(No Model.)

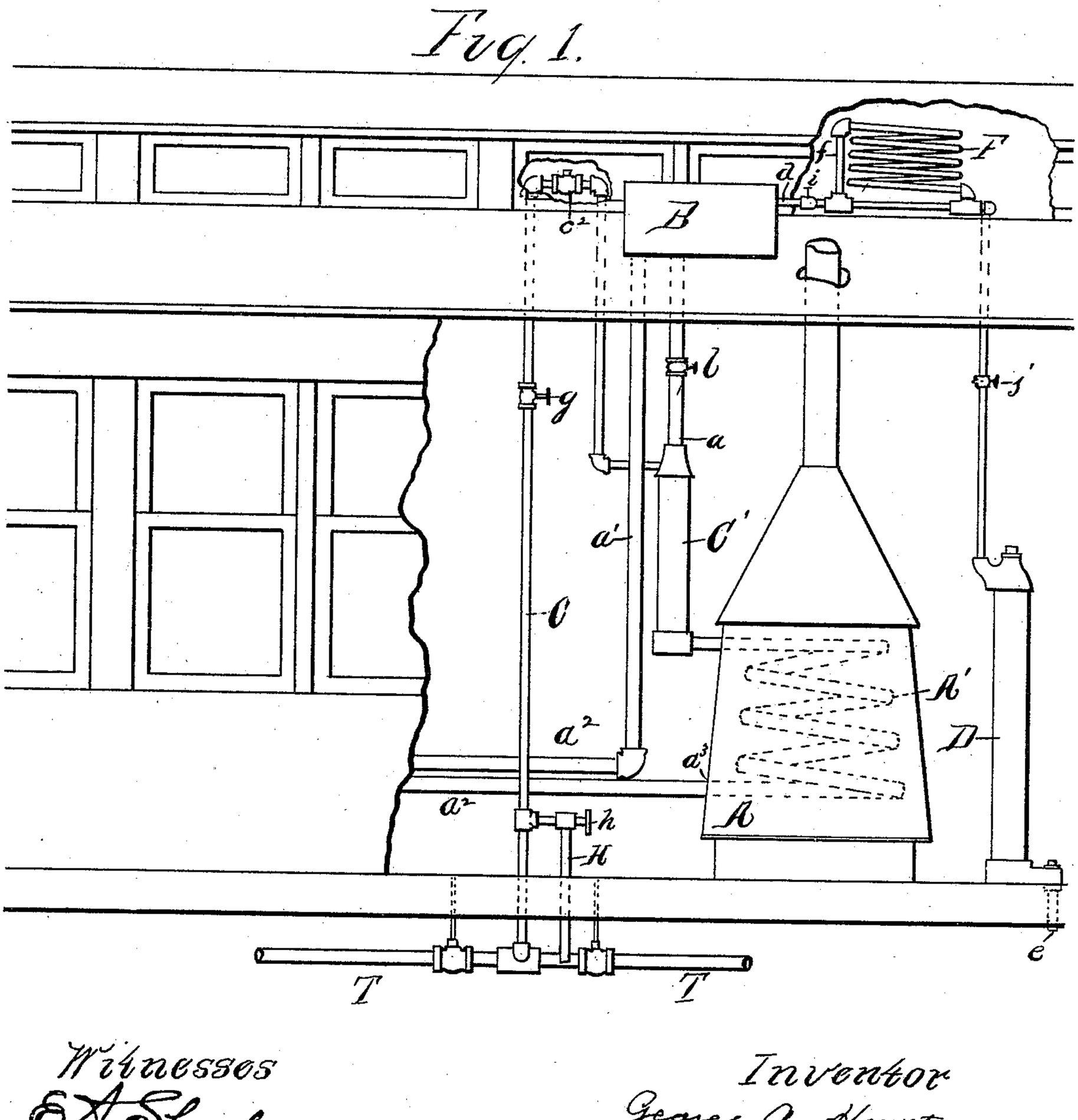
2 Sheets—Sheet 1.

G. A. HOUSTON.

CAR HEATER.

No. 432,239. Patented July 15, 1890.

Fig. 1.



Witnesses
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(No Model.)

