(No Model.) 3 Sheets—Sheet 1.

J. JOHNSON.

HEATER FOR RAILWAY CARS.

No. 245,504. Patented Aug. 9, 1881.

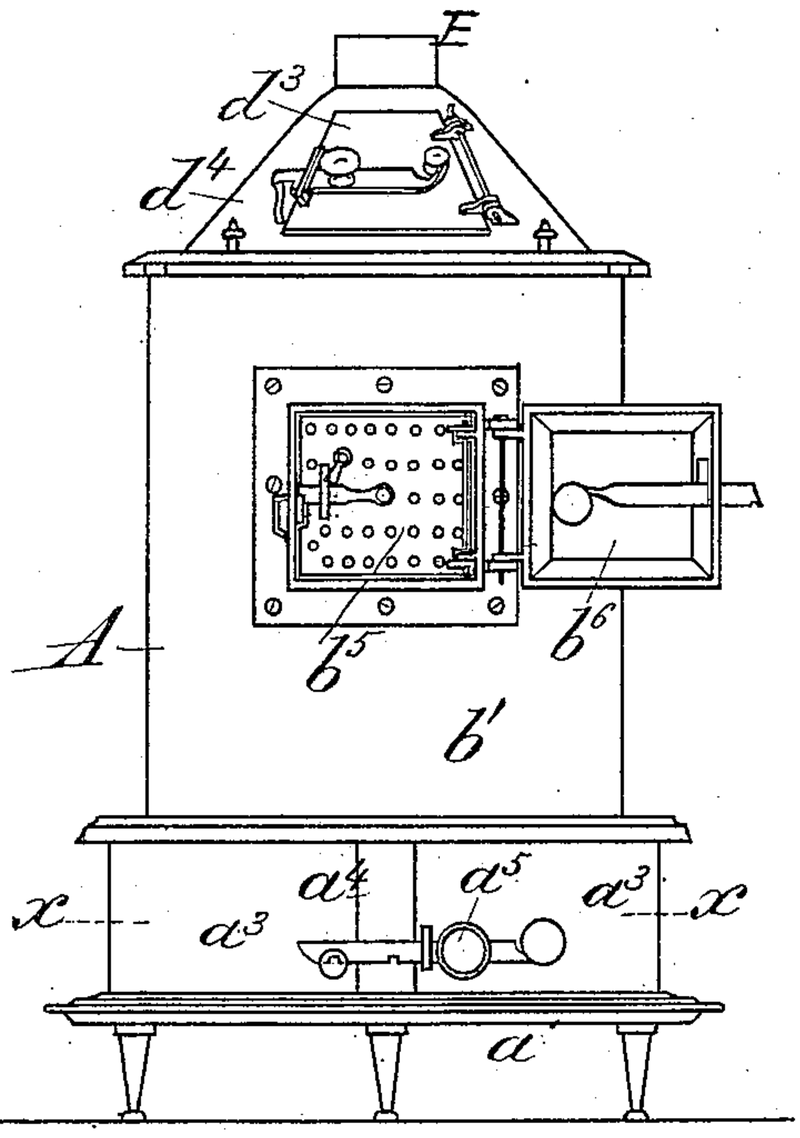

FIG. 1.
FRONT ELEVATION.

