2 Sheets--Sheet 1.

J. H. BLESSING

Steam-Traps.

No. 149,187. Patented March 31, 1874.

Fig. 1

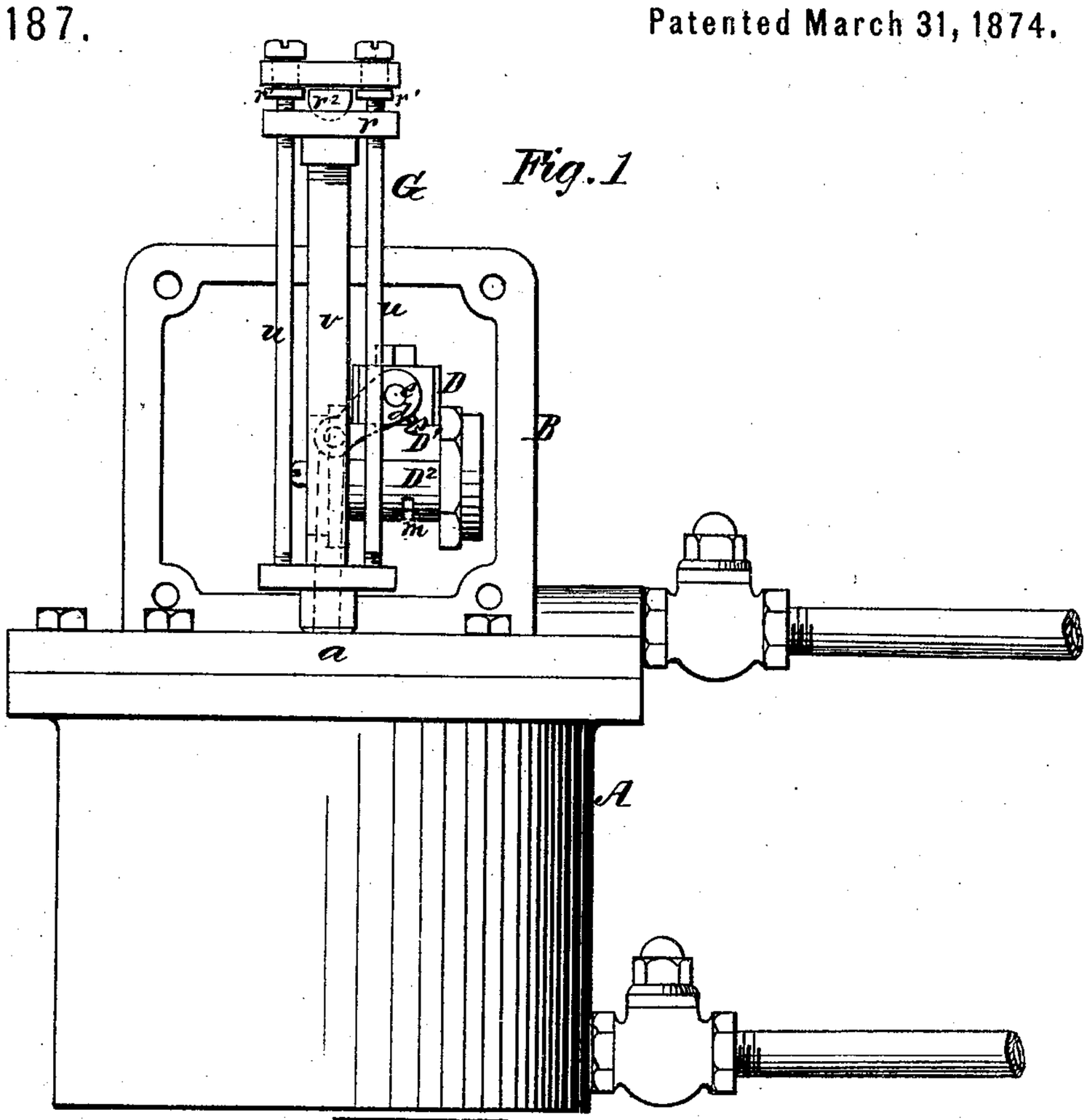
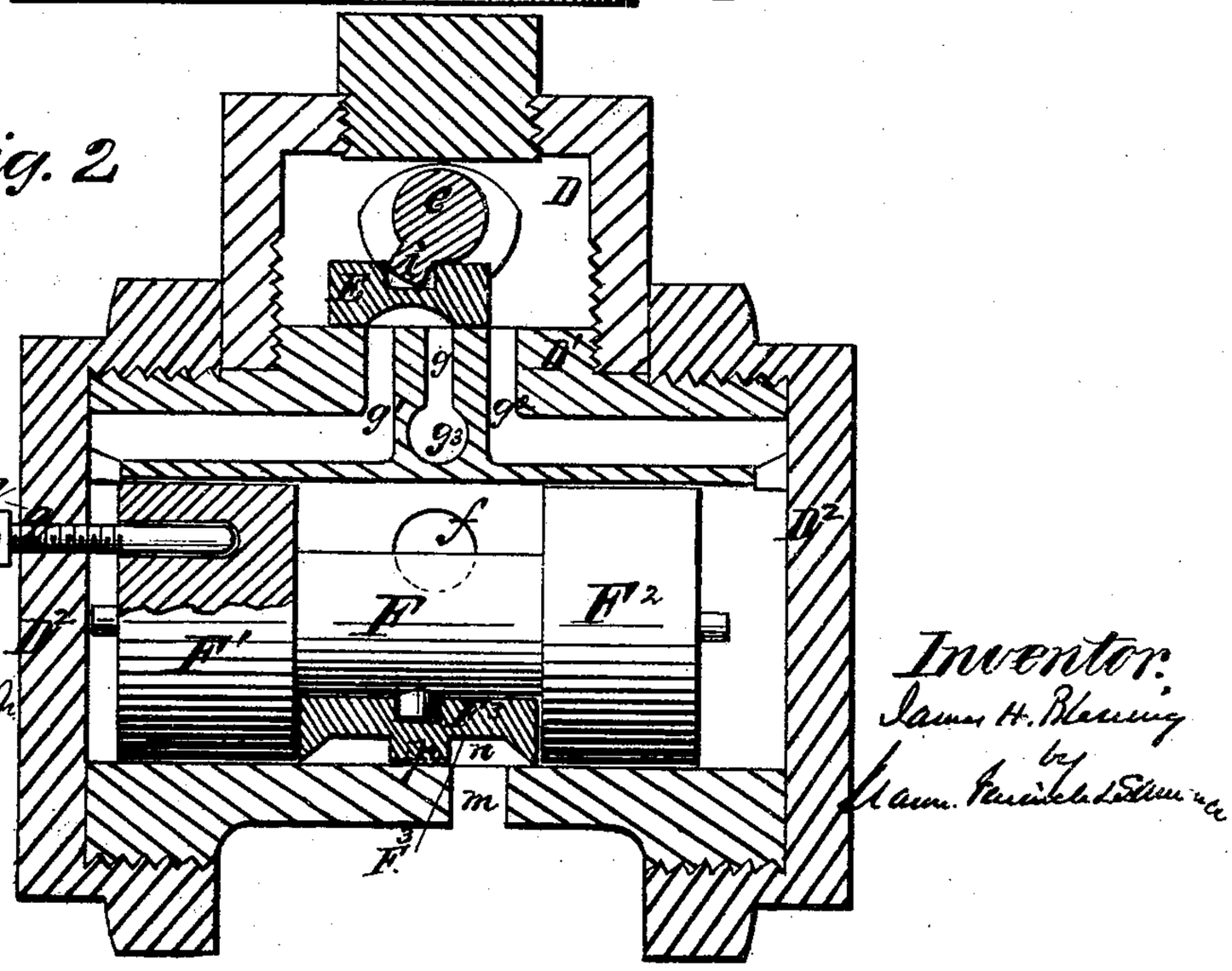