2 Sheets—Sheet 2.

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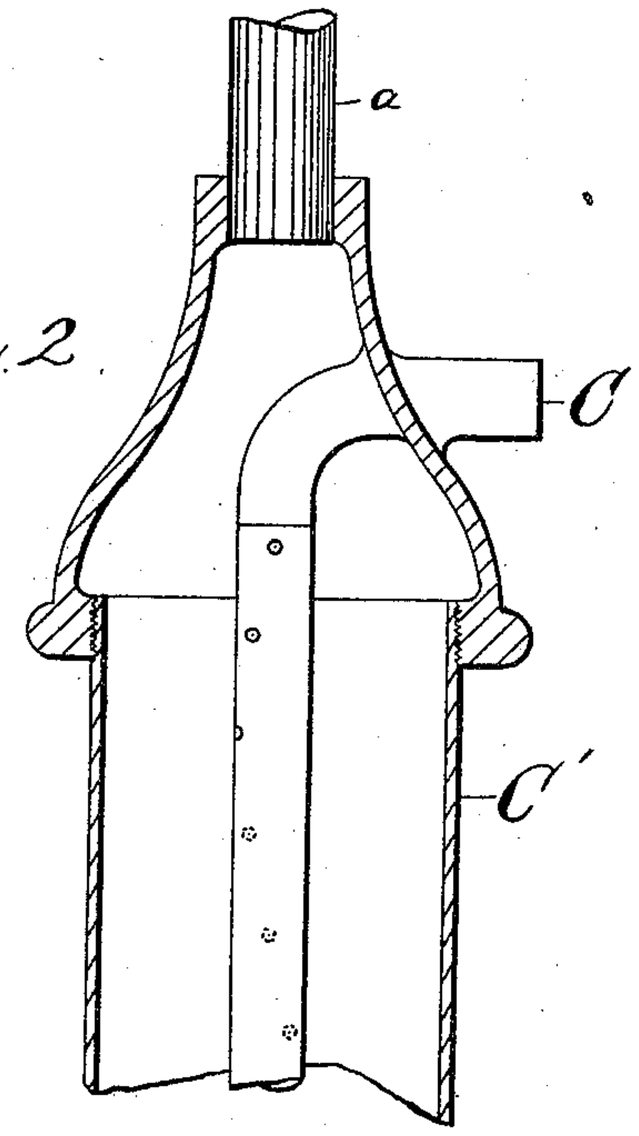
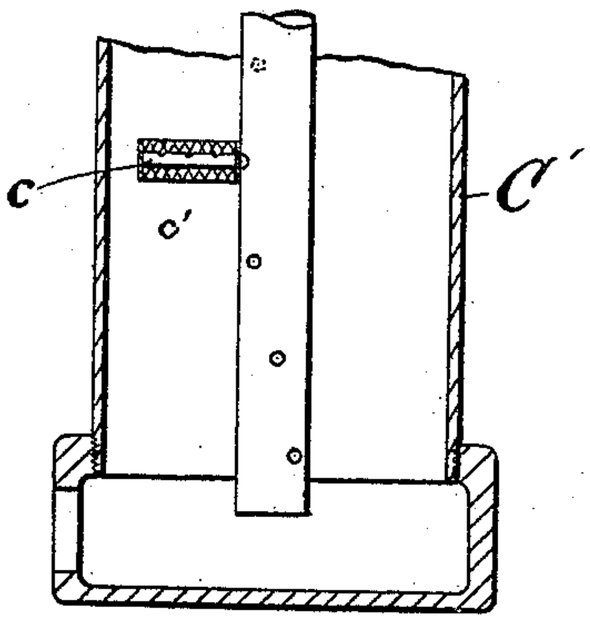
No. 432,239. Patented July 15, 1890.

Fig. 2.





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UNITED STATES PATENT OFFICE.

GEORGE A. HOUSTON, OF BELOIT, WISCONSIN.

CAR-HEATER.

SPECIFICATION forming part of Letters Patent No. 432,239, dated July 15, 1890.

Application filed June 20, 1889. Serial No. 314,976. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. HOUSTON, a citizen of the United States of America, residing at Beloit, in the county of Rock and State of Wisconsin, have invented certain Improvements in Car-Heaters, of which the following is a specification.

Referring to the accompanying drawings, wherein similar reference-letters indicate the same or corresponding parts, Figure 1 is a side elevation representing the combined apparatus as arranged for practical use. Fig. 2 is a vertical section, broken, representing the construction of the steam-delivery pipe and the chamber in which it acts.

My invention is here illustrated as applied in connection with the well-known Baker heater, long used for heating railway-cars by a hot-water circulation. The body of said heater is shown at A, the inclosed heating-coil in dotted lines at A′, the expansion-tank at B, the pipe which conveys the hot water from the heating-coil to the expansion-tank at *a*, the pipe which conveys the hot water from the expansion-tank to the circulation-pipes at a', and the circulation-pipes at a^2 a^2, returning the cooled water to the boiler at a^3. These parts are all old and are not disturbed or altered by my improvements, except in slight particulars, where it is necessary to make the proper connections to my apparatus, and when the circulation-pipes are charged with water and a fire is made in the heater they are capable of operating precisely as heretofore.

