

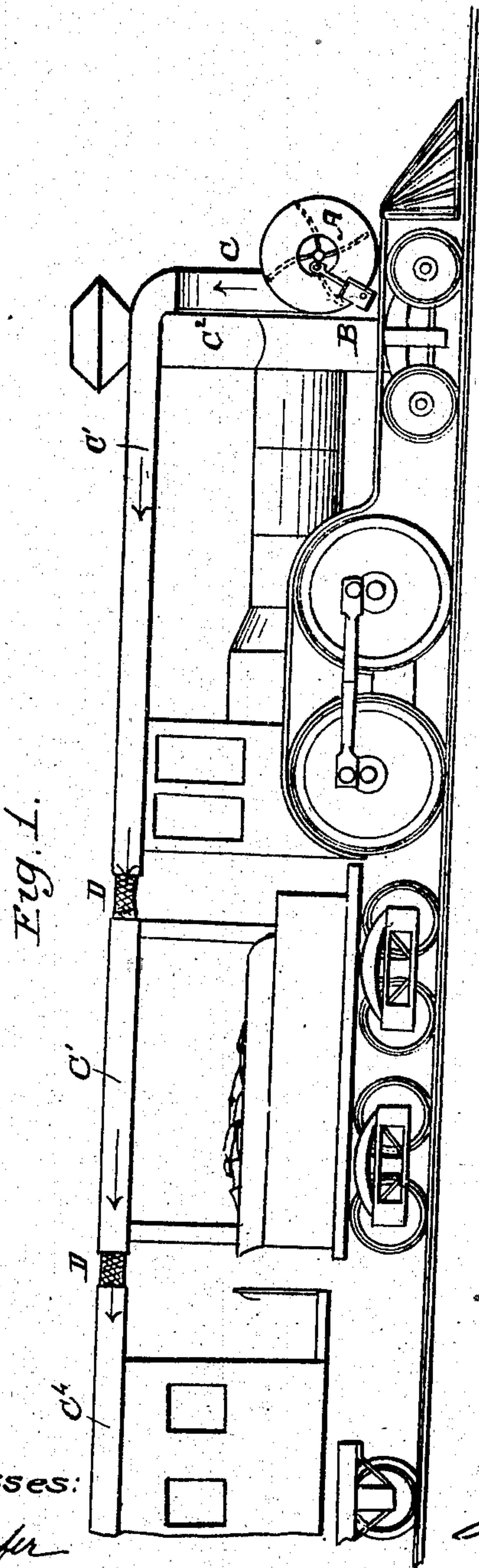
A. J. MARSHALL.

2 Sheets—Sheet 1.

Ventilating and Warming Railroad Cars.

No. 67,894.

Patented Aug. 20, 1867.



Witnesses:  
Edw. A. Ayer  
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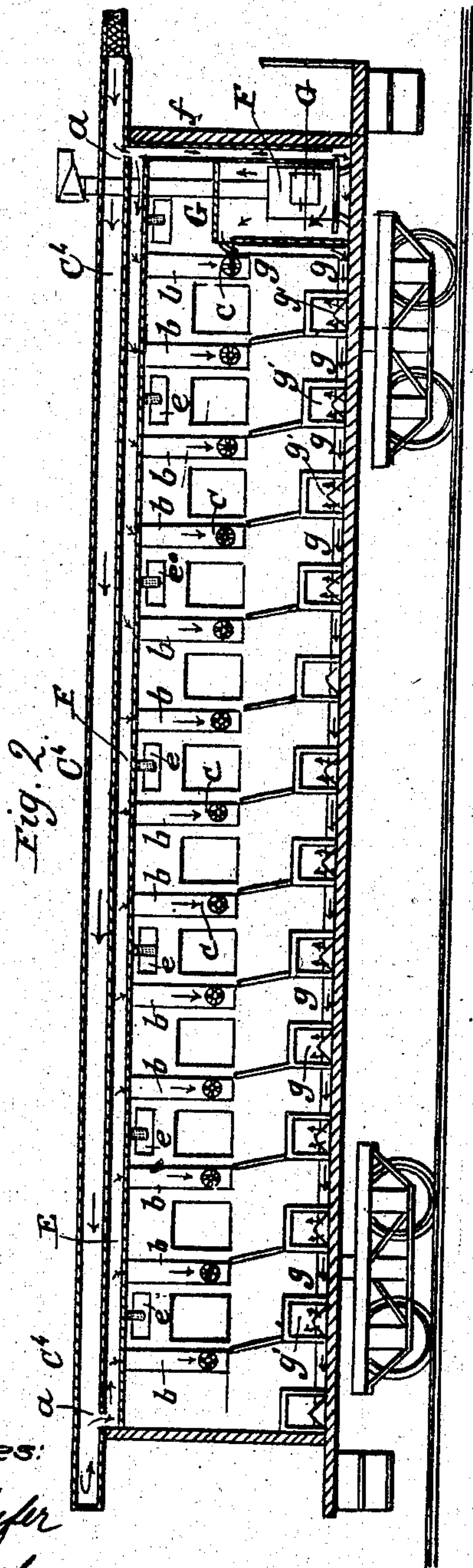
Inventor:  
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Mason L. L. L. L.

