(No Model.) 3 Sheets—Sheet 1.

R. H. PLASS.

APPARATUS FOR LIGHTING AND HEATING RAILWAY CARS, &c.

No. 353,499. Patented Nov. 30, 1886.

Fig. 1.

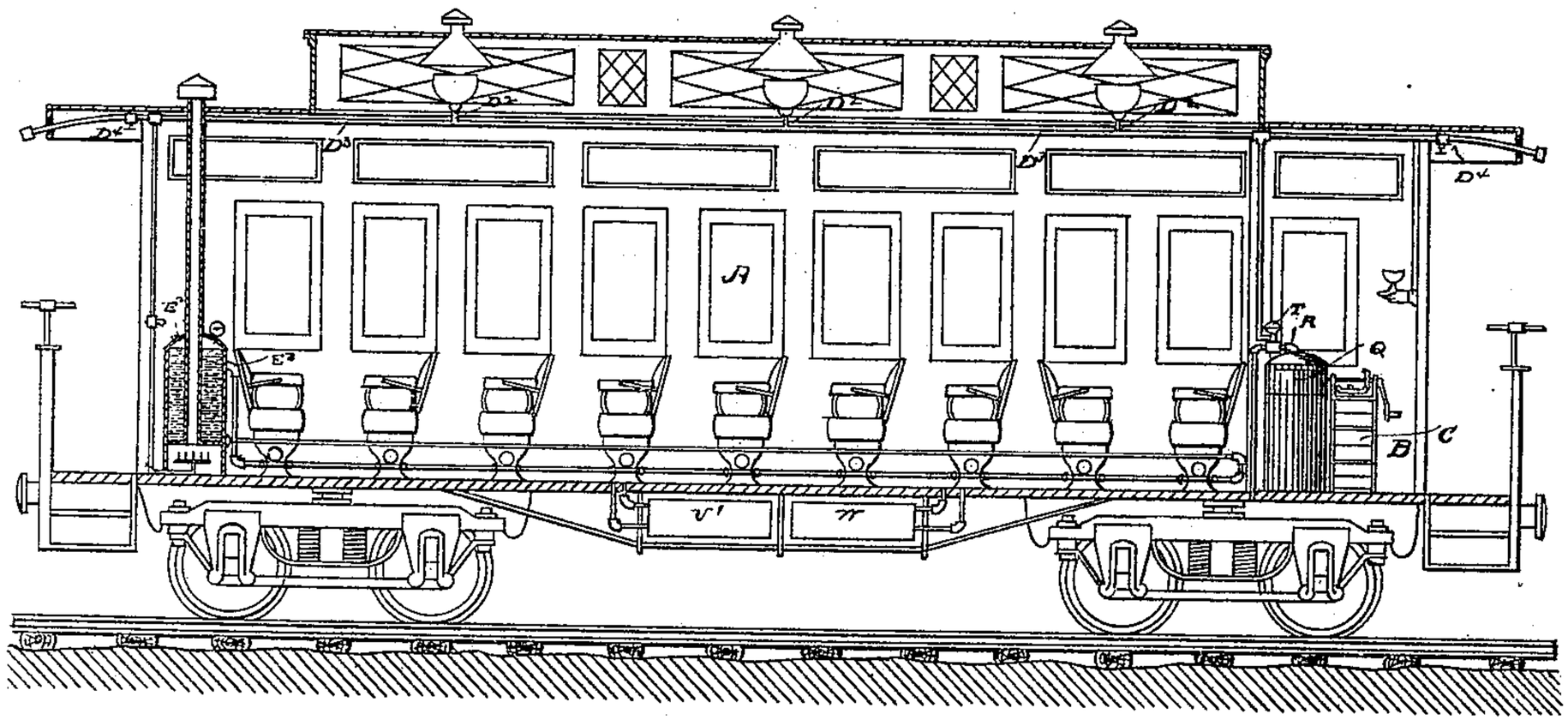
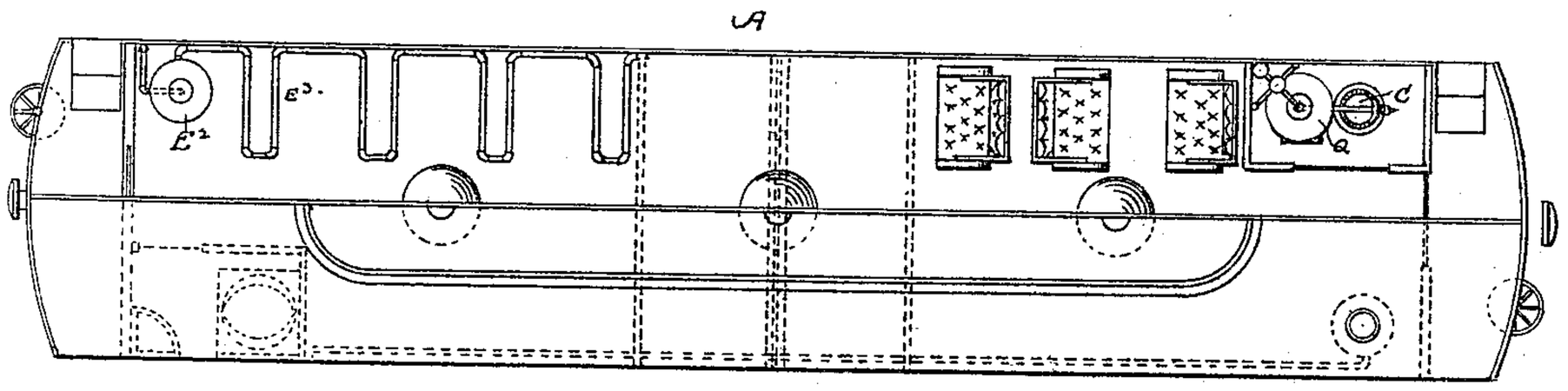