My improvements are in the nature of an attachment adapted to be applied and used with said water-heater system, or with any other water-heater having substantially the same general mode of operation for the purpose of performing additional functions and producing additional results.

The objects of my invention are to enable the heater to be used not only, as heretofore, for warming the car by water heated by a fire under and around the coil, but also for warming the car directly by steam introduced from the locomotive-boiler or exhaust or any other source outside of the car, and for heating the water circulation not only by the fire around the coil, but also by steam heat derived from such outside source.

Referring now to the structures in which my improvements are embodied and applied, T is a pipe extending along the train, with proper coupling devices between the cars, for the purpose of transmitting a supply of live or exhaust steam, or both, from the outside source, above referred to, to the several cars composing the train. From this main pipe, which I term the "train-pipe," I extend a branch pipe C to a point preferably above the water-level in the expansion-tank B, and thence down to the side of the pipe *a*, which I enlarge at this place into an elongated vertical chamber or stand-pipe C′. The pipe C extends down into the chamber C′, as shown in Fig. 2, and is perforated to allow the steam to escape from it into the water contained in the chamber, or into the empty chamber when the water circulation is not to be used. Desiring to direct the steam upward in said chamber to aid in forcing a water circulation, I connect to the pipe at each of its perforations a hollow horizontal tube *c*, perforated along its upper side, from which the steam will be delivered upward into the chamber. To prevent the escaping steam from causing a boiling sound in the water, I surround the short horizontal tubular arms *c* with fine wire-gauze *c′*, or any equivalent material which will break up the steam-jets, and thus prevent the noise. Preferably I arrange a check-valve c^2 at the highest part of the pipe C, to prevent water from backing over into the train-pipe in case steam should be shut off therefrom for a considerable time, or any condensation in the pipe should create a backward pressure.

If the system should be charged with water and the steam from the locomotive thus admitted into it, as I propose to do, it is evident that an excess of water would soon result from steam-condensation, and hence provision must be made for taking care of any water not needed in the heating system. To this end I lead a pipe *d* from the expansion-tank at the water-level therein to a vertical chamber or stand-pipe D, provided with an outflow-port so controlled by an automatically-operating valve that when the chamber D fills with water the valve will open and let it out and will close again after the chamber is sufficiently free of water.

Many different forms of automatic valve

are available for opening and closing the outflow-port of the stand-pipe D; but I prefer the construction shown in a pending application filed by me therefor as a division of the original application in this case and officially designated as Serial No. 333,294.

Taking advantage of the pipe *d*, which will ordinarily be filled or partially filled with steam, whether the water circulation be in use or not, I arrange a heating-coil F in the upper part of the car, directly under the roof and in front of one of the ventilator-openings, to warm the air which enters through said opening, and to aid in warming the car when said opening is closed. The coil F is arranged to take steam at its upper end by a short branch *f*, and to drain into the pipe *d*, as shown. A cock *g* is placed in the pipe C to regulate or cut off access of steam from the train-pipe when desired, and a drain-tube H, provided with a cock *h*, is applied at or near the lower end of pipe C to free the latter from water when necessary. A cock *i* enables the attendant to cut out the coil F and stand-pipe D, if he desires to dispense with the heat of coil F when using the water circulation alone. A cock *j* may also be placed in the pipe *d*, between the coil F and the chamber D, to cut out the latter, but leave the coil in action for heating purposes when using the water circulation alone. A cock *l* is placed in the pipe *a* above the chamber C′, and is to be closed when a steam circulation alone is desired. Instead of a single coil F, the number may be multiplied, if preferred, suitable connections being made for supplying them with steam and draining their condensation-water into the water circulation; but I do not deem it necessary to illustrate them, as their construction will be within the skill of the ordinary mechanic.

To operate the combined apparatus in the manner in which the Baker heater is usually operated, the attendant closes cocks *g j*, opens cock *l*, and charges the water-circulation system to the usual level. If he desires heat from coil F, he opens cock *i*; otherwise he closes it. Upon now making a fire in heater A the water in the coil A′ becomes heated and is forced upward through the expansion-tank, and thence down through pipe *a′* into the heating-pipes a^2 a^2, and back to the coil A′, in the manner already well known.