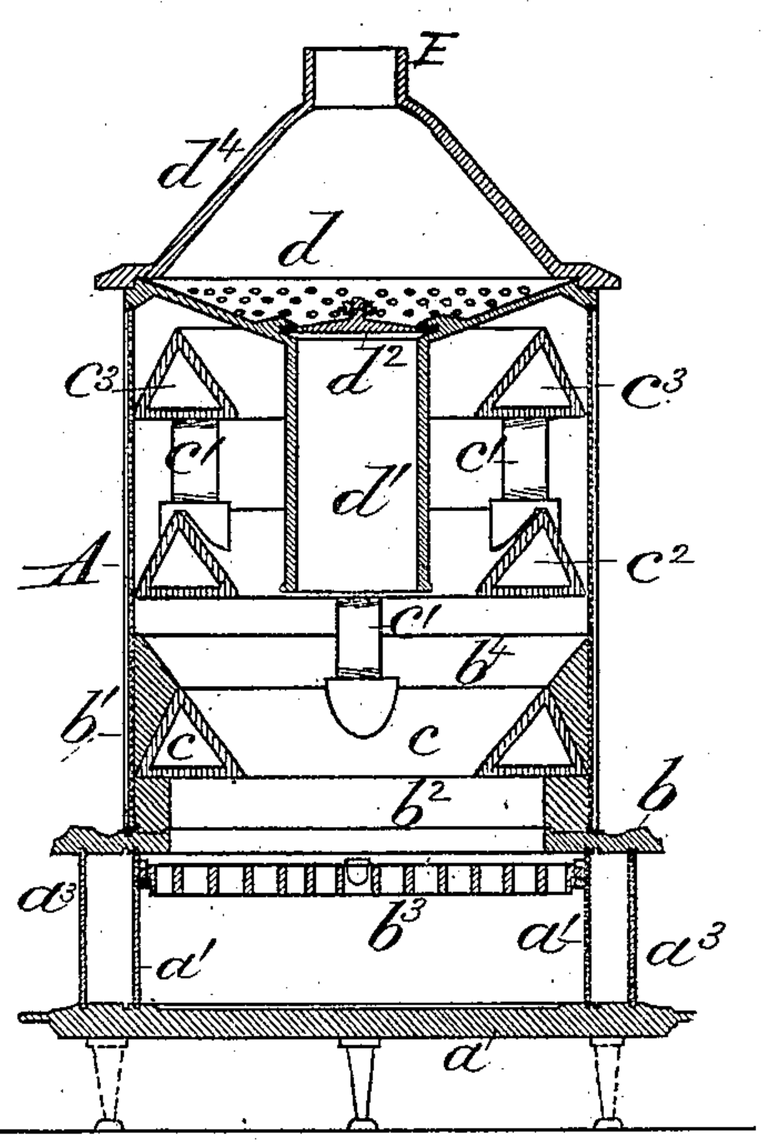

FIG. 3
SECTION THROUGH A.B.

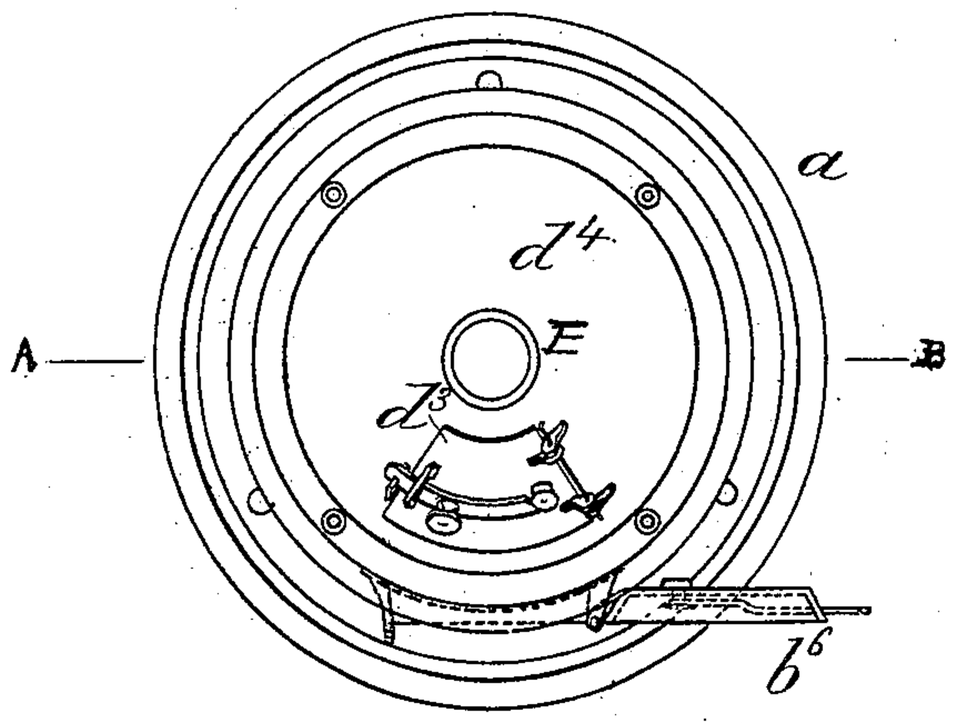

FIG. 2
PLAN.

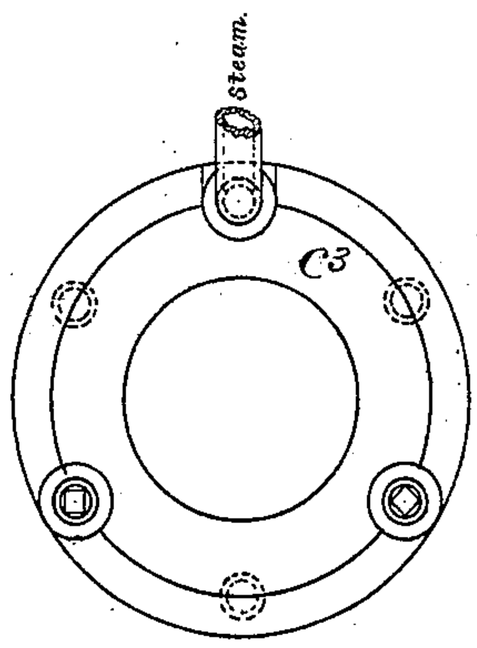

FIG. 4.
PLAN OF UPPER ANNULAR.

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(No Model.) 3 Sheets—Sheet 2.

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HEATER FOR RAILWAY CARS.

No. 245,504. Patented Aug. 9, 1881.

