(No Model.)

J. H. BANKS.

STEAM TRAP.

No. 352,387. Patented Nov. 9, 1886.

Fig. 1.

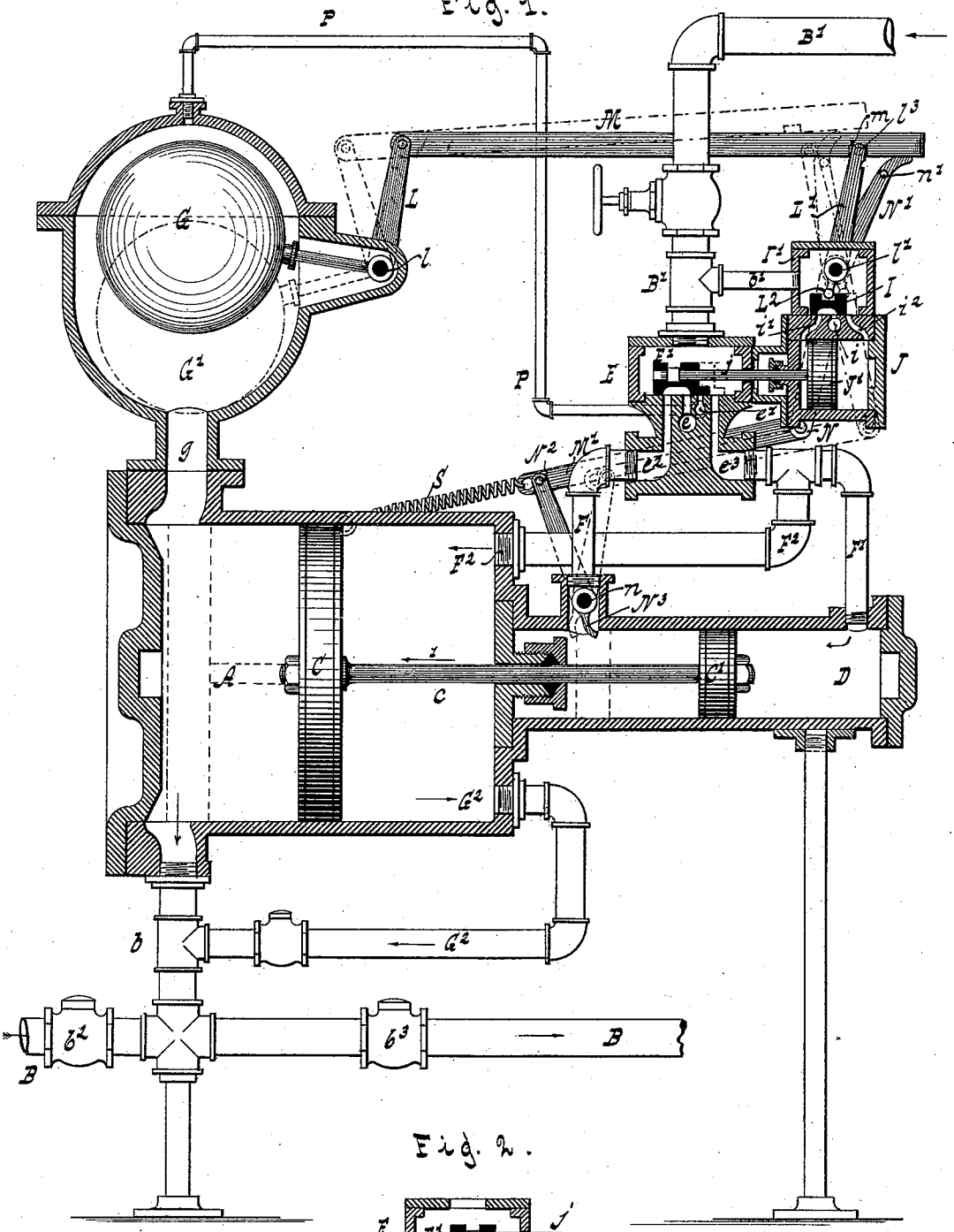
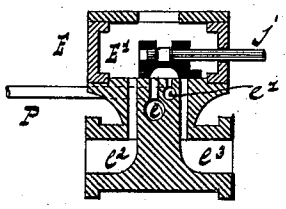


Fig. 2.