Fig. 2



Witnesses:
James Martin Jr.
J. Wesley Wagner

Inventor:
James H. Blessing
by
Munn, Pennie & Dickerson
Attorneys

2 Sheets--Sheet 2.

J. H. BLESSING

Steam-Traps.

No. 149,187. Patented March 31, 1874.

Fig. 6

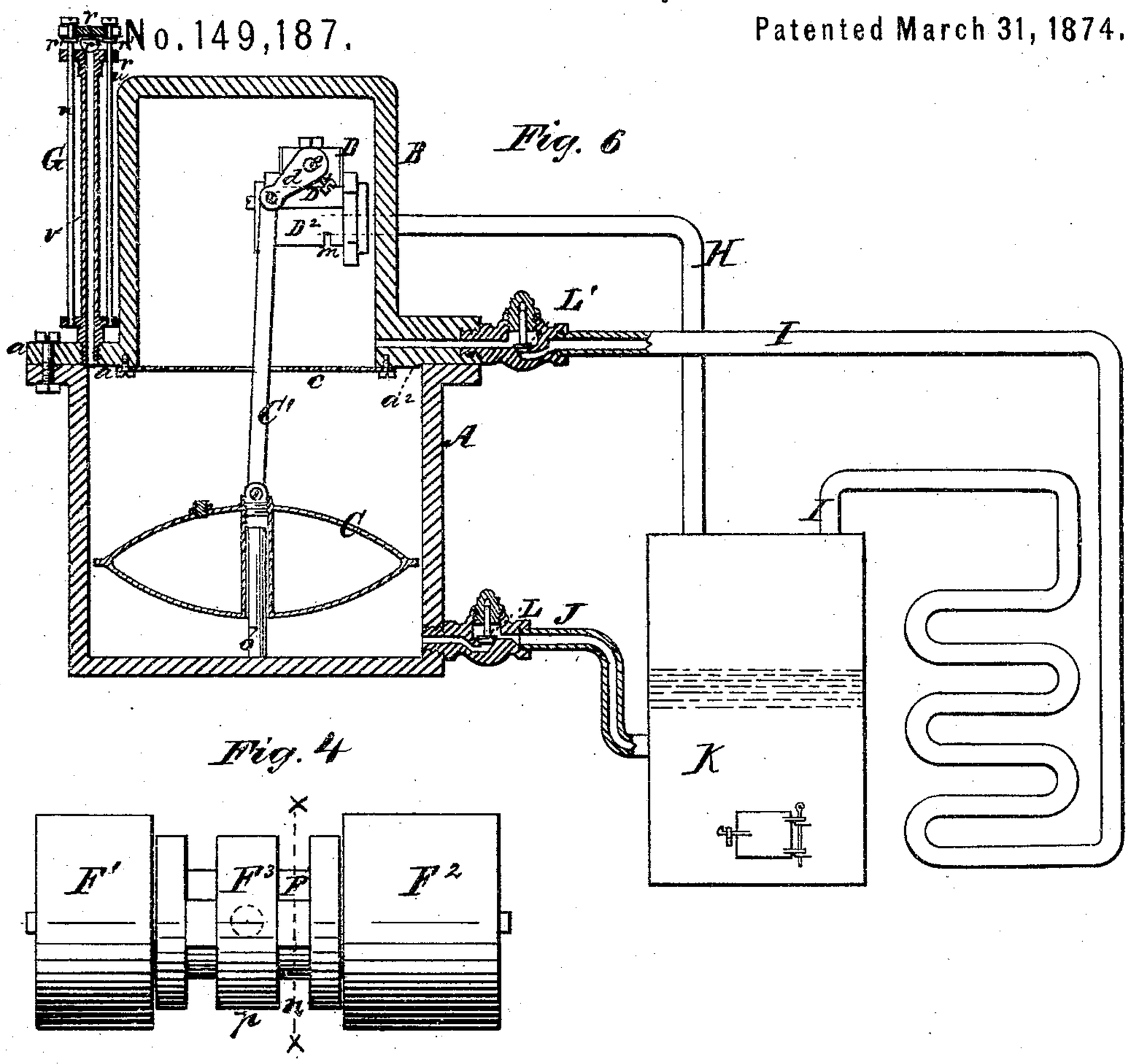


Fig. 4

Fig. 5

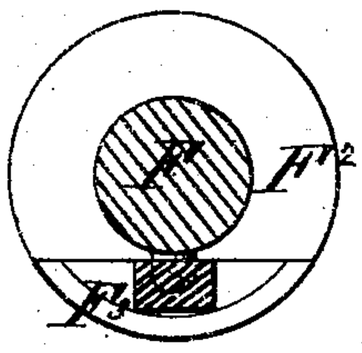
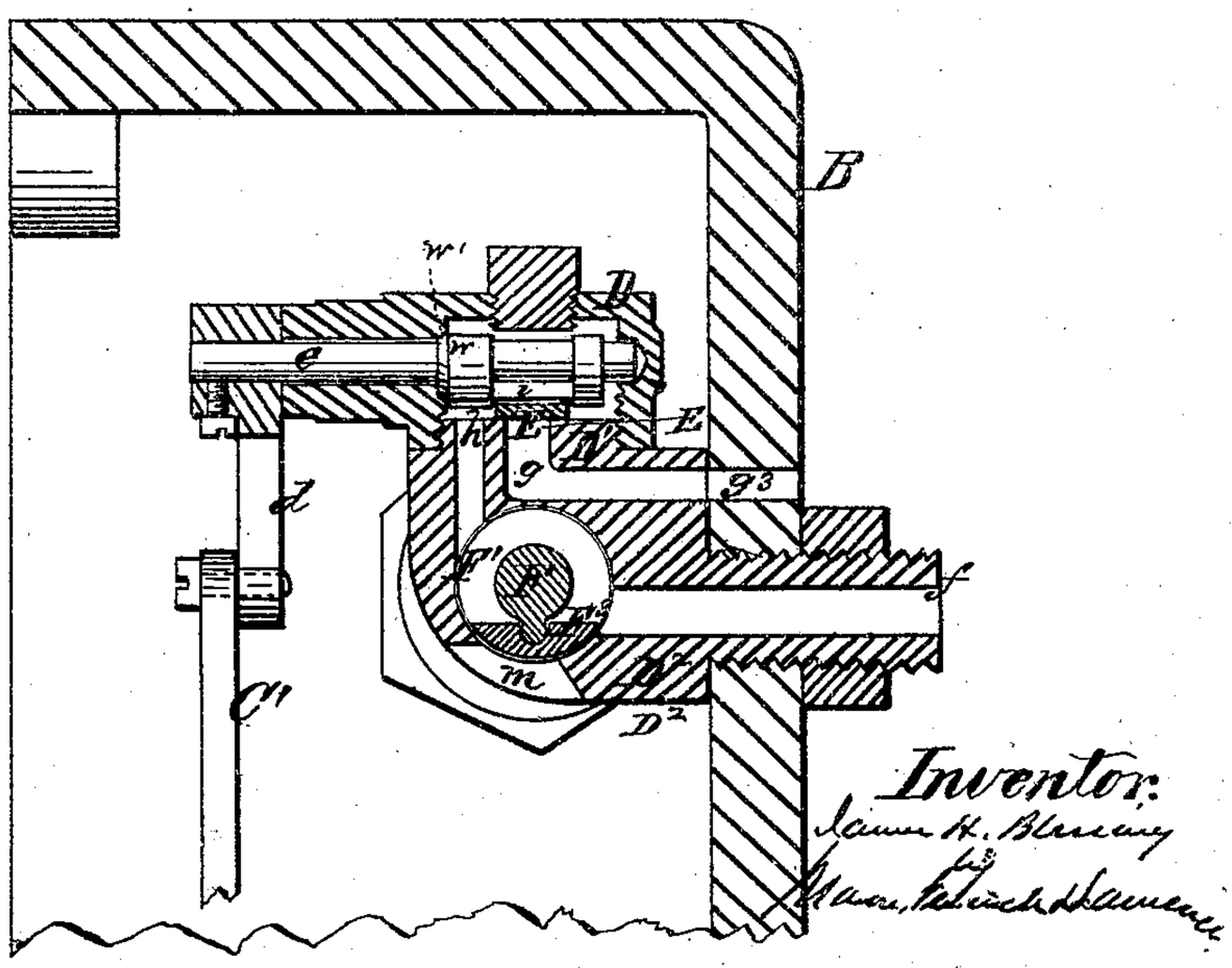


Fig. 3



Witnesses.
James Martin Jr.
J. Wertheimer

Inventor:
James H. Blessing
by his Attorneys
Munn, Pollock & Howson

UNITED STATES PATENT OFFICE.

JAMES H. BLESSING, OF ALBANY, NEW YORK, ASSIGNOR TO FREDERICK TOWNSEND AND JAS. H. BLESSING, OF SAME PLACE.

IMPROVEMENT IN STEAM-TRAPS.

Specification forming part of Letters Patent No. **149,187**, dated March 31, 1874; application filed November 22, 1873.