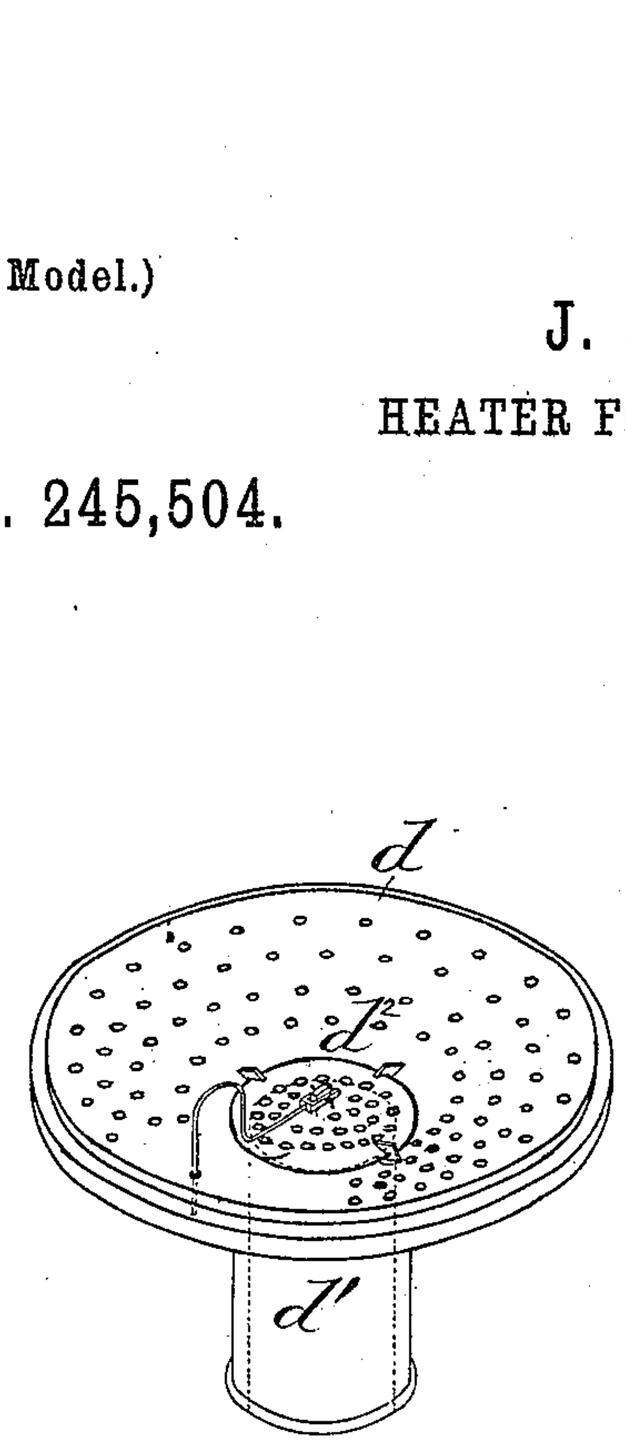

FIG. 5.

PERFORATED CROWN PLATE.

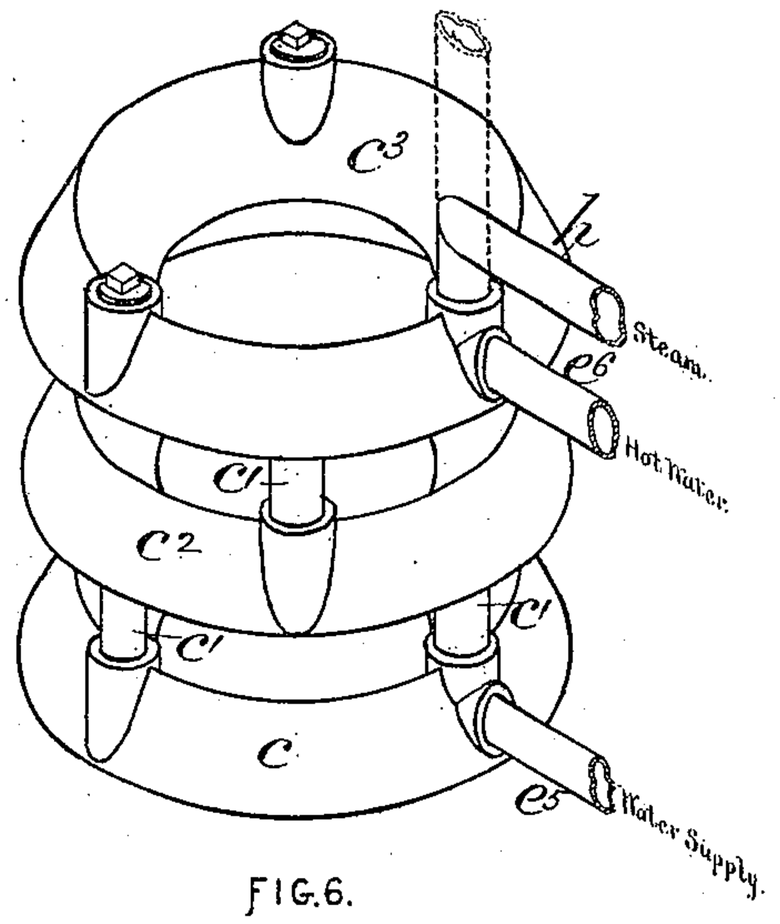

FIG. 6.