**A. J. MARSHALL.**

## Ventilating and Warming Railroad Cars.

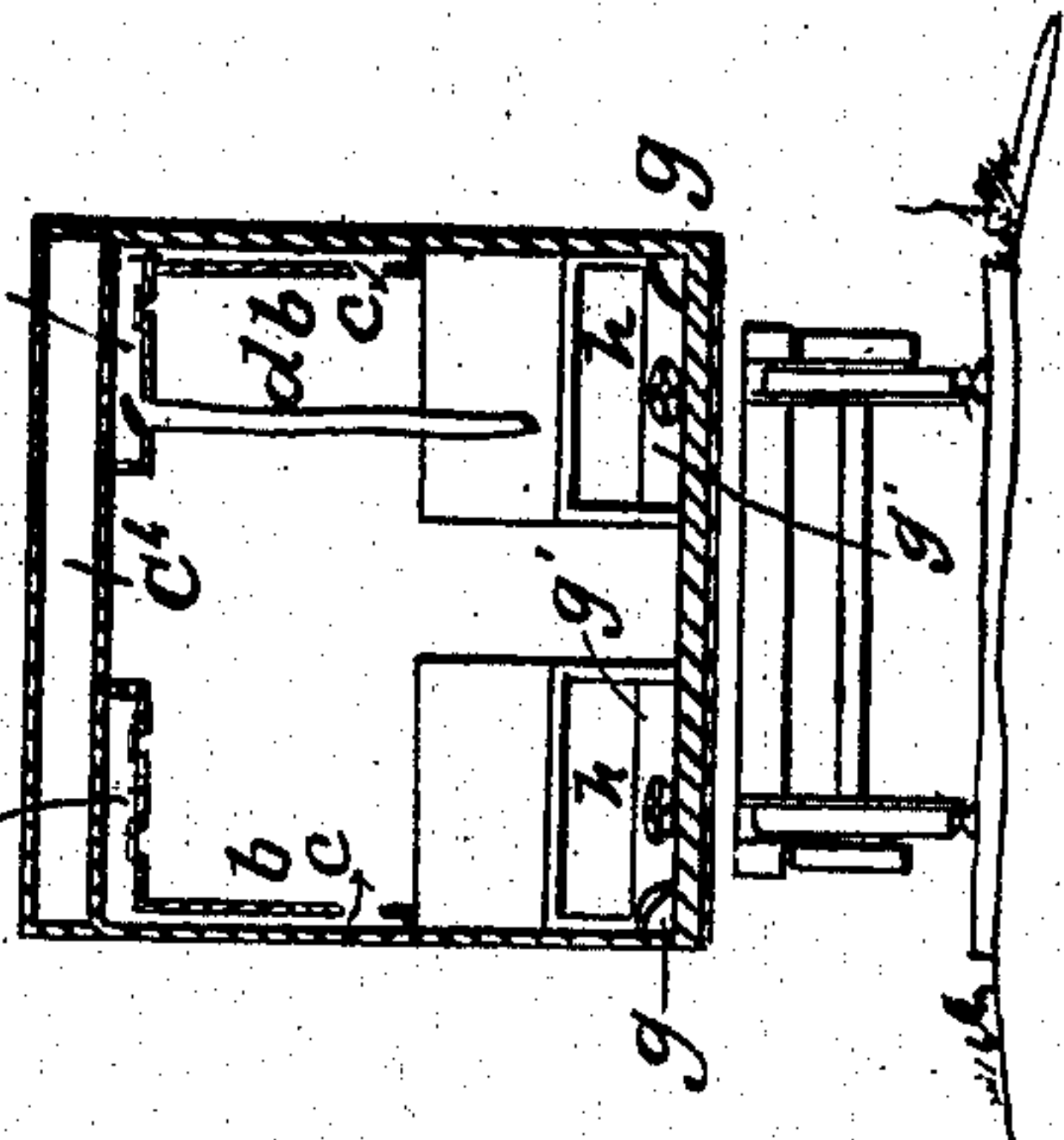
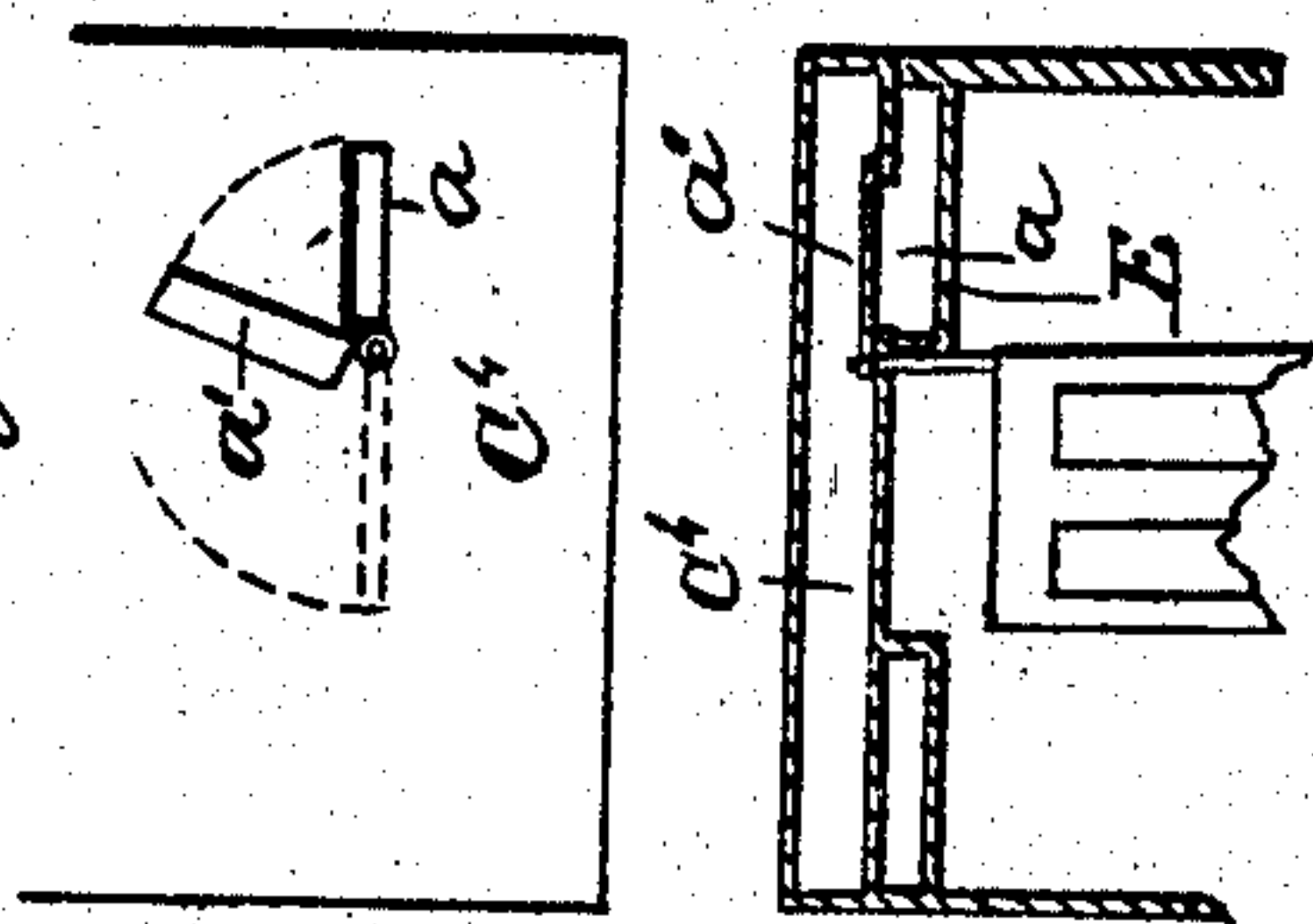
**No. 67,894.**

