(No Model.)

F. G. PROCUNIER.

STEAM TRAP FOR RADIATORS.

No. 438,825. Patented Oct. 21, 1890.

Fig. 1.

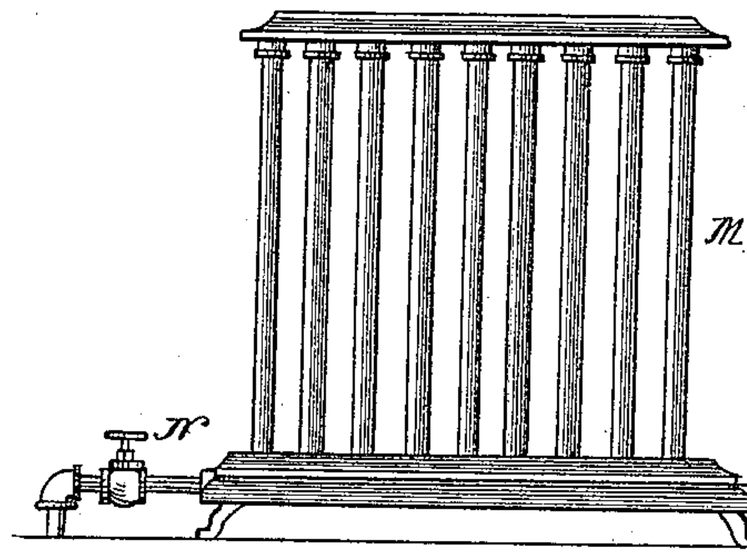


Fig. 2.