REAR OF BOILER.

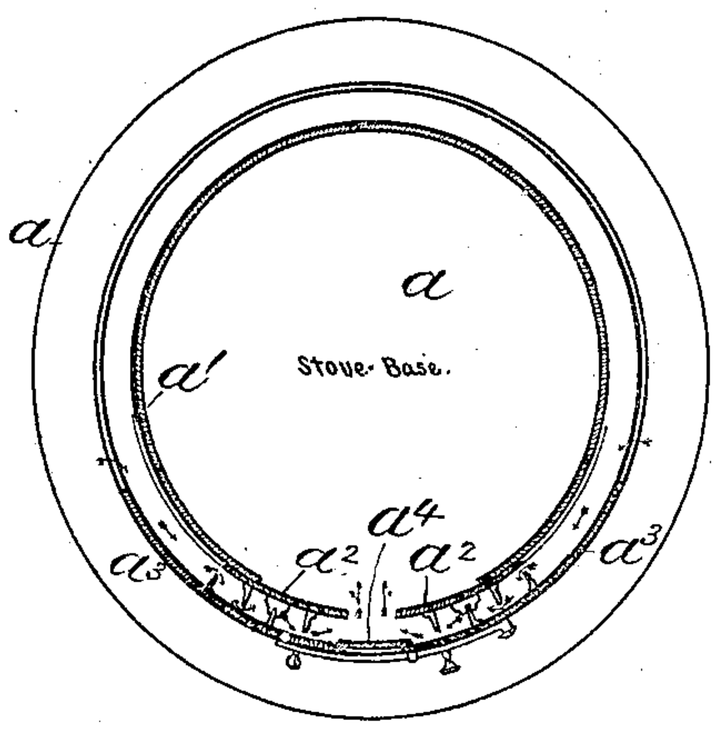

FIG. 7.

PLAN OF DRAFT.

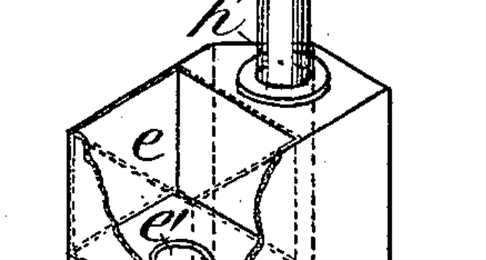

FIG 8.

RESERVOIR.

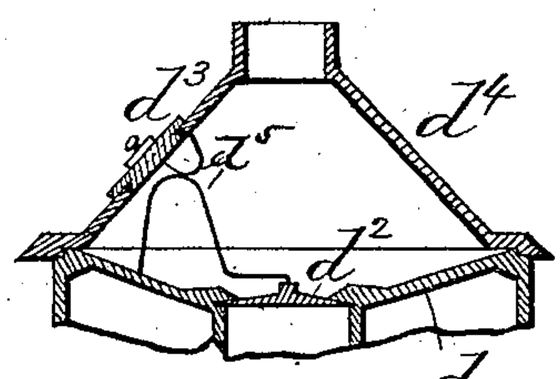

FIG. 9.

ATTEST.

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(No Model.) 3 Sheets--Sheet 3.

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HEATER FOR RAILWAY CARS.

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Fig. 10.