Fig. 2.



WITNESSES

W. W. Mortimer.

H. F. Riley

INVENTOR

R. H. Plass,

by R. G. Dyrenforth,

his Attorney.

(No Model.)

3 Sheets—Sheet 2.

R. H. PLASS.

APPARATUS FOR LIGHTING AND HEATING RAILWAY CARS, &c.

No. 353,499. Patented Nov. 30, 1886.

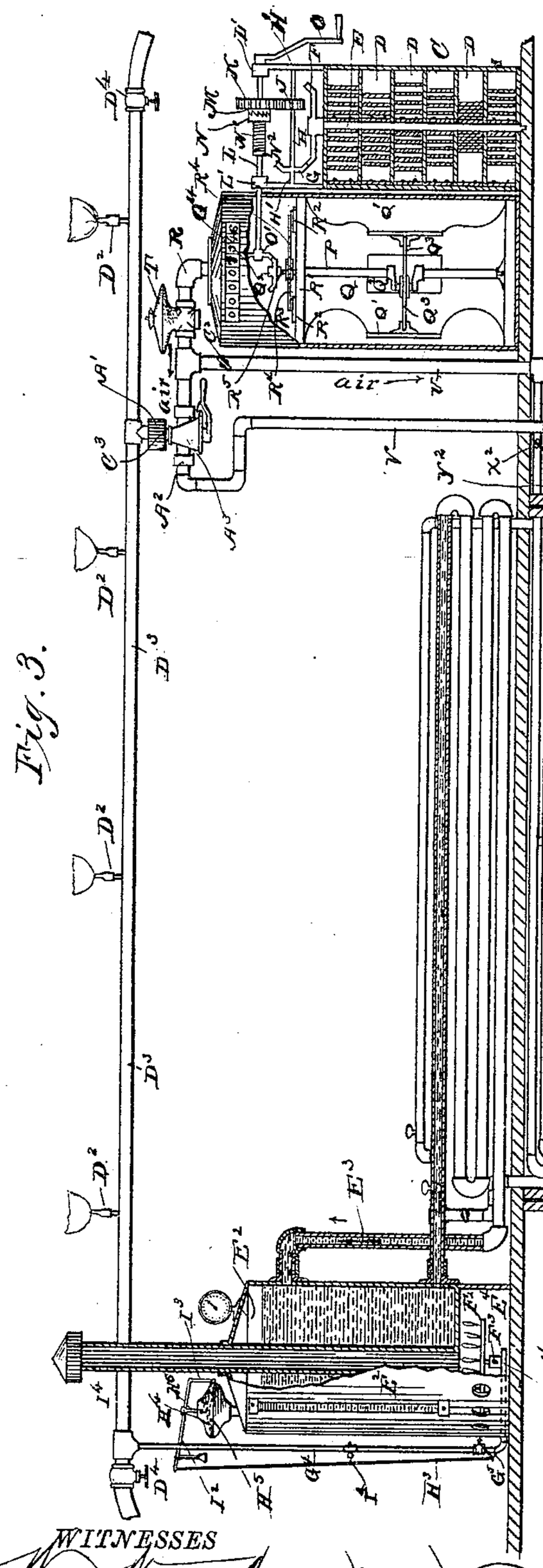


Fig. 3.

