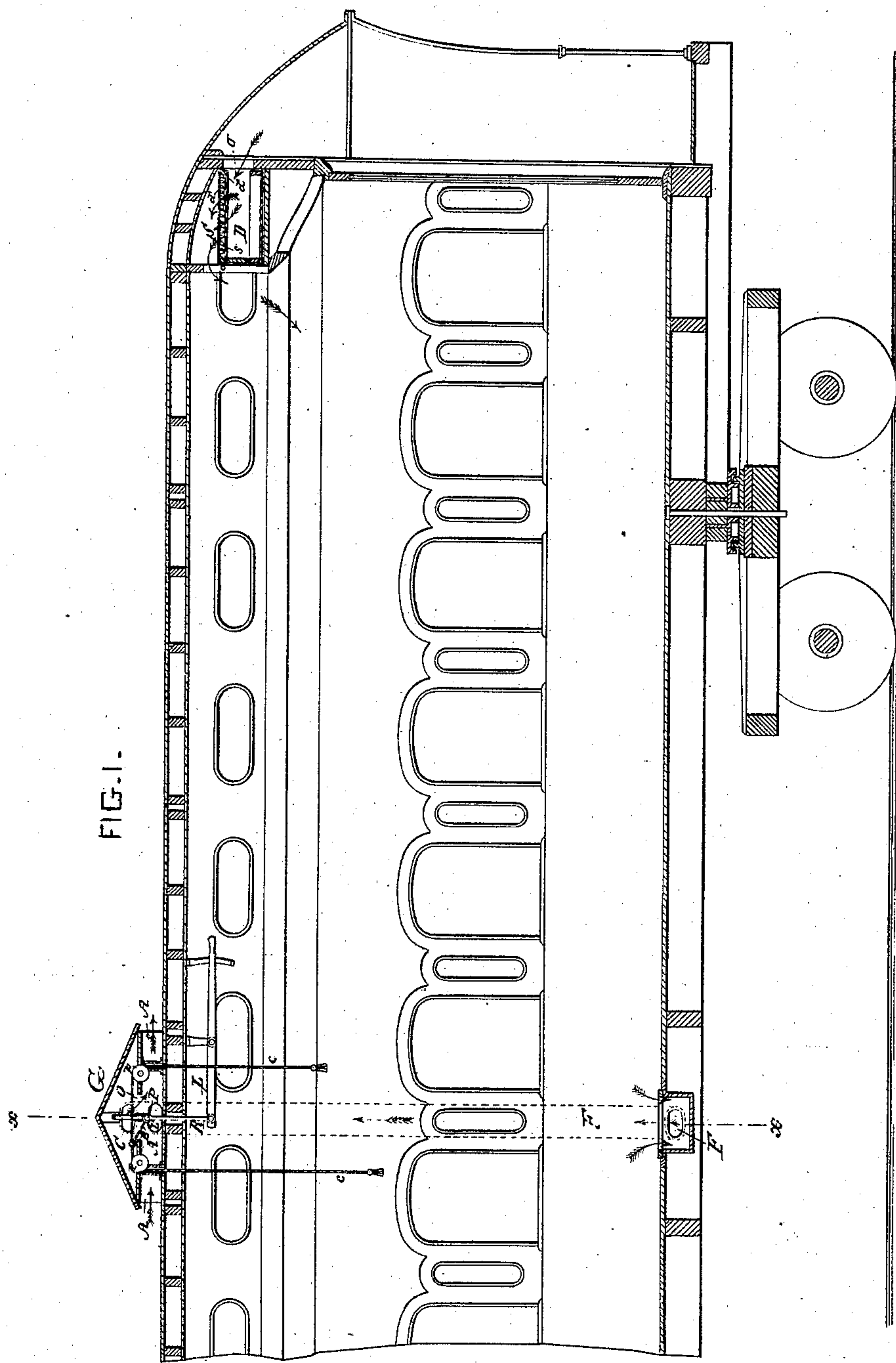
(No Model.)

2 Sheets--Sheet 1.

D. GROESBECK.  
Ventilating Apparatus.

No. 232,488.

Patented Sept. 21, 1880.



WITNESSES:  
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FIG. 2.