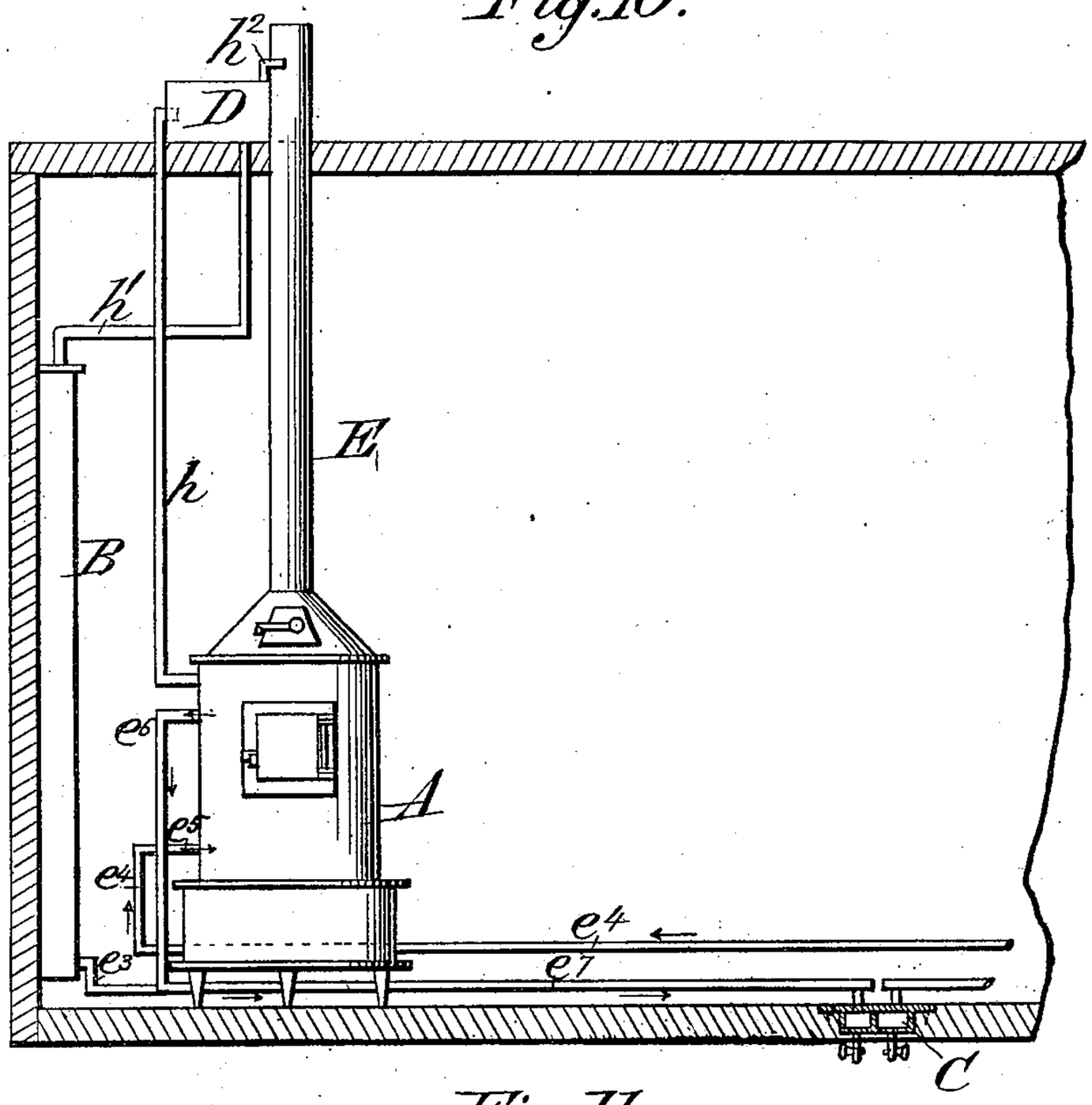
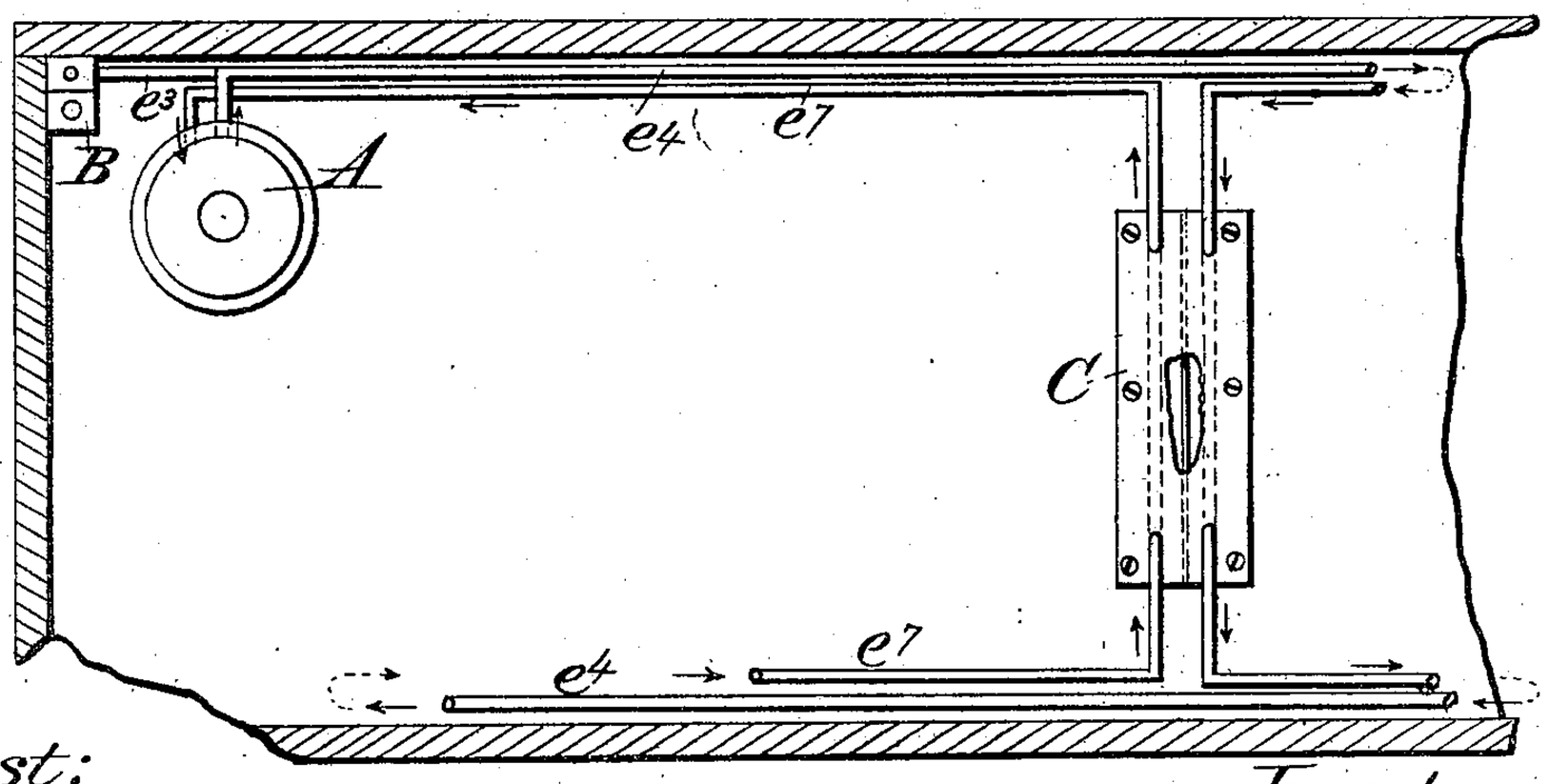