Patented Aug. 20, 1867.



**Witnesses:**

Edward L. Luyfer  
Walter Hinchman



## Inventor:

A. J. Rathall  
by his agent  
Marion Lincoln Lawrence.



# United States Patent Office.

A. J. MARSHALL, OF WARRENTON, VIRGINIA.

*Letters Patent No. 67,894, dated August 20, 1867.*

## MODE OF VENTILATING AND WARMING RAILROAD CARS.

*The Schedule referred to in these Letters Patent and making part of the same.*

### TO WHOM IT MAY CONCERN:

Be it known that I, A. J. MARSHALL, of Warrenton, in the county of Fauquier, and State of Virginia, have invented an Improved System of Ventilation and Warming; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 shows the mode of forcing air from the front of a locomotive back to the passenger coaches.

Figure 2 is a vertical longitudinal section through a railroad coach, showing both the summer and winter arrangements for ventilating the same.

Figure 3 is a vertical transverse section of the coach represented in fig. 2.

Figure 4 is a sectional view in detail, showing one form of spring-valve for allowing of the escape of an excess of air from the coaches.

Figures 5 and 6 show a mode of closing the induction passages leading from the main air-reservoir to the distributing conduits by opening one or the other of the doors of the coach.

Similar letters of reference indicate corresponding parts in the several figures.

This invention relates to a novel and improved system of ventilation, which is designed particularly for ventilating and supplying pure air to railroad coaches, whether at rest or in motion, so as to afford comfort to passengers in cold or warm weather; and free the coaches of all dust, sparks, and other impurities. The object of my invention is to provide for supplying one or a number of railroad coaches in a train with pure air in such quantities that the internal pressure of air in said coaches shall greatly exceed the external pressure, and thereby cause an effuse of the air from the several cars in currents so strong as greatly to exceed in velocity any current of dusty and impure air, which, from the motion of the cars, will tend to press in upon the passengers, thereby effectually repelling all outward impurities of dust, smoke, sparks, and unwholesome gases. My plan contemplates impacting the several cars of the train with volumes of pure air by the action of a pneumatic engine (as presently explained) to any degree of pressure desired, and at such pressure I propose to have valves in the several cars which will press open and thus prevent unnecessary condensation, and afford escape for the foul or vitiated air from the car. For the purpose of preventing the air from the main or primary conduit from rushing by force of the blower in upon the passengers in rude and unwholesome current, I have interposed a second chamber or reservoir within each car for its reception, from which it may be conveniently distributed or divided out in manageable proportions throughout all parts of the car, and admitted or excluded from the several seats, as is pleasant to the occupants, as will be hereinafter explained. The invention further provides a winter arrangement for warming air taken from the primary conduit or reservoir and conducting this warmed air through passages which are distributed beneath the seats of the coach and provided with registers, by means of which each passenger sitting at any point in a coach can supply himself with warm air in any desired quantity without inconvenience to his fellow-passengers, as will be hereinafter described. Besides these individual registers, to be controlled by the passengers at their seats, there are larger registers placed in each end of the car by the doors, which are under the control of the conductor, which are designed for the general diffusion of a warm current throughout the car. These larger registers will be supplied by pipes with air warmed by the stove, as the others are.

To enable others skilled in the art to understand my invention, I will describe one practical mode of carrying it into effect.