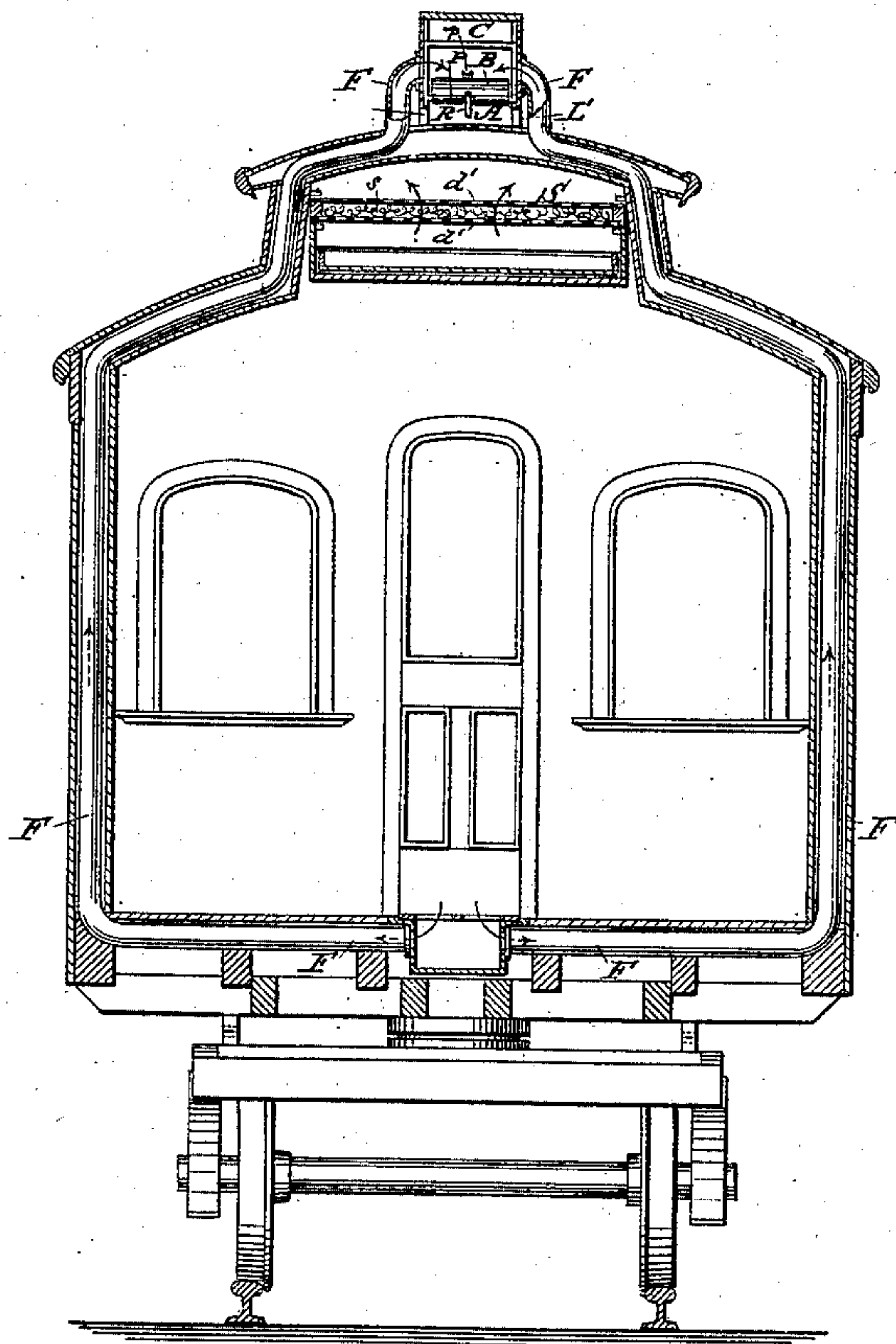