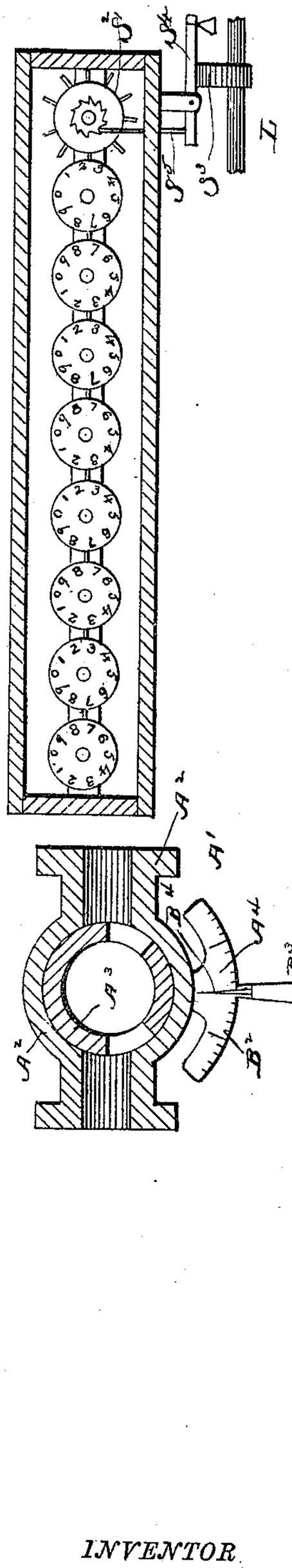


Fig. 9

Fig. 4.

WITNESSES

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R. H. PLASS.

APPARATUS FOR LIGHTING AND HEATING RAILWAY CARS, &c.

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Fig. 5.

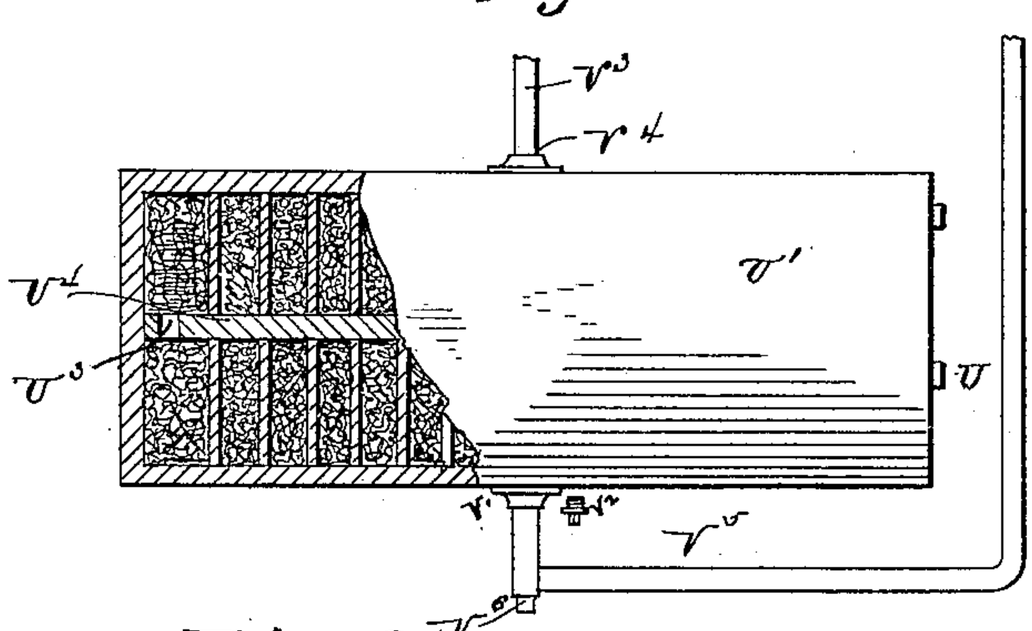


Fig. 6.

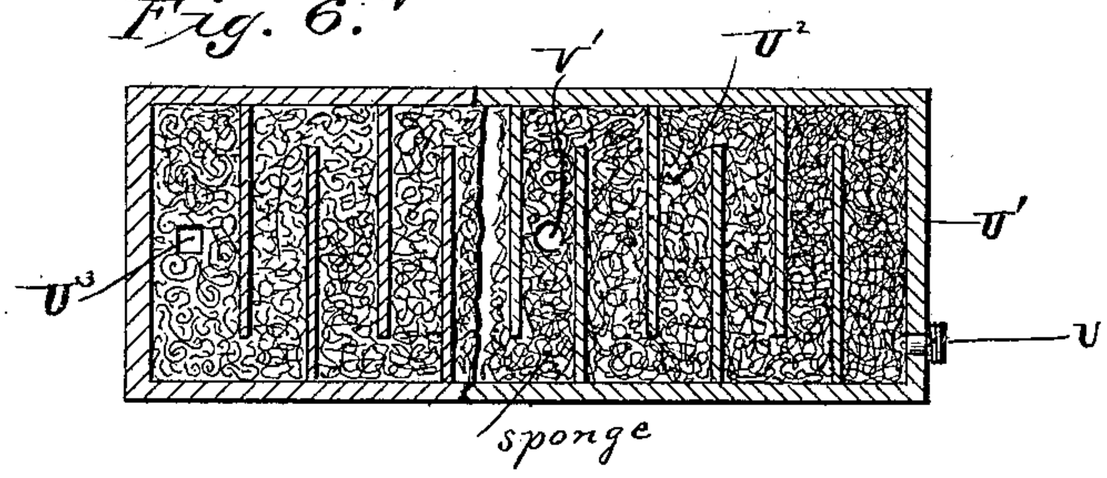


Fig. 7.