In the accompanying drawings, A represents a casing containing a revolving blower or fan, which casing is arranged directly in front of the locomotive and in the longitudinal plane, passing through the centre of the same so as to draw in air, which is undistributed, and which will be free from dust and sparks. The fan which is within the casing A is driven by means of one or two small engines, B, which receive steam from the boiler under the control of the engineer, so that the fan can be kept constantly in motion, whether the train be in motion or at rest. I prefer to employ a rotary fan or screw, as stated, but do not confine my invention thereto, as any other suitable pneumatic pump may be employed to accomplish the object hereinafter to be explained. From this fan-case A, a pipe, C, of as large cubic measurement as may be reached without obstructing the view of the track from the cabin window, rises perpendicularly, and gradually increases in width until it



terminates in a horizontal conduit, C', which in cross-section may be elliptical, and which may be equal in width to the width of the passenger coaches. This conduit embraces the upper part of the smoke-stack C<sup>2</sup>, and forms a kind of double roofing over the locomotive and its pilot-house, as shown in fig. 1. It terminates at the rear end of the pilot-house, above the junction of the locomotive with the tender, and has a flexible pipe, D, suitably applied to it, for forming an air-tight connection with the conduit C' over the tender. At the rear end of this conduit, over the tender, a similar flexible pipe, D, connects with the front end of the conduit C', which is constructed upon the passenger coach, and which forms the roof thereof, as shown in figs. 1, 2, and 3. Each passenger coach is constructed with a double roof or air-conduit, C', as shown in fig. 2, and these conduits should all communicate with the conduit C' over the locomotive, and form a continuous uninterrupted passage for air back to the rear end of the rearmost coach in the train, at which point the conduit is tightly closed, so that no air can escape. The flexible connections or pipes D, which unite the several conduits, are designed to be made so as to allow of the free lateral and vertical motions of the several carriages, and also to accommodate themselves to the motions of the carriages in turning curves of the road. These connections may be made of rubber cloth suitably protected from injury, and so applied to the ends of the conduits as to admit of being quickly removed and attached when the carriages are uncoupled and coupled. These flexible couplings D will form coverings for the platforms of coaches coupled together, and to protect passengers and others passing from one coach to another in bad weather. It is designed in practice to employ a secondary roof of a single thickness, arranged a short distance above the conduit or double roof, for the purpose of protecting the air therein from becoming heated by the influence of the sun. I am aware that prior to my invention a small pipe leading back from a fan upon the locomotive, and communicating with the interior of several coaches, has been employed for purposes of ventilation and purification, but in such contrivance a double air-conduit roof for each passenger coach was not contemplated, nor was the forcing-fan arranged in front of the locomotive, where pure air only could be obtained. I do not, therefore, lay claim broadly to the principle of forcing air into coaches by means of a pneumatic engine located upon the locomotive. It will be seen that I locate a pneumatic engine directly in front of the locomotive boiler and smoke stack, and construct a conduit leading from it, which extends back over the locomotive, and forms a roof, into which I force air in such quantities, whether the train be in motion or at rest, that the pressure of air therein will greatly exceed the external pressure. At each end of each coach I make openings *a a* of suitable capacity, which may be provided with sliding valves *a'*, figs. 5 and 6, attached to the doors of the coach in such manner that when these doors are open the passages *a* will be closed, and when the doors are shut the said passages will be open. These passages *a a* communicate with what I shall hereafter term the secondary conduits E E, which extend longitudinally along the roof inside of the coach, and which may be equal, or nearly so, in width to the width of the seats below, as shown in figs. 3 and 6. These secondary conduits are designed for receiving air from the primary conduit or reservoir between the two walls or thicknesses of the roof, and distributing this air equably into vertical passages *b b* which lead downward a suitable distance between the passenger seats, and have registers *c* applied to them, as shown in fig. 2. By means of these passages *b* and their respective registers each passenger can obtain pure air in suitable volumes without inconvenience to his or her fellow-passenger. These air-induction passages may be arranged at any desired height above the floor of the car. The object of making the secondary over-head conduits of the width shown is to provide for the use of flexible hose, as shown at *d*, fig. 3, for each passenger. Such hose will be attached to suitable valvular couplings applied to the secondary conduits, and may be used or not at the option of the passengers. Instead of using the wide conduits E, they may be made in the form of hollow cornices around the coach for distributing air to the several descending passages *b*. For the purpose of obtaining a general supply of air into the coach suitable openings should be made at the ends of the coach, communicating with the secondary air-conduit, and these openings should be provided with suitable registers, so that the supply of air can be regulated or cut off entirely by persons employed on the train. It is designed to force air into the coach or coaches through the last-mentioned registers from the secondary conduit in such quantities that the pressure of air inside the coaches shall exceed the external pressure. By this means foul air and dust will be expelled, and there will not be a tendency of such impurities to enter the coaches. To avoid any inconvenience to the passengers from a superabundance of air, or from the air becoming impacted or condensed above a given pressure, I provide exit-valves *e e*, at suitable points, which are held closed by springs, and which can be adjusted and set to open at any given pressure. Similar exit-valves may be applied to the sides of the primary conduit, which will allow of the escape of air above a given pressure.