WITNESSES:

Alfred Stanton

William Miller

INVENTOR

Joseph H. Banks.

BY

Van Santvoord & Hauff

his ATTORNEYS.

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

JOSEPH H. BANKS, OF NEW YORK, N. Y.

STEAM-TRAP.

SPECIFICATION forming part of Letters Patent No. 352,387, dated November 9, 1886.

Application filed April 1, 1886. Serial No. 197,446. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH H. BANKS, a citizen of the United States, residing at New York, in the county and State of New York, have invented new and useful Improvements in Steam-Traps, of which the following is a specification.

This invention relates to improvements in steam-traps of that class which are applied to steam-heating apparatus and serve to return the water of condensation to the boiler.

My invention consists, essentially, in a steam-trap embodying in its structure a water-cylinder, which receives the water of condensation from the coils, a piston in said cylinder, an auxiliary piston which works in a separate steam-cylinder, a chamber communicating with the water-receiving cylinder, a float therein, which rises with the level of water, and a steam-valve, which is moved during the rise of the float to admit steam to both cylinders to effect the working stroke of the pistons. The valve is moved to admit steam to the auxiliary steam-piston for the return-stroke by means of levers which are actuated by the steam-piston, all of which is more fully pointed out in the following specification and claims and illustrated in the accompanying drawings, in which—

Figure 1 represents a central vertical section of an apparatus embodying my invention. Fig. 2 is a similar section of detail parts.

Similar letters indicate corresponding parts.

In the drawings, the letter A designates the water-receiving cylinder, to which the water of condensation is conducted by the return-pipe B of the heating-plant. C is the water-piston, which works in the cylinder A, and is connected by a rod, *c*, with an auxiliary piston, C′, that fits the bore of a steam-cylinder, D. This cylinder is shown smaller in diameter than the water-cylinder, but is of the same length and is separated steam-tight from the other. A stuffing-box prevents leakage about the piston-rod *c*.

The steam-cylinder is in communication with a valve-chest, E, which receives live steam directly from the boiler through a steam-pipe, B′, and the valve-chest is provided with a main exhaust-port, *e*, an auxiliary exhaust-port, *e′*, and two steam-ports, e^2 e^3, that are all controlled by an equalizing slide-valve, E′, having considerable lap at one end. As shown in the drawings, the steam-cylinder is connected with the ports e^2 e^3 by steam-pipes F F′, respectively, one at the front and the other at the rear end of the cylinder.

The water-cylinder A is in communication with the valve-chamber through port e^3 and a steam-pipe, F², which latter is connected to the steam-pipe F′, so that when the valve E′ opens port e^3 live steam is admitted to both cylinders behind the pistons C and C′, respectively; but when the valve opens port e^2 steam can enter only steam-cylinder D and in front of its piston.

To admit steam to both cylinders A and D during the working stroke of piston C, the valve E′ is moved on its seat by connections, which will be hereinafter described, with a float, G, that is contained in a chamber, G′, which is connected with the water-cylinder by a branch, *g*, so that the water of condensation enters this chamber to raise the float after a sufficient quantity of water has accumulated to fill the cylinder. This float G may be connected directly to the valve E′, so as to move the same on its seat as it rises; but for reasons to be presently stated I cause the float to operate an auxiliary slide-valve, I, which is situated in a valve-chest, I′, and controls an exhaust-port, *i*, and steam-ports i' i^2, leading to an auxiliary cylinder, J. In this cylinder J is fitted a piston, J′, which is connected with the valve E′ by a rod, *j*, and such connection is made adjustable, as usual, by means of a nut engaging a thread on the rod *j*. The auxiliary cylinder is closed steam-tight from the valve-chest E, and a stuffing-box prevents leakage about the rod *j*.