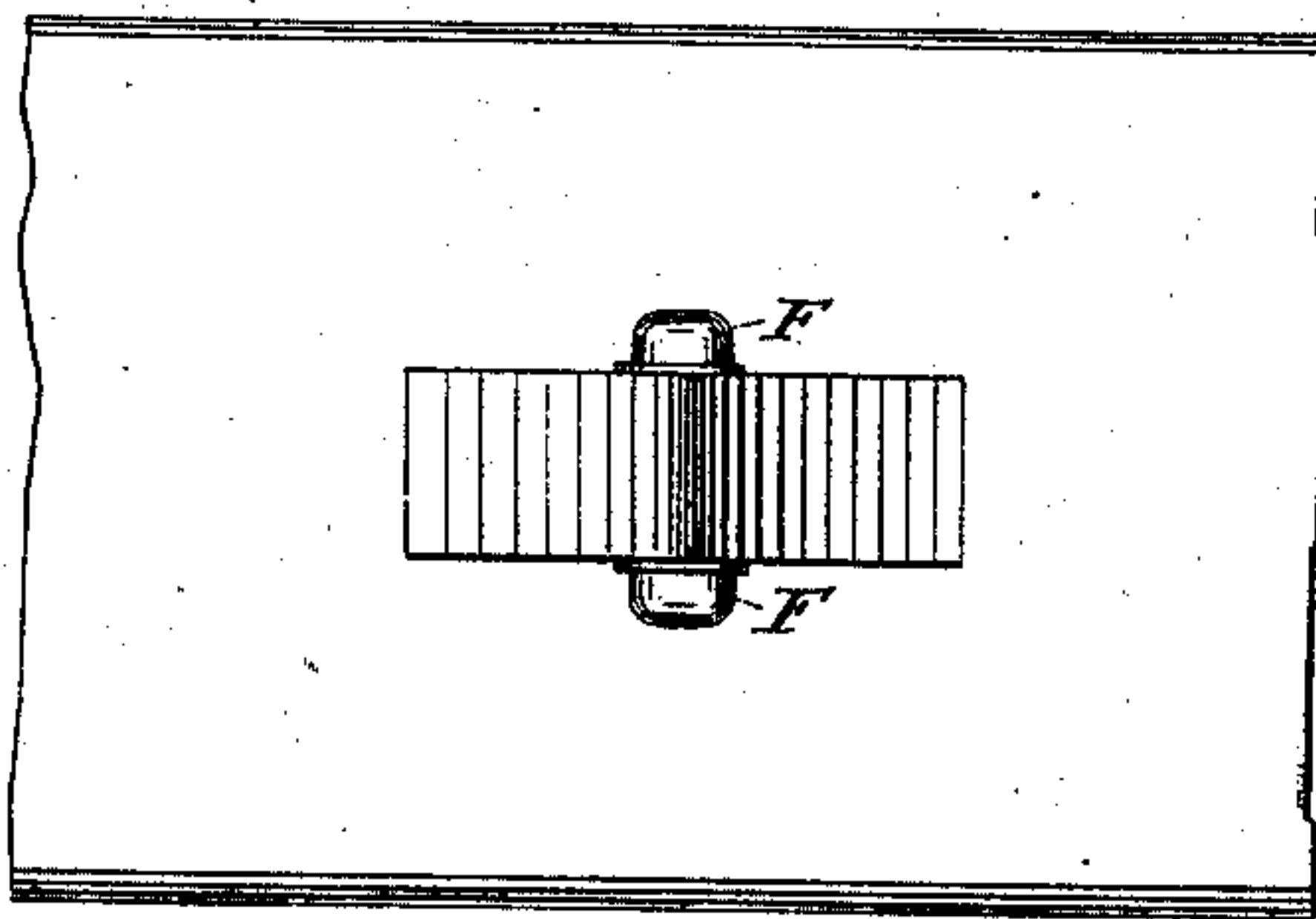