To all whom it may concern:

Be it known that I, JAMES H. BLESSING, of Albany, county of Albany and State of New York, have invented a new and useful Improvement in Steam-Traps for Heating Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompaing drawings, forming part of this specification, in which—

Figure 1 is a front elevation of a steam-trap with my improvements applied to it, the face-plate of an air-tight auxiliary steam-chest, which I employ on top of the water-trapping vessel, being removed. Fig. 2 is a longitudinal section of the main steam-chest, auxiliary valve, main valve, and valve-chambers, which I employ within the said air-tight auxiliary chest. Fig. 3 is a transverse section of the said auxiliary valve, main valve, and valve-chambers, as arranged within the auxiliary chest, and as combined with the stem of the float which I use in the trapping-cylinder. This view shows the main supply steam-passage into the valve-chest, and also the exhaust-passage from the main steam-chest to the atmosphere. Fig. 4 is a bottom view of the main sliding valve, consisting of a stem, two pistons, and a plate, in this instance. Fig. 5 is a transverse section of the same in the line *x x* of Fig. 4. Fig. 6 is a view, partly in section and partly in elevation, showing the float connected to the rocker-arm of the auxiliary valve, and the trapping-vessel combined with check-valves, water-pipe, and steam coil-pipes, and the direct steam supply-pipe of the boiler, the said check-valves and pipes being the same as heretofore patented to me.

The object of this invention is to trap and return to the boiler the water of condensation from steam heating-coils that are located below or above the water-line of the boiler. The nature of my invention consists, first, in an auxiliary slide-valve of small area, arranged in a main steam-chest, and moving over working and exhaust ports the same as any ordinary slide-valve, connected to the stem of a float of the trapping-vessel, and moved over its ports by the rising and falling of the float in said vessel, in combination with a main steam-valve of greater area, which is moved back and forth on its seat to let in or shut off steam from the trapping-vessel by the steam which is admitted from the steam-chest through its working-ports into chambers beyond the ends of the said main valve, as will be hereinafter described. By this combination I am enabled to move the small auxiliary valve on its seat, so as to open the steam-ports by the buoyancy of the small quantity of water which the trapping-vessel contains, and thus open a passage for the admission of steam of the full boiler-pressure to the main valve, and employ such steam for moving the said valve on its seat, and opening and closing the port which forms the communication between the main steam-chest and the trapping-vessel, steam supplied from the steam-chest being used while the port is open, for the purpose of assisting the trapping-vessel in its operation of taking in the water of condensation from steam-coil or other steam-heaters, and returning it to the boiler, on the same plan as in my circulating steam-trap patented February 13, 1872. My invention consists, second, in constructing on the trapping-vessel an auxiliary steam-tight chest or chamber, which is in communication at its lower end with the trapping-vessel, and locating the valve mechanism within this chamber. By this construction the stem of the float and the shaft of the rocker-arm are worked without a stuffing-box, and thus much friction obviated, and a certain and uniform operation of the trap at all times insured, as will be hereinafter explained.

To enable others skilled in the art to make and use my invention, I will proceed to describe the same with reference to the drawings.

A is a flanged trapping-vessel, of circular or any other form in its horizontal section. B is a rectangular chamber or chest, made open at its lower end, set upon the top of this vessel and packed, and bolted, by a flange, *a*, on its lower edge, to the flange of the vessel. The diameter of the vessel is greater than the width or length of this chest, and therefore a shoulder, a^2, is formed at the point of union between the vessel and the chest. To this shoulder the ordinary perforated diaphragm *c* is