Fig. 11.



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UNITED STATES PATENT OFFICE.

JONATHAN JOHNSON, OF LOWELL, MASSACHUSETTS.

HEATER FOR RAILWAY-CARS.

SPECIFICATION forming part of Letters Patent No. 245,504, dated August 9, 1881.

Application filed March 9, 1881. (No model.)

To all whom it may concern:

Be it known that I, JONATHAN JOHNSON, a citizen of the United States, residing at Lowell, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Heaters for Railway-Cars; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to improvements in that class of safety-heating apparatus employed in warming railway-cars in which the heat of the fuel is utilized by heating water which circulates through the car in suitable pipes, the radiation from which is depended upon to warm the air of the car, the object being to improve the construction of the heater, rendering it less liable to set fire to the car in case of accident, and, further, prevent loss of heat in transferring the circulation from one side of the car to the other.

To this end my invention consists in the construction and arrangement of parts as hereinafter more fully set forth.

In the accompanying drawings, Figure 1 is a front elevation of the heater with the outer door open. Fig. 2 is a plan showing the exterior of the heater, looking from above. Fig. 3 is a vertical transverse section, showing the arrangement of the water-tubes with relation to the fire-pot and other parts of the heater. Fig. 4 is a plan view of the upper annulus or circular water-tube, showing the points at which connections are made therewith. Fig. 5 is a perspective view of the perforated crown-plate. Fig. 6 is a perspective view of the water-containing tubes and their connections complete as they appear before being placed in the heater. Fig. 7 is a horizontal section on the line *x x* of Fig. 1, showing the draft-controlling apparatus. Fig. 8 is a perspective view of the reservoir or tank which supplies the heater with water. Fig. 9 is a vertical section through a part of the heater, showing the devices for securing the lid of the fuel-magazine in place. Fig. 10 is a vertical longitudinal section of a car provided with the heating apparatus, and shows the relative arrangement of the several parts. Fig. 11 is a horizontal section of a car, and shows the means employed for transferring the circulating water from one side to the other of the car.

It has long been a desideratum to produce a car-heating apparatus that should be efficient in its operation, heating the whole car evenly from end to end, and at the same time be safe from explosions, and from the greater danger of setting fire to the car when the latter should be overturned, or when any part of the heater was broken by collisions or other accidents. To accomplish these results I employ means as will be more fully described.

A represents the heater, which is placed in any desired position in the car, preferably one corner, as shown in the drawings, and is constructed of a base-plate, *a*, mounted upon suitable legs, which may be secured to the floor of the car. The upper surface of this base-plate may be depressed to form a receptacle for an ash-pan, and this depression surrounded by an annular groove forming a seat for the lower edge of the ash-pit wall *a'*. This wall has an opening in front, through which access is obtained to the ash-pit and the air needed to support the combustion of the fuel passes. This opening is closed by the sliding doors a^2, moving in a groove outside of the ash-pit wall and close to it, so that the sliding doors a^2 are always in close contact therewith. Another annular groove is formed in the base-plate, outside that which receives the wall *a'*, in which moves the sliding doors a^3. These doors are provided upon their inner sides with a series of radial projections, which alternate with a similar series of projections extending outward from the inner sliding doors, a^2, thus causing the air which enters the ash-pit between the outer and inner doors to follow a zigzag path, as indicated by the arrows in Fig. 7 of the drawings.