FIG. 3.



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# UNITED STATES PATENT OFFICE.

DAVID GROESBECK, OF NEW YORK, N. Y.

## VENTILATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 232,488, dated September 21, 1880.

Application filed June 10, 1880. (No model.)

*To all whom it may concern:*

Be it known that I, DAVID GROESBECK, of the city, county, and State of New York, have invented certain Improvements in Ventilating Apparatus; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to apparatus for ventilating all kinds of apartments, whether in buildings, railway-cars, or ships. For railway-cars it has, however, very marked advantages; and as a description of it in its application to this branch of ventilation will fully illustrate all its main features, I will principally confine myself to such a description.

The drawings show the invention as applied to a railway-car, Figure 1 being a longitudinal vertical section; Fig. 2, a cross-section on the line  $xx$  in Fig. 1, and Fig. 3 a plan view.

The objects sought and advantages secured by my improvements are the ample supply to confined spaces of fresh pure air, the diffusion of the inflowing volume of air in such manner as to avoid sharp drafts or currents, the perfect removal from the inflowing air of all mechanically-suspended impurities or dust, the perfect adjustability of the apparatus to supply more or less air according to all requirements between a determinate maximum and minimum supply, the exclusion of snow or rain without interrupting the free influx of air, the exclusion to a great extent of the deafening noise of railway-trains, which, finding access through ventilating-openings, is, with many kinds of apparatus, a serious annoyance, and at the same time to provide an apparatus which, on account of its cheapness and effectiveness, is capable of a very wide application to ventilating purposes.

The general principle of circulation adopted in my apparatus is the exhaustion from the inclosed space to be ventilated of the foul air contained therein and the inflow caused by external atmospheric pressure of pure air to take the place of the air so drawn out from said inclosed space.

The nature of my invention, which is devised to carry out this principle in the best possible manner, consists in adjustable devices

which, placed in certain positions relative to the space to be ventilated, exhaust through the action of external winds or currents the aforesaid foul air, and cause air to be forced in by external atmospheric pressure diffused and freed from mechanical impurities.

Referring now to the drawings, A represents a passage open at both ends, through which flows a current of air exterior to the car, which current I shall hereinafter name the "inducing-current." Said passage has, preferably, a greater extent longitudinally than laterally in relation to the car; but the capacity for ventilation possessed by the apparatus will, with any given adjustment, made as hereinafter set forth, depend upon the lateral measurement of said passage and the speed of the car. Midway in the longitudinal extension of said passage is placed an adjustable and reversible deflector, B. Said deflector is made of wood, metal, or other suitable material, in the form of a flat plate having sliding pivots  $p$ , that slide in vertical guideways G, placed at opposite sides of the passage A. The passage A is formed with a rectangular opening,  $o$ , in its upper inclosing-wall, and upon one or the other edge of this opening, toward one or the other end of the car, the unpivoted edge of the deflector B rests when the apparatus is adjusted for operation, as hereinafter described.

Above the passage A, and communicating freely with it through the opening  $o$ , is a chamber or inclosed space, C. Flues or passages F lead from registers placed in the floor of the car to and open into the chamber C, and the course of the foul air in passing from the interior of the car is through said flues F into the chamber C, and thence out of one end or the other of the passage A, according to the adjustment of the deflector B and the direction of the external current relatively to the car, as more particularly hereinafter set forth.

The angular position of the deflector B relative to the direction of the inducing-current through the passage A may be variously adjusted, and I do not confine myself to the particular method shown in the drawings, but a description of this method will be sufficient for the purposes of this specification.

To one or both pivots P of the deflector B is connected one end of a rod, R, which, at its



opposite end, is pivoted to a lever, L. This lever is provided with means to fasten it in any desired position, and through its aid a person within the car may adjust and fasten the deflector B at any angle desired. Such adjustment regulates the flow of air out of the car, as will be described farther on.

The flues or passages are, for car-ventilation, preferably arranged to take their air from the middle part of the car in order that the flow of air in the car may be from the ends toward the middle. As stoves in railway-cars are generally placed at the ends of the car, the arrangement described causes a more uniform distribution of the heated air along and over the floor of the car, thus adding greatly to the comfort of passengers.

The operation of the parts of my invention thus far described is as follows: The deflector B, when raised to a horizontal position, continuous with the top of the passage A, has no action, but when inclined in such manner that its pivoted edge is in the least lower than the top of said chamber it will, when the exterior air-current flows through said passage in such manner as to impinge against the under side of said deflector, deflect downward the current which passes under its pivoted edge. Such current then becomes an inducing-current—that is to say, it produces a reduction of pressure in the chamber C by continuously exhausting air therefrom, and to fill the partial vacuum thus produced air rushes from the car through the pipes or flues F into said chamber, from which it in turn is drawn out and discharged with the inducing-current at that end of the passage A where the said current makes its exit. Air to supply the place of that thus taken from the inside of the car is admitted through diffusers, hereinafter described. That the effect described above may be produced, no matter which end of the car is in the advance when the car is in motion, it is necessary either to have two contrariwise-arranged apparatus (which is objectionable not only on the score of increased cost, but also because the inoperative one would admit snow, rain, and dust) or to render the deflector B reversible. This I accomplish in the following manner; but I do not strictly limit myself to this method, as other methods may be employed: To the unpivoted edge of said deflector I attach cords *c*, which pass in opposite directions over separate pulleys *p*, the free ends of the cords passing downward through sleeves into the interior of the car. Pulling one or other of these cords downward at once reverses the position of the deflector, and the angle of inclination of said deflector after the same has been reversed will be the same for any adjustment of its pivots as before the reversal, but in an opposite direction.