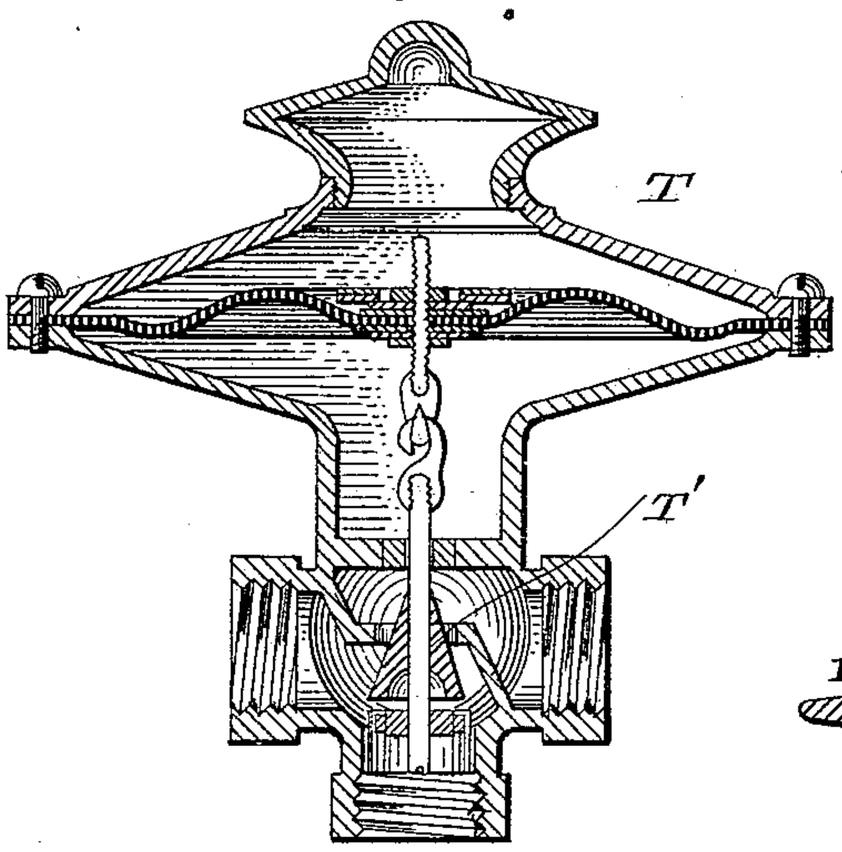
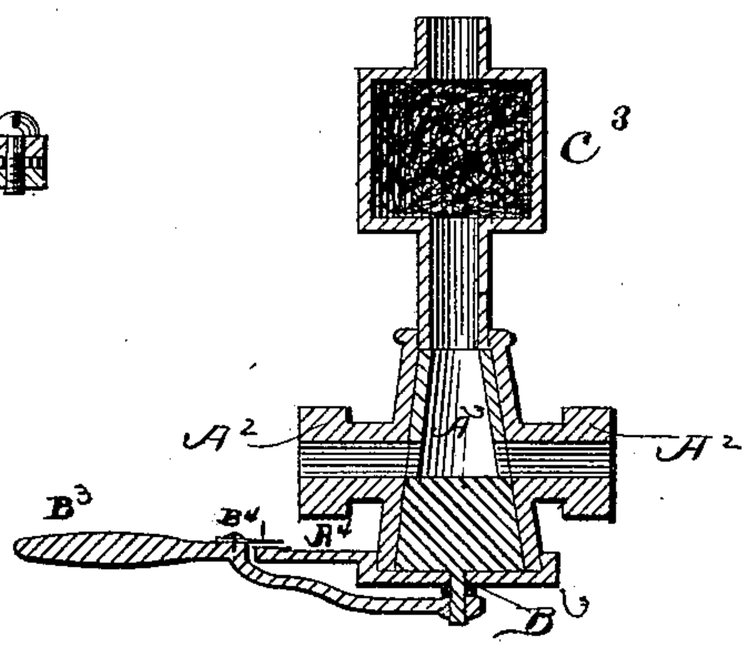


Fig. 8.