fastened. The chamber B is made steam-tight, except at the points where steam is admitted into it, and where steam and air are expelled or exhausted from it. C is the float, made in form of a flattened spheroid, and of a diameter nearly equal to the vessel A. It has a tubular passage through it, and is fitted over a vertical guiding-stem, *b*, which extends up from the bottom of the vessel about half the depth thereof. This float has a connecting-rod, C, pivoted to it, and said rod passes up through a central opening in the diaphragm, and connects with an arm, *d*, of a rock-shaft, *e*, as shown. The rock-shaft is constructed with a concave circular shoulder, *w*, which fits a convex seat, *w'*, in the steam-chest on that side where said shaft passes out into the auxiliary steam-chest. This mode of forming the joint dispenses with the use of a stuffing-box or packing, as such joint always works steam-tight when set up properly. D is the steam-chest for the valves; it is mounted upon a seat, D^1, of a cylinder, D^2. The valve-chest, cylinder, and valve-seat are fastened to the back plate of the auxiliary chest B by means of a hollow screw-plug, *f*, which connects with a steam-pipe leading from the dome of a steam-boiler. The seat of the cylinder has an ordinary exhaust-port, *g*, and two working-ports, g^1 g^2; the exhaust-port coincides with a passage, g^3, in the back of the chest B, while the working-ports enter the cylinder D^2 at its respective ends, like as in any piston-engine. There is also a supply steam-passage, *h*, which leads from the steam-chest down into the cylinder D^2, between the pistons of the main valve, and connects with the passage formed by the screw-plug *f*, as shown. This passage is always open to the pressure of steam in the boiler. There is another passage, *m*, in the cylinder, which leads into the trap-cylinder. E is the auxiliary valve, and F F^1 F^2 F^3 the main or piston valve. The valve E is simply a slide-valve, operated by a toe or rib, *i*, on the rock-shaft, which is connected to the rod of the float. The main valve consists of a stem, F, with a piston, F^1, on one end, and a piston, F^2, on the other end of a transversely-grooved plate, F^3, set in between the piston-heads, and connected to its stem F by a pin, so as to rest snug upon the bottom of the cylinder, as shown in Fig. 2. The groove *n* in this plate admits steam to pass from the steam-chest into the trap when the passage *m* is open, which is the case when the part *p* of the plate stands on one side of the passage *m*, as shown in Fig. 2; but when the said part *p* is over the said passage, no steam can escape into the trap. Two grooves are shown, but only one is employed for the purpose stated. The piston is guided in the cylinder and held from turning by means of a set-pin, *q*, passed through one of the cylinder-heads into a hole in one of the piston-heads, as shown. G is the air-valve; it consists of an expansion-tube, *v*, with a ball-valve seat, *r*, on its end, and of rods *u*, with a suspended valve-seat, r^1, upon them above the seat *r*. The ball or semi-ball valve r^2 plays up and down between the two seats. This air-valve is screwed into the top of the trapping-vessel A, as shown. H is the direct steam-pipe, connecting with the passage *f*; I, the steam coil-pipe, leading into the auxiliary steam-chest B; and J, the water-discharging pipe, leading out of the vessel A; and K is the boiler; L L', check-valves. These parts are arranged and operated just the same as in my circulation-trap hereinbefore referred to, and therefore are not claimed as new here.

The trap being placed above the water-line in the boiler—say, thirty inches, more or less—steam is first taken direct from the boiler through the pipe H and hollow plug *f* into the space between the pistons F^1 F^2, and through the passage *h* into the small steam-chest D. This insures boiler-pressure of steam at all times in the chambers and passages just mentioned. Steam is next admitted from the boiler K into the coil of the pipe I, and, as this coil is filled with air, the steam forces the air up into the chest B and trap-cylinder A, through the check-valve L'; the trap-cylinder filling with air raises the ball-valve r^2, and the air escapes to the atmosphere. In the meantime steam has taken the place of air in the coil of the pipe I, and the coil has been giving off heat to the surrounding atmosphere, a part of the steam has condensed, and a certain amount of water from condensation has dripped down into the lowest part of the coil, and there being a pressure of steam in the coil on top of the water, and no pressure in the trap-cylinder, the water is forced up through the pipe I and check-valve L into the chest B, from whence it falls through the perforated diaphragm *c* into the cylinder A, and raises the float C. The float, after moving a certain distance upward, causes the rocker-shaft *e* to move the small valve E to the left, opening the port g^2 for the admission of steam on the right-hand side F^2 of the double piston-valve. At the same time the pressure is relieved from the left-hand side F^1 of the piston-valve by passing out through the port g^1 and exhaust-port *g* to the passage g^3, which leads to the atmosphere, thus causing the piston-valve F^3, with the plate which closes and opens the passage *m*, to move quickly to the left, and open the said passage *m*, and admit steam into the trapping-cylinder A for equalizing the pressures. When the steam first enters the trap-cylinder A it passes up into the tube of the air-valve G, heats the same, and thereby causes the tube to expand, and move up against the ball-valve r^2, and close the passage against the escape of steam. After the pressures are equalized the water in the trap-cylinder A will begin to flow out through the valve L and pipe J, and as the water descends in the trap-cylinder the float falls and carries with it the connecting-rod C, and said rod pulls down the rock-arm *d*, and this causes the rocker-shaft *e* to move the valve E to the right, thus closing port g^2 and opening port g^1, and admitting steam on the left-hand side of the piston, which steam moves the piston with plate F