I find the apparatus hereinbefore described works better with side openings, L', one placed in each side of the passage A opposite each other below said deflector and midwise in said

passage. These permit the surplus air which enters the passage A to find ready egress from said passage.

At some other part of the car, or other inclosed space to be ventilated, dependent upon circumstances, I provide an apparatus for admitting, purifying, and diffusing the air necessary to replace the air exhausted from said car or other inclosed space. This apparatus consists in an air-chamber, D, having openings *o*, which freely admit external air, and a peculiarly-constructed slide, S, which forms the cover of said chamber, and which slides in and out in ways or grooves provided for its edges, and formed on the inside of said chamber. The construction of said slide is as follows: First a frame of any suitable material is made, preferably of rectangular form. To both sides of this frame is fastened a diaphragm, *d'*, of perforated or reticulated material, preferably wire-cloth. Between these diaphragms is placed a uniform filling of sponge, *s*, torn or cut into pieces sufficiently small to allow of its even distribution throughout the space between the diaphragms.

For railway-cars I prefer to place a diffuser at or near each end of the car and in the upper part of the car near the roof thereof. The action of these diffusers is, while admitting ample volume of air from the exterior of the car into the interior of the same, to filter out from the inflowing air all mechanical impurities, whether it be dust, drifting snow, or any other substance floating in and carried along by the current, and to so subdivide and diffuse the current and distribute it over large area as to reduce its velocity below that which renders currents of air sensible to the human skin, thus entirely obviating injurious or annoying drafts. The direction of the flow of the intruding air is indicated in the drawings by curved arrows.

To better illustrate the action of the deflector and the effect of adjusting it to different angles of inclination with the top of the passage A, I append the following statements of results as determined by careful and accurate experiments:

For railway-cars four sizes may be employed, in which the dimensions of the passage A for the inducing-current range from forty inches long, twelve inches wide, and five inches high at the ends to seventy-two inches long, thirty-six inches wide, and ten inches high at the ends. The first-named of these sizes has a deflector six inches wide from its pivoted to its opposite edge. The last-named size has a deflector twelve inches wide. The first-named size will, under different adjustments, discharge the following volumes of air: When at a thirty-mile speed the deflector is set at one inch—that is to say, when its pivoted edge is one inch lower than the opposite edge—the apparatus will discharge two hundred and twenty cubic feet per minute; when set at two inches the discharge will be four hundred



and forty cubic feet; when set at three inches, the maximum, the discharge will be six hundred and sixty cubic feet per minute.

The larger size above described will, when  
5 set at one inch, discharge per minute at the same speed, six hundred and sixty cubic feet; at two inches, one thousand three hundred and twenty cubic feet; at three inches, one thousand nine hundred and eighty cubic feet;  
10 at four inches, two thousand six hundred and forty cubic feet; at five inches, three thousand three hundred cubic feet; at six inches, three thousand nine hundred and sixty cubic feet; at seven inches, four thousand six hundred  
15 and twenty cubic feet; at eight inches, five thousand two hundred and eighty cubic feet.

The apparatus will work when the pivoted edge of the deflector is set only at one-fourth of an inch lower than the opposite edge. When  
20 set at this inclination the smaller apparatus above described will discharge at a thirty-mile speed fifty-five cubic feet per minute and the larger one hundred and sixty-five cubic feet per minute. These figures show more  
25 plainly than anything else how perfectly under control the ventilation is brought by the adjustment of the deflector.

The amount discharged in any given position of the deflector will be practically proportional to the speed of the train or the velocity  
30 of the current exterior to the car or inclosed space to be ventilated. The flues or passages F must, of course, be large enough to permit the maximum discharge. For the first above-  
35 described apparatus each of these flues should have an area of cross-section equal to eighteen square inches. For the second, the area of the cross-section of each flue should be one hundred and forty-four square inches.

The area of the diaphragms *d* for admission of air should be about twenty by forty inches for each car, which will give an ample supply under atmospheric pressure for either  
40 of the four sizes. The velocity at which the mass of air in the car will move in a car about fifty feet long, and containing about three thousand cubic feet, when three hundred cubic feet per minute are discharged, is only two and one-half feet per minute from each end toward  
50 the center. It would be double this were the air drawn from one end of the car only, and this reduction of velocity is a further advantage in connecting the flues F with the middle of the bottom of the car.