WITNESSES

W. W. Mortimer.

H. F. Riley.

INVENTOR

R. H. Plass,

by R. G. Dyrenforth,

his Attorney.

UNITED STATES PATENT OFFICE.

REUBEN HOPKINS PLASS, OF NEW YORK, N. Y.

APPARATUS FOR LIGHTING AND HEATING RAILWAY-CARS, &c.

SPECIFICATION forming part of Letters Patent No. 353,499, dated November 30, 1886.

Application filed July 22, 1884. Serial No. 138,476. (No model.)

To all whom it may concern:

Be it known that I, REUBEN HOPKINS PLASS, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a new and useful Improvement in Apparatus for Lighting and Heating Railway-Cars, &c., of which the following is a specification, reference being had to the accompanying drawings.

My invention has relation to apparatus for lighting and heating railway-cars, street-cars, steamboats, &c., designed to generate on the car or vessel the gas for lighting and heating the same, and to so regulate the apparatus that should a car be derailed or overturned by accident the gas will be automatically cut off at the generator, and the danger of a conflagration will be thus avoided.

It has for its objects to provide apparatus of the class referred to that shall possess superior advantages in point of simplicity, cheapness, safety, convenience, durability, and general efficiency; and the invention consists in the construction and novel arrangement of parts, as will be hereinafter fully described, and particularly pointed out in the claims.

In the drawings, Figure 1 is a vertical longitudinal sectional view of a railway-car provided with my improved gas lighting and heating apparatus. Fig. 2 is a partial plan view of a car and the apparatus. Fig. 3 is an enlarged detail sectional view of the mechanism composing the apparatus, grouped together for convenience of illustration. Fig. 4 is a detail plan view of the density-regulating cock and gage. Fig. 5 is a detail view of one of the generators arranged for being charged with the gasoline. Fig. 6 is a horizontal sectional view of one of the generators, with the horizontal partition partly broken away to show the arrangement of the flues; and Fig. 7 is a detail view of the regulator for maintaining a uniform pressure of air. Fig. 8 is a vertical section of density-regulator and mixing-chamber, and Fig. 9 is a detail view of the register.

The object of my invention is to produce an apparatus that will obviate the possibility of the burning of the train in case of such accidents as a collision or the upsetting of the cars from any cause, and I will now proceed to describe the apparatus by which I effect this result.

Referring by letter to the accompanying drawings, A designates a passenger-car in which I have disposed my apparatus in a manner to economize as much space as possible, and at the same time to locate the generator and the heater in such positions that neither the gas or heat producing apparatus can cause any damage to property or danger to the lives of the passengers in case of an accident.

B designates the compartment, in one corner of the car, in which I locate the spring-motor C, which consists of a nest, six (more or less) in number, of coiled springs, each incased in a separate sleeve, D, but all connected to the same vertical shaft E, having a bevel gear-wheel, F, secured to its upper end. This gear-wheel F meshes with a small bevel gear-wheel, G, on a horizontal shaft, H, having bearings H′ near the upper ends of the uprights I of the motor-frame. Near the end of the shaft H, opposite the bevel-gear G, I provide a small pinion, J, which engages a spur gear-wheel, K, on a longer horizontal shaft, L, having bearings L′ in the upper ends of the uprights I of the motor-frame. On one face the spur gear-wheel K is provided with a half-clutch, M, with which a sliding half-clutch, N, on the shaft L engages to hold the springs at the points to which they have been wound. The half-clutch N is held to place by a spiral spring, N′, which bears against it and against a collar, N^2, on the shaft L.

One end of the shaft L is provided with a crank, O, by which the coiled springs in the sleeves D are wound. The other end of said shaft L is provided with a bevel gear-wheel, O′, which engages a bevel gear-wheel, O^2, on the upper end of the vertical crank-shaft P, within the air pump or blower Q. This air-pump has three or more diaphragms, Q′. I have shown but three; but it is obvious that five may be used. The three diaphragms Q′ are connected to a collar on the crank Q^2 of the crank-shaft P by three arms, Q^3, and when the crank-shaft is rotated operate as a bellows to draw the air into the pump and to force it out through the air-pipe R. Above the bellows in the pump is a partition, R′, provided with valve-seats R^2, which are controlled by valves R^3, secured to the ends of arms R^4, connected to an eccentric, R^5, on a reduced portion of the crank-shaft P, and when the latter is rotated it opens and closes the valves at the proper times.