For ventilating and warming the coaches during the winter months the cold air direct from the fan will be shut off from the registers. The stove F will be encased within an air-tight jacket, G, shown in fig. 2, which jacket will communicate by means of a conduit, *f*, with the primary conduit, so that the cold air will be first delivered into this jacket at its bottom, thence rise and become warmed and pass out at the top through a conduit, *g*, as indicated by the arrows in fig. 2. The pipe or conduit *g* is carried along beneath the car-seats and made to communicate with branch passages, *g'*, beneath or between each seat. These branch passages may be made with double inclined sides, as shown in fig. 2, so as to serve as foot-rests, and each one of them should be provided with registers *h h*, so that the passengers sitting in the seats can supply themselves individually with warm air, or cut off the supply, at pleasure. There will be an opening through the pipe or conduit *g*, near the heating apparatus, which should be provided with a register for the purpose of supplying air generally to the coach. This register-opening may be applied to the upper part of the casing which surrounds the stove or furnace, or it may be arranged wherever found most convenient, the object being to have a general supply of warm air separate from the distributing registers beneath the seats. Advantage may be taken of the condensed air in the casing G for supplying the fire therewith for the purpose of increasing the combustion of the fuel. This supply of air to the furnace fire-chamber should be under the control of persons employed on the train.



I do not desire to confine my invention to the precise arrangement of distributing pipes, nor to the number of such pipes and registers herein shown and described, as the arrangement of these pipes or conduits leading from the secondary conduit may be greatly changed and modified without departing from the principle of my invention, which consists in making provision for equably distributing throughout one or a number of cars or coaches warm or cool air taken from the front of the locomotive boiler and smoke stack by the employment, in conjunction with a main or primary conduit, of a secondary conduit and a multiplicity of small service conduits provided with registers and arranged for the use of each one of the passengers riding in a coach. By this part of my invention I obviate the objection and annoyance of admitting strong currents of air into the coaches directly from the primary conduit, and I introduce the air from a large reservoir, where it is highly condensed, through a great number of small ventricles so disposed as to afford a uniform ventilation, purification, and distribution.

The invention herein set forth is applicable by suitable modifications to the ventilation and warming of steam and other vessels, and also to the ventilation and warming apartments of buildings.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In combination with a pneumatic engine which is arranged in front of a locomotive, and adapted for being driven by means of an engine operating independently of the locomotive driving engine, I claim the arrangement of a primary conduit, constructed as described, with flexible connections, and forming the roof of the passenger coach, and adapted also to serve as a medium through which to supply and condense air in such coach, substantially as described.

2. In combination with a primary conduit, *C'*, for conducting air and forming the roof of a railway coach, as described, I claim the secondary conduits *E*, arranged within the car, and communicating with the said primary conduits for the purpose of abundantly distributing pure air to service pipes *b b*, which are provided with registers, *c*, and arranged substantially as described.

3. In combination with a railway coach having a double roof or air-conduit communicating with and receiving air from a forcing engine arranged upon the locomotive, I claim means, substantially as described, for warming said air and distributing it throughout the coach, substantially as described.

4. The warm-air distributing-conduits or foot-rests *g g* applied beneath or between the seats of a railway coach provided with registers, and communicating with air-heating apparatus, substantially as described.

In the matter of my application for a patent witness my hand.

A. J. MARSHALL.

Witnesses:

EDW. SCHAFER,

WALTER HINCHMAN.