If we take out three thousand cubic feet per minute the motion of the interior mass will be only twenty-five feet per minute, or about five inches per second; and if we run the discharge  
55 up in hot weather to six thousand feet per minute, with the thermometer standing, as it often does in warm climates, at from 100° to 110° Fahrenheit, we get a velocity of fifty feet per minute, which might under such circumstances be very desirable, and this, by simply  
65 moving the adjusting-lever, may be reduced to any desirable point or instantly cut off.

Now, I am well aware that the flow of an inducing-current of air through a passage in which a reversible deflector is placed has been  
70 applied to the removal of dust from cars prior to my invention; but it was done in a different way from that described by me, and in such manner as to introduce defects into any system of ventilation accomplished by its use. All these faults are avoided by my improve-  
75 ments.

The position of my apparatus for generating the inducing-current is at the top of the car, which arrangement, in great measure, excludes  
80 the noise produced by the trucks.

My diffusers effectually prevent the creation of drafts or the entrance of dust to the interior of the car.

The adjustability of my deflector and placing it under intelligent control instead of  
85 leaving it to the control of a fitful air-current enables me not only to exactly adjust the amount of air admitted to the necessities of each car, and in due relation to external temperature, but also to exclude storm when the  
90 car is standing still.

I am also well aware that sponge has been used to filter air for ventilating purposes; but this, so far as I am aware, has been done in a different manner from that adopted by me in the  
95 following particulars: First, provision for the easy cleaning of the sponge from accumulated impurities therein has not been made; second, the arrangement for obtaining diffusion which I have described was not carried out.  
100

By my arrangement of a slide carrying sponge between perforated or reticulated diaphragms I supply a convenient means for  
105 cleansing the diffuser. The slide is drawn out of its grooves, beaten or washed, as may be needed, or both, and then replaced. The combination of the diffusing-slide with the air-chamber into which the air flows before  
110 passing through the diaphragms and sponge causes the air to pass into the car at a low velocity and in large volume, instead of in sharp, piercing currents.

Having thus described my improvements, what I claim as my invention, and desire to secure by Letters Patent, is as follows:  
115

1. The combination, with an inducing air-current passage and an air-chamber having an opening into said passage and communicating by flues or passages with an inclosed space in a railway-car or steamboat or other apartment  
120 to be ventilated, of an adjustable deflector placed in said passage in relation with said opening and means for adjusting the same within said car, steamboat, or apartment, whereby the quantity of air drawn through  
125 said opening may be regulated as desired, substantially as and for the purposes specified.

2. The combination, with a railway-car or other inclosed space or apartment to be ventilated, of an inducing air-current passage, A,  
130 chamber C, having the opening *o* and deflector B, all placed at the top of the car or



other apartment, a flue or flues or passages leading therefrom down to and communicating with the bottom of the car or apartment, whereby the interior mass of air is caused to  
5 flow from the ends of the car or apartment toward the middle thereof, and means whereby the adjustment and reversal of said deflector may be made by a person inside the car or apartment, substantially as and for the purposes described.  
10

3. In combination with apparatus, arranged substantially as described, for drawing air from the middle part of the bottom of a railway-car, air diffusers and filters placed at or near the ends  
15 and at or near the top of the car, whereby the flow of the mass of air in the car is directed from each end toward the middle of the car for more uniform distribution of heat and reduction of the velocity of the moving mass of  
20 air therein, substantially as specified.

4. In an air-diffuser for ventilation, the air-chamber D and removable slide S, fitted to slide in said chamber and composed of a frame,

perforated or reticulated diaphragms attached to opposite sides of said frame, and sponge 25 packed between said diaphragms, whereby the air is both diffused and filtered in its passage into an apartment, and whereby the said slide may be readily removed for cleaning and replaced after cleaning, substantially as and for 30 the purposes described.

5. The combination, with an air-chamber, C, communicating by flues or passages with an inclosed apartment to be ventilated, and having an opening, o, formed therein, of an in- 35 ducing air-current passage, A, having the adjustable reversible deflector B, arranged in relation with the opening o, and lateral openings L, arranged midwise in said passage and below said deflector, substantially as and for 40 the purpose set forth.

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Witnesses:

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