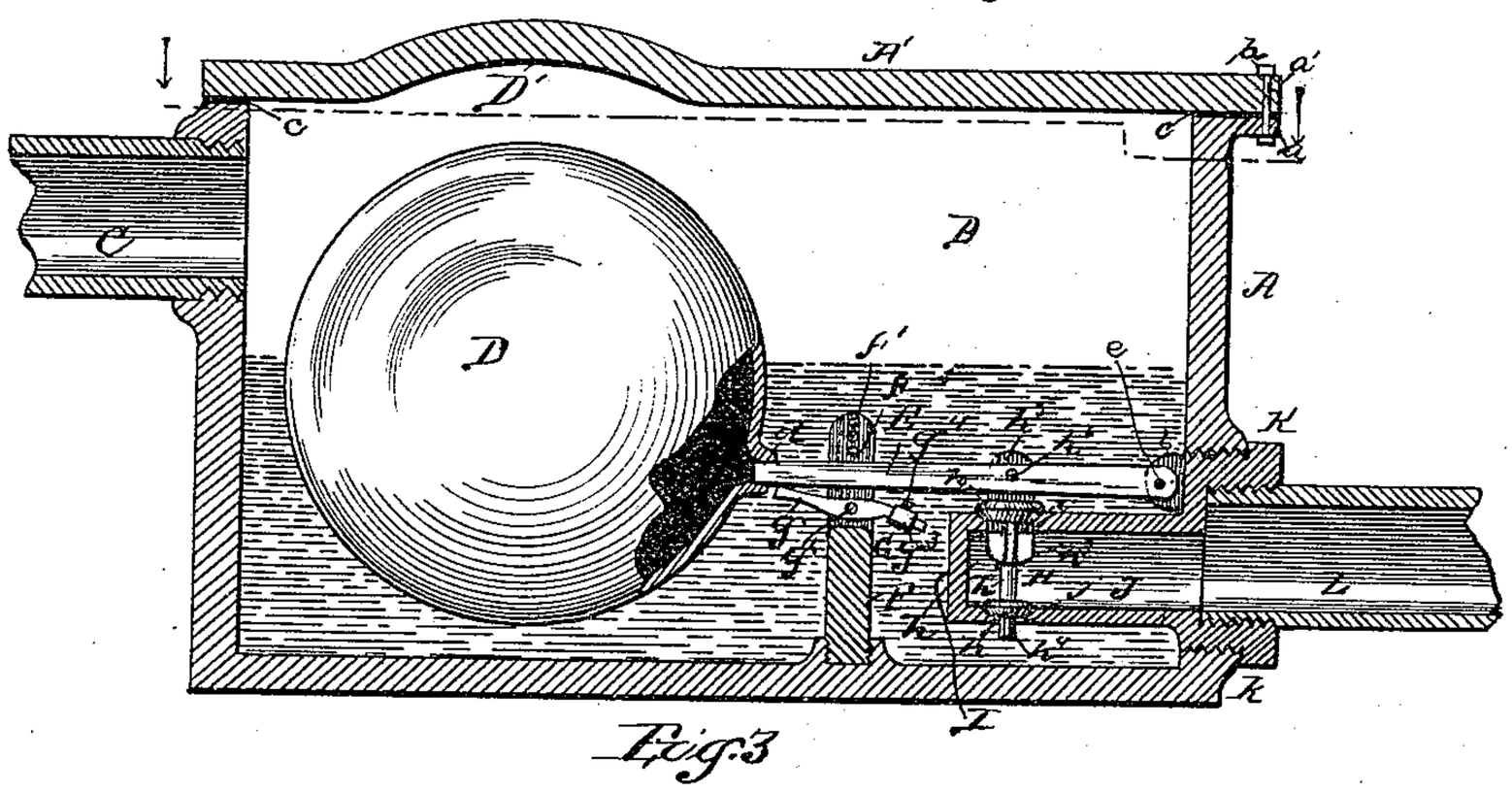
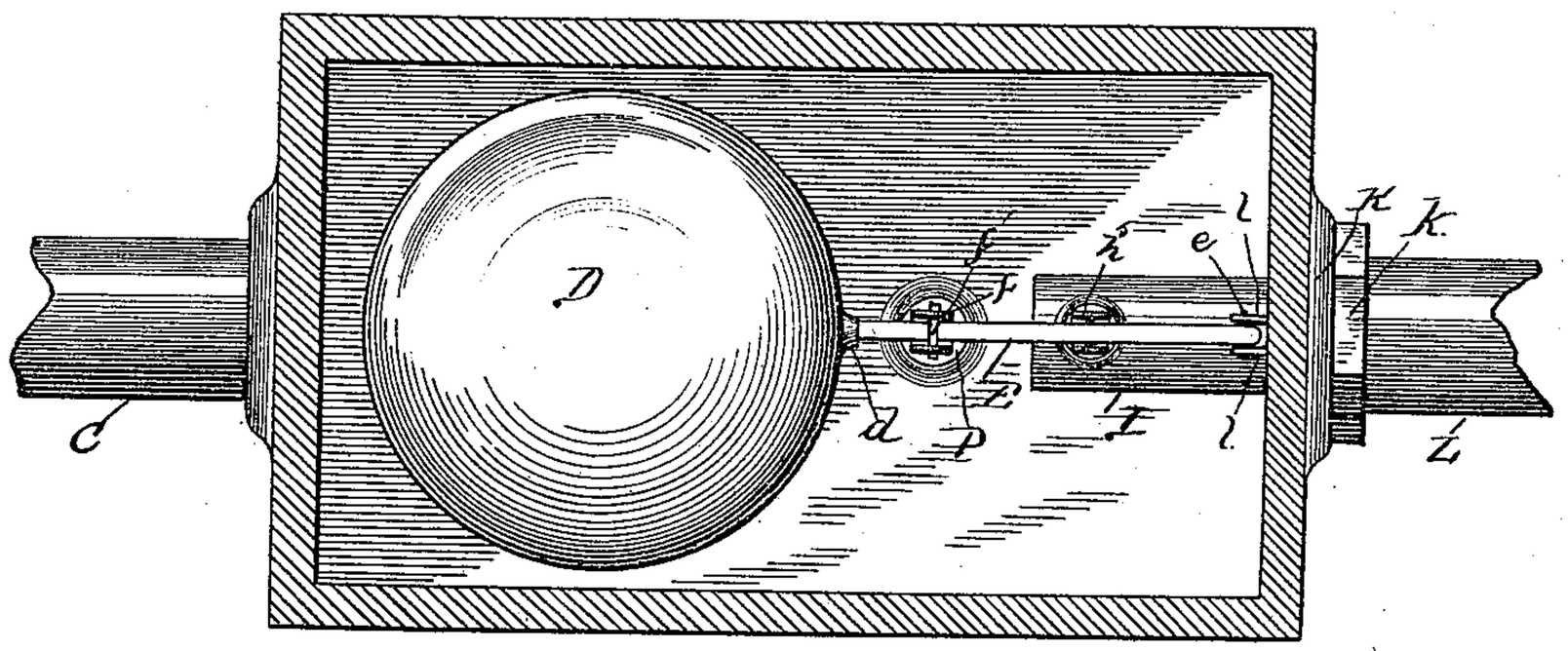