The air as it passes through the pump is measured by registering mechanism located in the inlet-chamber Q^4 of the air-pump Q'. The meter S consists of a horizontally-arranged frame within the chamber Q^4, provided with eight wheels, each having the units 0 to 9 arranged in a circle on its face or upon its periphery, and geared together in their common frame, so that but one figure of each series of units will be displayed at the same time through the view-plate in the pump-case. The units-disk of the series of wheels makes ten revolutions and turns the tens-disk one point, or from 0 to 1. Ten more revolutions turns the tens-disk one more revolution, or to 2. When the tens-disk has been turned ten revolutions, the hundreds-disk will be moved one point, or from 0 to 1, and thus on until the tens-of-millions disk has been reached, and this may be turned ten times, thereby registering ten million cubic feet of air by the eight disks. The units-disk is operated by a ten-toothed wheel, S^2, which is moved one tooth forward at each revolution of the shaft L by a cam, S^3, on said shaft L, which strikes a weighted lever, S^4, fulcrumed above said shaft L in the chamber Q^4 and provided with a pivoted pawl, S^5, which engages a ratchet-wheel on the ten-toothed wheel S^2, and turns it one tooth every time the weighted end of the lever drops after having been raised. In this manner the air is measured before it has been carbureted, and the meter is kept clean and will operate more accurately than if gas were measured.

I provide the air-pipe R with a pressure-regulator or air-governor, T, which is preferably located near the air-pump in order to economize space, and is constructed after the manner of the gas-governor described and illustrated in Letters Patent No. 177,745, granted to Reuben H. Plass, May 23, 1876, with the exception of the valve T', which is made conical and with a longer taper than the valve in the patent referred to, in order that it may have a slower action. The pressure-regulator is herein illustrated in vertical section, Fig. 7. As the pressure of the air on the diaphragm of the regulator increases, the valve T' is raised and the opening through which the air must pass is contracted, so that the air is condensed and the volume permitted to pass through the regulator is reduced, insuring a uniform supply to the generator, however the pressure may vary. When the power of the motor becomes weakened by the uncoiling of the springs, the valve will descend and the opening in the regulator becomes enlarged, and the same volume of air is permitted to pass through the regulator under a smaller pressure.

It is obvious that the pressure-regulator may be arranged in connection with the gas-pipe of the apparatus to regulate the supply of gas to the burners, as in said Letters Patent referred to, and I may use it in that connection herein, if desired.

From the pressure-regulator, as herein arranged, the air passes down through the air-pipe U and into the lower section of the generator U', through which it passes tortuously to its opposite end through the saturated absorbent material with which the flues U^2, formed by the vertical partitions, is packed or provided, thence up through an opening, U^3, in the horizontal partition U^4 in said generator U' at the opposite end from that at which it entered, and thence tortuously through the upper section of said generator U', through saturated absorbent material in the flues of said upper section, and out into the gas-pipe V.

I use two generators, or what I term a "team-generator." These generators are made of copper, preferably, and are of like construction. I locate them, preferably, under the body of a railway-car, as shown; but it is obvious that the location of the generators, as well as the other parts of the apparatus, may be varied to suit the structure, either movable or stationary, in which it is to be used, to suit the exigencies of the case, without departing from the character of the invention; and I do vary the location of the parts of the apparatus to suit the character of the structure in which I employ the apparatus.

The generators U' and W are made preferably rectangular in form, and are provided with central horizontal partitions and vertical partitions, as shown, to form flues or tortuous passages, in which sponge or other suitable absorbent material is placed and is saturated with gasoline, in a manner hereinafter explained. Each generator is provided in its bottom with an opening, V', through which the generator is to be filled, and after the generators have been filled and the absorbent material has been properly saturated and the surplus gasoline run off said openings are closed by screw-plugs V^2. At the time of filling the generators with the gasoline a glass tube, V^3, which is used as an indicator to denote when the generator is full, is inserted in an opening, V^4, in the top of each generator. The generators are filled through the openings in their bottoms by means of a siphon, V^5, having a plug, V^6, in its lower ends. When the glass tube indicates that the generator is full, the flow of gasoline through the siphon is stopped, and as soon as the absorbent material has become charged or thoroughly saturated the plug V^6 in the lower end of the siphon is withdrawn and the gasoline is permitted to run off. When the gasoline has run out, the siphon is removed and the opening it occupied is closed with the screw-plug V^2. The indicator-tube is also withdrawn, and the opening in the top of the indicator is also closed by a screw-plug.

In the illustration I have built a case, *w'*, beneath the floor of the car, having a door at each side, into which case the two charged generators are slid after the manner of drawers. In the bottom of the case *w'*, I provide a coil of pipe, w^2, for the passage of hot water or steam, said pipe being placed in connection with the heating apparatus, described farther on. The walls and doors of

the case *w'* are made double, and the space in said double walls and doors is packed with felt or other suitable non-conductor of heat and cold.

The object of the coiled pipe and the non-conducting packing is to prevent the charge in the generators from being affected by extremely cold or freezing weather, and to maintain a temperature within the generators corresponding to the temperature within the car.