It will also be perceived that coals or cinders would be obliged to follow the same path in a reverse direction against the draft in case they were thrown violently from the ash-pit through the doors a^2 when the latter were partly or wholly open; and as this would be an impossibility it is plain that no danger of setting fire to the car by the escape of ignited fuel from the ash-pit is to be feared.

In order to move the doors a^2 for the purpose of controlling the draft, they are provided with

externally-projecting lugs, which interlock with similar lugs projecting from the inside of the doors a^3. It is therefore apparent that when the outer doors are moved the inner doors are carried with them. One of the outer doors is also provided with an apron, a^4, which passes behind the other door of the pair, and is of sufficient length to give all the opening to the inner doors needed for draft purposes without making any external opening opposite.

A spring-latch, a^5, having a series of notches for catching on a suitable stop, is provided for the outer doors, by which they are securely held together and the width of the draft-opening regulated. It will be apparent, however, that when access to the ash-pit is desired the outer doors, carrying with them the inner, may be run back in the grooves until the whole width of the ash-pit opening is free.

Above these devices, resting upon them, and provided upon its under side with a series of annular grooves corresponding to those in the top of the base-plate, is the base-ring b, which is provided upon its upper side with an annular groove to receive the lower edge of the double shell b'. This shell is preferably composed of an inner ring of boiler-plate, or similar strong sheet metal, surrounded by one of Russia iron or brass, simply for the purpose of rendering the outer surface of the heater more ornamental. Another annular groove within that which receives the shell b' serves as a support for the fire-brick ring b^2, beneath which and attached either to the base-ring or ash-pit wall in any of the well-known forms in use is the grate b^3, upon which the fuel is placed.

Resting upon the fire-brick ring b^2 is a cast-iron hollow ring or annulus, c, of triangular section, which forms the lower one of a series or stack of similarly-formed water-receptacles, c^2 and c^3, connected to the lower one of the series and to each other by the short pipes or nipples c', which may be provided with right and left screw-threads upon their opposite ends, the threads cut to receive them in the several rings being similarly formed, so that in case it be necessary to supply a new ring to the heater it may be done by simply unscrewing the connecting-nipples, putting the new ring in place, and screwing in the nipples again. If it be difficult to obtain the nipples with screw-threads cut in opposite directions, ordinary nipples may be used with the threads at both ends running in the same direction; but in this case it will be necessary to employ jam or lock nuts upon the nipple, which, after they are inserted, are screwed tight against the rings.

It will be observed that the connections between the several rings are not placed vertically over each other, but alternately, thus compelling the water to pass around each ring before it can ascend to the one above. By this arrangement a better circulation of the water through the heater is secured and the lower rings protected from suffering by exposure to intense heat.

In order to more fully protect the lower annulus, c, and shell b', an additional fire-brick ring, b^4, or other suitable refractory material, is placed between them, resting upon the annulus and projecting sufficiently above it to prevent the direct radiation of heat from the fuel from striking the shell, and also to prevent the lodgment of ashes between the ring and shell.

In the front of the shell is formed an opening which gives access to the interior of the heater and allows air to enter above the fuel for the purpose of tempering the fire, which opening is provided with an inner perforated door, b^5, provided with a locking-latch and an outer tight door, b^6. By this arrangement of the doors, when it is desired to admit air above the fuel the outer door, b^6, is opened; but the inner perforated door, b^5, remains closed, thus preventing the escape of ignited fuel in case of accident, and at the same time admitting a free supply of air to the heater above the fuel.

Resting upon and supported by the shell b' is the perforated crown-plate d, to which is attached the fuel-magazine d', covered by the lid d^2, which is secured in place by lugs formed upon the crown-plate, underneath which the edges of the lid catch, and by the lug d^5 upon the inner side of the door d^3 in the conical cap d^4, which forms the covering of the heater and conducts the gases produced by the combustion of the fuel to the smoke-pipe E. The lug d^5 may be dispensed with, if desired, allowing the door to rest on the top end of the rod in place of the lug. This door d^3 also serves as an opening for the introduction of fuel to the magazine, and is securely held in place when closed by a spring-latch, which continues to keep the door closed, even if the heater be turned upside down, and can only be opened by applying sufficient force to the latch to overcome the elasticity of the spring.

All the latches used upon the heater, except the locking-latch upon the perforated door b^5, are what is known to the trade as "spring-latches," being made of iron and the needed resiliency imparted to the spring portion of the latch by hammering when cold, the elasticity of springs so formed not being affected by heat, as are steel springs to which the resiliency is imparted by tempering.

Fig. 5 of the drawings shows an enlarged perspective view of the crown-plate and lid, in which it will be observed that the perforations do not extend over the whole surface of the plate, but that the portion thereof which comes beneath the door d^3 is without openings. By this means the escape of gas into the car when the door is opened to replenish the magazine with fuel is prevented, as all the openings through which the gas rises are beneath the cap d^4, by which they are conducted to the smoke-pipe E.