Fig. 3.



Witnesses.

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FRANK G. PROCUNIER, OF CHICAGO, ILLINOIS, ASSIGNOR TO HIMSELF AND EBENEZER HAMILTON, OF SAME PLACE.

STEAM-TRAP FOR RADIATORS.

SPECIFICATION forming part of Letters Patent No. 438,825, dated October 21, 1890.

Application filed December 31, 1889. Serial No. 335,545. (No model.)

To all whom it may concern:

Be it known that I, FRANK G. PROCUNIER, a subject of the Queen of Great Britain, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Traps for Radiators; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, forming a part thereof, in which—

Figure 1 is an elevation showing the trap attached to radiator-coil. Fig. 2 is a central longitudinal section through the trap. Fig. 3 is a horizontal longitudinal section looking down on the float.

It is the practice with steam coils or radiators for heating to use on one side a valve to control the steam, and on the opposite side a valve for the return-pipe of the water of condensation. In use serious defects have been found in such construction of devices, among which the following may be mentioned: The steam passes through the radiator and enters the return-pipe and condenses therein, requiring an extra amount of steam to fill the return-pipe, and this extra steam necessitates the burning of a larger amount of coal to keep up the supply. The shutting off of the steam at the supply end or a reduction of the pressure causes water of condensation to accumulate in the coil, and this water must be blown out before the steam can pass through the radiator and perform its work. The steam coming in contact with the water of condensation produces a cracking and thumping, which is very disagreeable and unpleasant. The water of condensation cools the radiator, which oftentimes becomes air-bound, and to remedy this radiators have been provided with air-vents. The water of condensation not being forced from the coil when the steam is off or the pressure reduced is liable to freeze in cold weather, and oftentimes causes serious damages in being thawed out, and in some cases bursting the coil, and these defects, with others, have been found to exist in radiators where a valve is used at both the supply and exhaust or return end of the radiator, and the object of this invention is to overcome these defects and objections in the present construction of radiator-coils; and its nature consists in providing a steam-trap located between the coil and the return-pipe in such proximity to the coil and so operating as to trap the water of condensation and allow it to escape without permitting the steam to pass into the return-pipe, in providing a float-actuated eduction-valve with a lifting-lever automatically operating to raise the float and hold the valve open for escaping the water of condensation after the steam is shut off and the pressure reduced, in providing an eduction-valve carried by a stem actuated by the rising and falling of a float and a lifting-lever automatically operating against the float-stem to hold the float raised and the eduction-valve open when the pressure is off the trap, and in the several parts and combination of parts hereinafter described, and pointed out in the claims as new.