The generators are not used simultaneously; but they are connected together by pipes provided with stop-cocks, so that after one of the generators has been exhausted the other one may be instantly brought into use and used while the exhausted one is being filled at a station and replaced; or the exhausted one may be removed and left at the station to be recharged, and another already charged may be put in its place in the case and connected to the other one and to the pipes.

The generators are provided with the male sections of the couplings, by which they are placed in connection with the air-pipe and gas-pipe, and these latter pipes carry the sleeves by which the coupling is effected.

The two generators are connected in the following manner: The air-pipe U extends down through the bottom of the car, and extends through the case *w'* over both generators U' and W, and projects out of the casing at both ends, as shown. This air-pipe U is jointed at the bends and enters the lower section of the generator U' at one end thereof. A branch pipe, X, leads from the main pipe U and enters the lower section of the generator W at the opposite end of the case to where the pipe U enters. The air-pipe U is provided with a stop-cock, *x'*, which when closed prevents the air from entering the generator U'. The branch pipe *x* is provided with a stop-cock, x^2, which when open permits the air to enter the generator W. By closing the stop-cock x^2 when the generator W has become exhausted and opening the stop-cock *x'* the air will enter the generator U', and that generator will carburet the air. The gas-pipe V leaves the generator U' from its upper section above the air-pipe U, and a branch gas-pipe, Y, leaves the generator W from its upper section and connects with the main gas-pipe V. The gas-pipe V is provided with a stop-cock, Y', by which to cut off the gas from the generator U'. The branch pipe Y is provided with a stop-cock, Y^2, by which to cut off the gas from the generator W, so that by the arrangement of pipes and stop-cocks I am enabled to use the generators separately. The main gas-pipe V is further provided with a weighted stop-cock, Z, which always remains open while the car maintains its position on the track, but will be closed automatically by the weight Z^2, which swings in either direction to close it when the car is overturned, thereby cutting off the gas and avoiding any damage to the car or property or danger to the lives of persons from fire.

The air, after passing through either of the generators, becomes carbureted or charged with the vapors of the gasoline that have been drawn up or held by the capillary attraction of the sponge or other absorbent material to its greatest capacity, and is converted into a hydrocarbon gas of from twenty-five to thirty candle-power. The gas in this state is too rich to burn economically at all seasons of the year, and is returned to the air-pump compartment B at the end of the car, where it is passed through a density-regulator, where it is impoverished and its quality reduced to fifteen or twenty candle-power by an admixture of air from the air-pipe, and thence passed through the commingling or mixing chamber to the burners.

The density-regulator A' consists of a sleeve-joint, A^2, connected to the gas-pipe and to the air-pipe, and provided with a conical or tapering valve, A^3. To the lower end of the sleeve A^2 is secured a quadrant-plate, A^4, which is provided with a scale, B^2. The valve or cock A^3 is provided on its lower end, which is reduced to form a journal and projects through an opening in the quadrant-plate, with a lever, B^3, which is curved upward, as shown, and provided with an indicator-finger, B^4, which rests on the scale of the quadrant-plate and indicates the size of the passage in the density-regulator. By moving the lever to the desired point on the indicator (and with or without closing a stop-cock at C^2 in the air-pipe U, to prevent the air from passing to the generator,) the gas and air may be let into the density-regulator in the proportions necessary to produce the desired candle-power—*i. e.*, half gas and half air, or three-fourths gas to one-fourth air, or in any other desired proportions. From the density-regulator the gas and air pass into the commingling or mixing chamber C^3, which is filled with excelsior or other suitable material that will cause the gas and air to thoroughly commingle, and it passes thence to the burners D^2 in the gas-pipe D^3, running beneath the roof or monitor section of the car. The gas-pipes D^3 of each car have flexible tubing at each end, provided with hose-couplings to enable two or more cars to be connected together, so that one car may be supplied with gas from another car. The gas-pipes D^3 are provided with stop-cocks D^4 near each end, to cut off the supply of gas from an adjacent car when desired.

At the opposite end of the car from the compartment B, and preferably on the same side of the car, I locate that portion of the apparatus which is employed in heating the car. It consists of an upright boiler, E^2, which is connected with the hot-water or steam pipes E^3 in the ordinary manner. This boiler is provided with the usual steam and water gages, and has a hot-air and smoke flue or flues passing up vertically through the center of the boiler and extending through the roof of the car, and provided on its top with a hood. In the combustion-chamber E^4, below the boiler, I provide a burner, F^2, which operates on the principle of

the Bunsen burner, in which the gas is consumed, without giving out any light, by admitting air to the gas through an opening, F^3, in the gas-pipe F^4, immediately below the horizontal burner-pipe G^3. The gas-pipe F^4 is connected with the gas-pipe D^3 by a vertical gas-pipe, G^4, provided near its lower end with an automatic gage-cock, G^5. This gage-cock G^5 is operated by a rod, H^3, which is controlled by a steam-governor, H^4, on the top of the boiler E^2, said steam-governor being shown in vertical section in Fig. 3.