All the several parts of this heater are bound together by suitable bolts in such a manner that it may be thrown about in any way without danger of breaking its joints or allowing the smallest particle of ignited fuel to escape;

and should it be crushed in a collision the copious escape of water will instantly extinguish all the ignited fuel which may be in the fire-pot.

In order to make this heater useful as a car-warmer, it is necessary to connect the water-receptacles within the heater with a steady and automatic supply, which shall make good all losses by leakage and evaporation, and also connect it with a system of pipes extending through the car in which the hot water circulates, and which serve as radiators to disseminate the heat evenly throughout.

Referring in this connection to Figs. 10 and 11, it will be seen that the boiler A occupies a position near one corner of the car, the corner itself being filled by the reservoir B, which is shown on an enlarged scale in Fig. 8. This reservoir is provided at its upper end with a receiving-chamber, *e*, into which the water necessary to fill the pipes of the heater, the circulating-pipes, and reservoir to the height desired is poured, the water passing into the reservoir from the receiver through the pipe *e'*, which extends nearly to the bottom of said reservoir. A water-gage, e^2, is also attached to one side thereof, by which the height of the water therein is determined, and, consequently, the pressure under which the circulation is maintained. From the bottom of the reservoir a pipe, e^3, connects with the circulating or radiating pipe e^4, on its return to the heater, with which it is connected by the pipe e^5 entering the annulus *c*, from which the water ascends through the nipples *c'* to the annulus c^2, and from that through similar nipples to the upper annulus, c^3, from which it passes by the pipe e^6 into the radiating and circulating pipe e^7, and, this being connected through the box C with the pipe e^4, completes the circulation.

It is apparent that the feed-pipe, coming from the bottom of the reservoir, may be connected to either the outflow or return pipes of the circulation without materially changing the action of the apparatus, as its main duty is simply to supply the water.

The box may be divided by a partition into two longitudinal cavities, with which the circulating-pipes are connected; or the pipes themselves may be carried through the box and inclosed therein in some non-conducting substance, by which the loss of heat will be prevented. It also furnishes the lowest point in the circulation, and to it the draw-off cocks, by which the apparatus is emptied, are attached. As the annular water-containing rings within the heater are liable to generate steam when the fire is pushed and the circulation is quick, it becomes necessary to provide a means for its escape. This is accomplished by connecting with the apex of the upper ring, c^3, an escape-pipe, *h*, which leads upward and enters the condenser D, where, after condensation, it is returned to the reservoir B, through the pipe *h'*, and again enters the circulation. If at any time more steam should be generated than the condenser is able to convert into water, it passes off freely through the pipe h^2 directly into the air or into the smoke-pipe E.

It will be observed that this heating apparatus is absolutely safe from explosion under any circumstances, as there is no cock, valve, or other obstruction between the heater and the outer air, thus rendering it impossible to generate a greater pressure in any part of the apparatus than is produced by the column of water in the reservoir, which is so slight, never exceeding one pound to the square inch, as to render an explosion from over-pressure simply impossible.

Having thus described my invention, I claim as new, and desire to secure by Letters Patent, the following:

1. In a car-heater, and in connection with the draft-regulating devices thereof, the combination of outer and inner sliding doors, each of which is provided with projections alternately crossing the space between the doors and forcing the current of air to enter the ash-pit in a zigzag course, substantially as shown and described.

2. In a car-heater, the combination of a pair of doors, moving in a groove adjacent to and concentric with the ash-pit walls, with a second pair of doors, also moving in a concentric groove and connected with the first pair by interlocking-lugs, so as to cause them to move together, in the manner and for the purpose set forth.

3. In the draft-regulating devices of a car-heater, the combination, with an inner pair of sliding doors, of an outer pair moving simultaneously, one of said outer doors being provided with an apron which prevents direct communication between the outer air and the ash-pit when the doors are opened to regulate the draft, substantially as set forth.

4. In a car-heater, the combination of the perforated crown-plate, movable magazine lid or cover, and the fuel-door d^3, provided with a projecting lug for holding the magazine-lid in place when closed, all arranged substantially as and for the purposes specified.

5. In a car-heating apparatus, the combination, with the water-heating furnace A and circulating-pipes, of the open reservoir B, having receiving-chamber *e*, interior pipe, *e'*, and water-gage e^2, substantially as shown and described.

6. In a car-heating apparatus, the combination of the furnace A, having water-heating rings and connections *c c' c²* c^3, water-reservoir B, having receiving-chamber *e* and pipe *e'*, transfer-box C, condenser D, and suitable circulating-pipes, substantially as shown and described.

In testimony whereof I affix my signature in presence of two witnesses.

JONATHAN JOHNSON.

Witnesses:
A. R. BROWN,
CHARLES P. WEBSTER.