In the drawings, A represents a shell or case having two sides, two ends, and a bottom, and made of cast-iron or other suitable material, cast or otherwise formed into shape, and having a suitable cover A′. As shown, the top of the sides and ends of the case A have ears *a*, and the cover A′ has corresponding ears *a*′, through which ears *a* and *a*′ bolts *b* pass to secure the cover A′ to the case A, and in order to have a tight joint between the case A and cover A′ a suitable packing *c* is used between the two, as shown in Fig. 2.

B is a chamber in the shell or casing A for the water of condensation, and in this chamber is located the ball or float, its stem, and the controlling-valve for the outflow of the water of condensation.

C is a pipe between the radiator-coil and the shell or casing.

D is a float formed of a hollow ball or sphere, but which can be of some other shape that will rise as the water of condensation rises in the chamber B. As shown, the cover A′ has a concavity D′ to allow the ball or float to rise sufficient to open the escape-valve; but

this concavity D′ is not a necessity, as the case A could be made deeper and allow the ball or float full play.

E is a stem, one end of which is screwed or otherwise secured into a socket *d* of the float D, and the other end is held by a suitable pin or pivot *e*, so as to allow the float D to rise and fall freely.

F is a post screwed or otherwise secured at its lower end in the bottom of the case A, and having at its upper end a slot or opening *f*, in which plays the stem E, and by which the stem E is held and guided, and, as shown, the upward movement of the float D is limited by a stop-pin *f′*, extending across the slot *f* at the upper end of the post F, and, if desired, a series of holes *f″* can be provided in the post F to receive the pin *f′* and adjust the extent of the rise of the float D.

G is a weighted lever having an end *g*, which is in contact with the stem E, and an end *g′*. This lever G is located in the slot *f*, and is mounted on a pin or pivot *g″*, and the end *g′* carries a movable weight g^3, locked to the end *g′* by a set-screw g^4, so that the weight can be moved forward and back on the end *g′* to properly weight the lever G for its end *g* to act on the lever or stem E and raise the float D to escape the water of condensation from the chamber B when the steam is shut off.

H is a double valve, consisting of an upper valve *h*, a lower valve *h′*, and a connecting-stem *h″*. The valve *h* has a series of wings h^3, which furnish a guide for keeping the valve in line, and through the open spaces of these wings h^3 the water of condensation can pass when the valve *h* is raised from its seat, and the valve *h′* has similar wings h^4 for the same purposes as the wings h^3. The valve H is attached to the stem E by ears h^5, between which the stem E is located, and a pin or pivot h^6, passing through the ears h^5 and the stem E.

I is a wall or casing, having an opening *i*, with a seat for the valve *h*, and an opening *i′*, with a seat for the valve *h′*.

J is a passage in the wall or casing I, with which the openings *i* and *i′* communicate.

K is a plug, formed with the wall or casing I and screw-threaded into the end of the case A, and, as shown, the outer end of the plug K has a hexagonal or other edge *k* for applying a wrench to screw the plug into place.

L is the return-pipe, screw-threaded into the end of the plug K, and having its inner face at the bottom flush or in line with the bottom of the passage J. The inner end of the plug K has ears *l*, between which is pivoted the end of the stem E by the pin or pivot *e*.

M is the radiator-coil.

The parts of the trap are assembled by screwing the plug K, with the wall I, into the end of the case A, to bring the openings *i* and *i′* and the ears *l* in a vertical central line. The valve H is dropped into place for the valve *h* to seat at the opening *i* and the valve *h′* to seat at the opening *i′*, which is accomplished by passing the valve end *h′* through the opening *i*. The post F is screwed or otherwise secured in place to be in line with valve H. The ball-float D, with the stem E attached thereto, is placed in the chamber B, and the stem E pivoted between the ears *l* by the pin or pivot *e*. The valve H is attached to the stem E by the ears h^5 and the pin or pivot h^6. The lever G is placed in the slot *f* below the stem E and held in place by the pin or pivot *g″*, and the weight g^3 is adjusted on the end *g′* and locked by the set-screw g^4 at the proper point to overbalance the float D when the steam is shut off and raise the float to open the valves *h* and *h′*. The trap is attached for use by connecting it by the pipe C to the radiator-coil and connecting it with the return-pipe L through the plug K, and the supply-pipe N is to have a shut-off valve, as usual.