The steam-governor H^4 is provided with a diaphragm, H^5, which has a rod, H^6, extending therefrom up through the top of the governor, and the upper end of said rod H^6 is pivoted to a weighted lever, I^2, fulcrumed at one end to an arm, I^3, on said steam-governor, and at the other end said lever I^2 is pivoted to the upper end of the vertical rod H^3, so that the pressure of the steam in the steam-governor H^4 will automatically open and partially close the gage-cock G^5, to regulate the supply of the gas to the burner G^3, and thus the heat will be maintained at a uniform temperature. The gas may be cut off entirely from the burner G^3 by closing the stop-cock I^4 in the gas-pipe D^3.

For convenience and to economize space I prefer to locate the spring-motor, air-pump, pressure-regulator, density-regulator, and mixing or commingling chamber in the compartment B. It is obvious, however, that on horse-cars, vessels, or other movable structures, and in houses the location and arrangements of the parts of the apparatus will need to be varied. These variations may be made without departing from the character of the invention.

The cost of the gas is as follows: Three and a half gallons of gasoline at from fifteen to twenty cents per gallon will carburet one thousand cubic feet of air, giving it from twenty-five to thirty candle-power, and this is then impoverished to from fiften to twenty candle-power, so that the cost per thousand cubic feet of gas renders it an economical gas.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of my improved gas-lighting and gas-heating apparatus will be readily understood by those skilled in the art to which my invention appertains. The coil-pipe in the case *w'* is connected in the circuit of the hot-water or steam pipes in any well-known manner.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The means herein described for lighting and heating, comprising a carburetor with suitable pipes leading thereto and therefrom, an air or gas forcing or exhausting apparatus connected with said carburetor, the heating apparatus and burners for lighting and also for supplying a gas-fuel or fuel-gas to the heating apparatus connected with pipes leading from the carburetor to supply said burners, and valves in said pipes, all substantially as and operated as set forth.

2. The means herein described for lighting and heating, comprising the spring-motor, the diaphragm air-pump provided with a meter in its inlet-opening, the pressure-regulator, and the generator connected to each other and to the air and gas pipes, substantially as specified.

3. The combination, with the nest spring-motor consisting of springs coiled in separate sleeves and connected to common shafts to operate independently and in unison, of a spring-actuated clutch to retain power on the motor in winding up the springs, the diaphragm air-pump provided with a registering index or meter in its inlet-chamber, the pressure-regulator, and the generators connected to each other and to the air and gas pipes, substantially as described.

4. The means herein described for lighting and heating, comprising a spring-actuated motor, the diaphragm air-pump, and the generators provided with air and gas pipes having cocks, whereby one or both may be used, substantially as described.

5. The combination of the spring-motor, the diaphragm air-pump, the pressure-regulator, the generators connected to the air and gas pipes, and the commingling-chamber, substantially as described.

6. The combination, with the nest spring-motor, of the diaphragm air-pump having a meter in its inlet-chamber, the pressure-regulator generators connected to the gas and air pipe, the density-regulator, and the commingling-chamber, substantially as described.

7. The combination, with a car-body, of the casing provided with non-conducting packing, of the generators provided with air and gas pipes, and the heating-pipes arranged within the casing and connected with the heating apparatus, substantially as described.

8. The combination, with the car-body, of the casing provided with non-conducting packing, a coil of pipe in said casing connected with the heating-pipes of the car, and the generators or carburetors located in the casing and having the air and gas pipes, and the coupling-pipes, substantially as described.

9. The combination, in an apparatus for heating and lighting railway-cars, of the spring-motor, the diaphragm air-pump the interchangeable generators, air-pipes, leading to the generators, the heating apparatus, and pipe and gas-pipes leading from the generators to the heating apparatus, substantially as described.

10. The combination, in an apparatus for heating and lighting railway-cars, of the spring-motor, the diaphragm air-pump, the generator situated in a casing provided with non-conducting packing, the heating apparatus, gas-pipe leading from the generator to the heat-

ing apparatus, and a pipe leading from the heating apparatus and coiled within the casing of the generator, substantially as described.

11. The combination, in an apparatus for heating and lighting railway-cars, of the spring-motor, the diaphragm air-pump, the generator air-pipes connecting the air pump and generator, the heating apparatus, and gas-pipes for conducting the gas to the car and heating apparatus, and provided with a safety-cock whereby the supply of gas is automatically cut off when the car is overturned.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

REUBEN HOPKINS PLASS.

Witnesses:
STEPHEN E. TEMPLE,
J. S. A. WITTKE.