To operate the apparatus for direct steam-heating alone, the attendant opens cock *g* and closes cock *l*. Steam now flows in through pipe C to chamber C′, thence down through coil A′ into circulation-pipes a^2, and thence to expansion-tank B and stand-pipe D, from which the pressure escapes through the outflow-port until the air and water are all blown out of the system, whereupon the valve which controls the outflow-port will be closed, preventing further loss of steam. In sleeping-cars this will ordinarily be done only in mild weather, when a gentle warmth in the car is desirable during the evening, and is to be cut off or decreased after the passengers retire for the night. The temperature will be regulated by turning the cock *g* so as to permit a more or less active steam circulation. With a water circulation alone the heat cannot be readily shut off or regulated; but with my combined steam apparatus it can be perfectly regulated and shut off whenever desired.

To operate the apparatus for heating the water circulation by steam derived from the train-pipe, the attendant charges the system with water and opens cocks *g l i j*. Steam now passes from pipe C into chamber C′, heating the water therein and tending to force it upward both by mechanical action and by the resulting increase of the water temperature. If the cock *g* is wide open, steam will escape into the water from all of the short tubes *c*, and the action will be rapid; but if the cock *g* be only partially open steam will vent into the water only from the upper tubes *c*, and the action will be slower; hence by opening the cock *g* more or less the temperature of the car may be regulated at will. While this action is going on a fire may be made in heater A, and its heat added to the circulation, if desired. The condensation-water will be automatically disposed of in the manner above described.

It will be seen from the above explanation that there are important advantages resulting from the vertical position of the steam pipe or chamber C′, because the water-pressure in the lower part of the chamber, when steam and water are both used, will tend to force the steam out of the upper nozzles to the extent that they will afford it deliverance, reducing to a great extent the boiling sound, and thus enabling me to regulate the circulation more perfectly by the cock *g*.

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

1. The combination of the elevated expansion-tank B, provided with a valved waste-pipe, the heating-pipes a^2, having the vertical connections *a a′* to the expansion-tank, the train-pipe T, the branch C, leading from the train-pipe to a suitable point in the line of pipe *a* and provided with a regulating-cock *g* and means for preventing the backflow of water through said branch when the cock *g* is open, and a cock *l*, arranged in the pipe *a*, between its junction with branch C and its opening into tank B, whereby when the system is charged with water and the cock *l* is open steam-pressure from branch C will force a water circulation upward through pipe *a* and downward through pipe *a′* to and through the heating-pipes, and when cock *l* is closed the same pressure will force a circulation in the reverse direction, clearing the heating-pipes of water and substituting a steam circulation therein, substantially as described.

2. The combination of the elevated expansion-tank B, provided with a valved waste-pipe, the heating-pipes a^2, having the vertical

connections *a a'* to the expansion-tank, the enlargement or chamber C' in the line of pipe *a*, the train-pipe T, the branch C, leading from the train-pipe into the chamber C' and extending downward therein and provided with a regulating-cock *g* and means for preventing the backflow of water through said branch when the valve *g* is open, and a series of nozzles *c*, projecting laterally at different elevations from that part of branch C which is within the chamber C' and adapted to vent the steam upward, whereby a full pressure and volume of steam entering chamber C' through branch C will act directly upon different parts of the vertical column of water in said chamber at substantially different elevations, but in the same direction, and thus force a rapid circulation up through the chamber, but in proportion as the supply of steam is diminished it will cease to deliver through the lower nozzles, and will thus reduce the activity of the water circulation, substantially as described.

3. The combination of the elevated expansion-tank B, provided with a valved waste-pipe, the heating-pipes a^2, having the vertical connections *a a'* to the expansion-tank, the train-pipe T, the branch C, leading from the train-pipe to a suitable point in the line of pipe *a* and provided with a regulating-cock *g* and means for preventing the backflow of water through said branch when the cock *g* is open, and a steam-heating coil F, arranged above the level of the water in the expansion-tank, having its upper end provided with a connection which is adapted to take steam from a point above the line of said water-level, and its lower end adapted to drain into the waste-pipe, substantially as described.

4. The combination of a railway-car provided with ventilating-orifices in its roof, a system of heating-pipes for heating said car, a train-pipe T for supplying steam to said heating-pipes, an elevated expansion-tank B for receiving the condensation-water, provided with a valved waste-pipe, and a steam-heating coil F, arranged near the roof of the car and in the vicinity of said ventilating-orifices and above the level of the water in the expansion-tank, having its upper end adapted to take steam from a point above the line of the water-level in said tank, and its lower end adapted to drain into the waste-pipe, substantially as described.

GEO. A. HOUSTON.

Witnesses:
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WILLIAM LANPHUE.