In use, steam is admitted to the coil M by raising the valve of the pipe N, as usual, and such steam passes through the pipes of the coil, as usual, and enters the chamber B, and the excess of pressure on the outer faces of the valve *h* will hold the float D down, holding the valves *h* and *h′* closed. The water of condensation formed in the radiator-coil M flows out through the pipe C into the chamber B and rises in the chamber B to a point indicated by the dotted line, Fig. 2, at which point the water acts and raises the float D, lifting the stem E and raising the valve H for the valves *h* and *h′* to rise from their seats in the openings *i* and *i′*, allowing the water to flow out from the chamber B into the passage J through the openings *i* and *i′* and enter the pipe L to return to the receiver.

The water in the chamber B forms a seal against the passage of the steam into the return-pipe, as the water closes the openings *i* and *i′* against steam entering the passage J, and by this means steam is prevented from entering the return-pipe and forming water of condensation in the return-pipe.

The shutting off of the steam from the radiator-coils stops the supply to the chamber B, and when the pressure in the chamber B is sufficiently reduced through condensation of the steam the weight g^3 acts and pulls down the end *g′* of the lever G, raising the end *g*, and thereby raising the float D and stem E; and the raising of the stem E lifts the valve H from its seat and allows the water of condensation to flow out through the openings *i* and *i′*, clearing the coil and chamber B of the water, so that no freezing to produce injurious results can take place.

The trap prevents the steam from entering the return-pipe, and the condensing of the steam and forming water must be done in the coil and the chamber B; and as there is no steam in the return-pipe there will be no condensation in the pipe itself, so that the pipe is clear to carry off the water from the coil, and by preventing the steam from entering the return-pipe a less volume or amount of

steam is required, as the steam cannot pass the trap and must concentrate in the coil, where its full effect is had, giving an increased heat, because the steam is held in the coil by the trap until condensed and cannot enter the return-pipe, where it will be wasted, so far as producing heat in the coil is concerned.

The closing of the return-pipe against the admission of steam makes a great saving in the amount of steam used, for the return-pipe runs from the radiator to the receiver, near the boiler usually, and with a free communication, as must be the case with the old shut-off valve, it follows that the return-pipe must also fill with the steam, requiring for a long return-pipe as much, if not more, steam than is used by the radiator, and this steam in the return-pipe is simply wasted; but by trapping the return-pipe the waste steam is saved and used in the radiator, making a great saving in the fuel required, as less steam will be used with the radiator alone than with the radiator and an open return-pipe.

The device is very simple and can be applied to any radiator-coil by simply removing the valve for the return-pipe, and in use the trap will perform its office and hold the steam from entering the return-pipe and will receive all the water of condensation and take it off without any trouble and inconvenience, and by means of the weighted lever the float can be raised automatically to open the escape-valve when the steam is shut off and the pressure reduced, and allow the water to run out of the radiator into the receiver or boiler, so that no water remains in the coil to be frozen. The trap will operate automatically to escape the water of condensation by the raising of the float as the water rises in the chamber B and will hold the valve open to escape the water unless the condensation is stopped or the water in the chamber B is lowered below the floating-point of the float, when the float will fall and close the valve H and shut off the escape until the water again rises.

The float operates the valve when the pressure is on, and with the pressure on the weighted lever G is inoperative; but with the pressure off and reduced in the chamber B the lever G acts and opens the valve H automatically, so that with the pressure either on or off the valve H is automatically operated.

The lever G acts to raise the float only when the pressure is reduced to nothing, or nearly so, and the water of condensation has reached a point where the float ceases to descend and comes to a rest with the valve H seated and would remain seated, holding the water of condensation. The weight g^3 is adjusted on the long arm g' of the lever G at a point to more than counterbalance the weight of the valve h, so that with no steam-pressure on the float the weight will lift the float and hold it up, raising the valve H and keeping the discharge open for the escape of the water of condensation to the limit of the lower valve h' of the balance-valve H.