quickly to the right, and thereby closes the passage *m*, and prevents, for the time being, any more steam entering the trap-cylinder A. The trap-cylinder A is now full of steam, which corresponds with the pressure in the boiler, or nearly so, and in a few seconds this pressure becomes reduced from condensation, when the drip-water from the coil will again be forced up, and the first injection of water will be showered through the perforated diaphragm *c*, and this will cause the remaining steam in the trap-vessel to be condensed, thus forming a partial vacuum in the said vessel, and consequently the water to be more rapidly forced into the vessel, and the trap to repeat its operations with greater rapidity. The vacuum is maintained by the ball-valve r^2 being loose and dropping upon its seat, and preventing the air from going into the cylinder A and destroying it.

By the use of the air-valve G the trap is made perfectly automatic. Without this air-valve it would be necessary, in the first place, in starting the coils, to blow the air out of the coils and trap-vessel by placing an air-cock in the top of the trap, the same as I have shown and described in my other patents for steam-traps; for if the air were not blown out it would fill the trap-cylinder and accumulate pressure, and it would be impossible to get the water in without first getting rid of the air. I have found, even when I supposed all the air was out, there would still be some remaining in the pipes, and this, in course of time, would stop the trap from operating, and I was obliged to blow off again. By the use of the air-valve all attention to the blow-off is dispensed with; for, if air accumulates in the trap, the tube *r* contracts, the air blows out the trap, and the trap continues to operate. Thus it will be seen that this is an important addition to the trap, not only to the specified steam-trap, but for all float-traps, whether they return the water to the boiler or not.

I deem it proper to state that the within-specified steam-trap is not intended to supersede my gravitating steam-trap, but to be used in places where there is not room enough to allow for the swinging down of the pipes, and also in places where the boilers are arched over and there is not sufficient height over the top of the boilers to get the trap in position.

In experimenting with float-traps, I have found it next to an impossibility to successfully use rods and stuffing-boxes, for the reason that the power it requires to lift the valve uses up all the power of the buoyancy of the small quantity of water contained in the trap. For instance, say we have a float capable of lifting a valve one-half inch in diameter with fifty pounds pressure, and the rod attached to the float passed through a stuffing-box to the outside and all nicely packed, and it operated very well to-day, but on the morrow it was found that the stuffing-box leaked a little water around the rod, and to remedy this we screwed down to tighten it—this remedy would be found all right, but it so increased the friction that the float would not work under it.

With my present construction and arrangement I have not only dispensed with stuffing-boxes to reduce the friction, but have compounded the steam-valve for equalizing the pressures, and by the use of this valve the float has only to operate the small slide-valve E to admit steam on the pistons to move the large valve-plate F^3, which admits the steam for equalizing the pressures. Further, by the use of this compound valve (the float operating the small valve) I am enabled to secure a greater margin for the float; for instance, if it required four pounds on the end of the arm to move the small valve, and I had a float which would give me by displacement a power equal to eight pounds, I would have a margin of four pounds to secure successful operation; and, finally, by this arrangement of compound valve and the avoidance of the use of stuffing-boxes, I secure a float-trap which, after first being put in operation, will always remain the same—that is, there will be no difference in the friction, the trap operating under fifty pounds pressure the same one day as another.

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

1. The combination, in a steam-trap for a heating apparatus, of a valve, E, with the float of the trap, and with a valve which is operated by the steam admitted to it after the valve E is moved on its seat, substantially as and for the purpose described.

2. The trapping-vessel A of a steam-trap, constructed with an auxiliary steam chamber or chest, B, in combination with the steam-chest D, arranged within the chest B, and provided with a valve-mover, F, whose journal is fitted steam-tight within the chest D by the device *w w'*, and connected outside of the chest D to the float of the trap by an arm, *d*, which is within the chest B, substantially as and for the purpose described.

JAMES HENRY BLESSING.

Witnesses:
A. P. STEVENS,
M. J. POWERS.