The weighted lever G holds the float E up and the valve H raised and open until steam again enters the chamber B, providing a free escape for the air, which is forced out through the passage J into the return-pipe and escapes at the end of the return-pipe, and when the steam-pressure on the valve h is sufficient to overcome the weight g^3 the float drops and closes the valve, shutting off the escape; but this will not occur until the air has escaped from the radiator-coil.

The valve H is not a perfect-balanced valve, as the face of h is larger than the face of h'. The difference is so small and does not affect the proper seating of the valve, one section seating on the outside and the other on the inside of the chamber J, and this valve is automatic in its operation through the float E and the weighted lever G, with the pressure either on or off, and through this automatic working of the valve the water of condensation is free to pass off when the pressure is in the chamber B, and the chamber can be cleared of the water therein when the pressure is off, and at the same time no steam can pass into the return-pipe, and a passage is formed for the escape of air as the valve H is open with the steam shut off and is held open for the escape of air until the pressure is again in the chamber B by the action of the weight G, which raises the float E and stem F, thereby lifting the valve H.

The escape of air without closing the valve H is had by reason of the slow passage of the air, the velocity of which is not sufficient to force down the valve over the resistance of the weighted lever; but with the admission of steam the velocity thereof is sufficient to drive through the valve-opening and bear on the face of both the upper valve h and lower valve h', and as the combined areas of their upper faces is more than the combined areas of their lower faces an increased downward pressure is had sufficient to overcome the resistance of the weighted lever.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination, in a steam-trap, of a float actuating an eduction-valve for the water of condensation, and a lifting-lever automatically operating to raise the float and hold the eduction-valve open after the pressure is off the trap, substantially as and for the purposes specified.

2. The combination, in a steam-trap, of a float, a stem for the float actuating an eduction-valve for the water of condensation, and a lifting-lever operating against the steam to raise the float and automatically open the eduction-valve when the pressure is off the trap, substantially as and for the purposes specified.

3. The combination, in a steam-trap, of a float, a stem for the float, an eduction-valve

carried by the stem and opened and closed by the rising and falling of the float, and a lifting-lever automatically operating against the float-stem to hold the float raised and the eduction-valve open when the pressure is off the trap, substantially as and for the purposes specified.

4. The combination, in a steam-trap, of a float, a stem for the float, an eduction-valve carried by the stem, an eduction-opening controlled by the valve, and a lifting-lever automatically operating against the float-stem to hold the eduction-valve open when the pressure is off the trap, substantially as and for the purposes specified.

5. The combination, in a trap, of a float, a stem for the float, and a weighted lever acting on the float-stem to automatically raise the stem when the pressure is off, substantially as and for the purposes specified.

6. The combination, in a trap, of a float, a stem for the float, a weighted lever acting on the float-stem to hold the float raised when the pressure in the trap is reduced, a controlling-valve formed of an upper and lower valve, both carried by the float-stem, and an eduction-passage having an upper and lower inlet, both controlled by the valve, substantially as and for the purposes specified.

7. The float D and stem E, in combination with the weighted lever G, operating to raise and hold the stem E against a downward movement when pressure is off the trap, substantially as and for the purposes specified.

8. The float D and stem E, in combination with the weighted lever G and valve H, for the lever G to hold the stem up and the valve open against the downward pull of the valve when the pressure is off the trap, substantially as and for the purposes specified.

9. The float D, stem E, and guide-post F, in combination with the valve H and weighted lever G for holding the valve H open to escape the water of condensation when the pressure is off the trap, substantially as and for the purposes specified.

FRANK G. PROCUNIER.

Witnesses:
O. W. BOND,
J. R. ANDREWS.