Steam is admitted to the auxiliary valve I by a small branch pipe, *b′*, communicating with the steam-pipe B′, and when the valve I opens one of the ports i' i^2 steam enters the auxiliary cylinder J and moves the piston therein, whereby the equalizing-valve E′ moves on its seat to admit steam from the steam-pipe B′ to the cylinders A and D, or to the cylinder D, as stated. To move this auxiliary valve I on its seat as the float rises, I swing the float from a rock-shaft, *l*, and an arm, L, rigidly secured to this rock-shaft is connected by a link, M, with an arm, L′, that is rigidly attached to

a rock-shaft, l', which extends into or through the valve-chest I' and carries an arm, L^2, engaging with the auxiliary valve. The arm L' is not directly secured to the link M, as in such a case it would be vibrated to move the valve as the float falls, but carries a pin, l^3, which engages a recess, m, in the link, so that if the link M is swung upwardly about the arm L said link is thrown out of engagement with the pin on the arm L', and consequently the float can fall without moving the arm.

To throw the link M out of engagement with the pin l^3, the piston C' engages, when near the end of its forward stroke, with a finger, N^3, which is carried by a rock-shaft, n, and extends into the cylinder D in a position to be engaged by said piston. An arm, N^2, which is rigidly secured to the rock-shaft, is connected by a link, M', with one arm, N, of a lever, N N', that is loosely secured to rock-shaft l', and can turn about the same as a fulcrum without causing rotation of said shaft. The other arm, N', of this lever is in contact with the free end of the link M, so that when the piston C' engages finger N^3 the arm N' engages the link M and raises it upward to clear the arm L', which allows the float to fall. As the motion of the arm N' continues a pin, n', thereon engages with the arm L' and swings the same about its fulcrum, whereby the valve is moved to open port i', which consequently causes port e^2 to be opened, and steam is admitted in front of piston C'. To return the lever N N' and also the finger to their normal positions, one end of a spring, S, is connected with the link and the other end to some suitable portion of the apparatus.

In arranging the steam-fitting for the trap, the return-pipe B is connected with the water-cylinder A by a branch, b, which is located between two check-valves, b^2 b^3, opening in the same direction, so that the water of condensation lifts check-valve b^2 and enters the cylinder.

To relieve the pressure on the water as it gradually fills the cylinder, a small vent-pipe, P, is led from the top of the float-casing G and connected with the auxiliary exhaust-port e' of the steam-chest E, which port is in communication with the main exhaust-port e, while the water accumulates in the cylinder, Fig. 2.

To save the exhaust-steam from behind piston C, a steam pipe, G^2, is led from the rear head of the cylinder to the branch pipe b, which pipe is provided with a check-valve opening toward the pipe b. To save the exhaust from behind piston C', the port e^3 is kept closed by the lap of the valve E', as shown by dotted lines in Fig. 1 and full lines in Fig. 2, so that the exhaust-steam cannot escape in this direction, but finds its way through pipes F' and F^2 to the cylinder A.

In the drawings the apparatus is shown by the full lines, Fig. 1, in the operation of expelling the water of condensation which had accumulated in the cylinder, and the pistons C C' are moving in the direction of arrow 1. The float is in its highest position and the valve I opens port i^2, and live steam is entering the cylinder D through pipe F', and cylinder A through pipe F^2, so that the full boiler-pressure is on both sides of piston C and on one side of piston C'. The exhaust-steam from cylinder D escapes through pipe F and port e^2. As the pistons C C' advance to the end of their working stroke, piston C' engages finger N^3 and the auxiliary valve I is caused to open port i', whereby valve E' is moved into the position shown by dotted lines in Fig. 1, and in full lines in Fig. 2, in which position of the same port e^2 is open, port e^3 closed, and the exhaust-ports e e' are in communication. Steam entering port e^2 enters cylinder D only and drives the pistons on their return or non-working stroke. The exhaust-steam from cylinder D makes its way through pipe F' to cylinder A, and from thence through pipe G^2 to the receiving end of the cylinder. Exhaust-steam from the cylinder A also passes to this end of the cylinder through pipe G^2.

In moving the valve I on its seat to open port i' for the return-stroke of the pistons, the arm N of lever N' is vibrated, as stated, and lifts the link M, whereby the pin l^3 of arm L' is cleared from the recess m and the float falls. The arm N' now engages the arm L' and the valve I is moved to open port i'. The spring returns the lever N N' to its original position as soon as piston C' releases the finger N^3 and the link M falls and rests on pin l^3 of arm L'. As the float rises with the accumulation of water the link M is moved forward, and finally recess m engages pin l^3, and the valve I is moved to open port i^2. As the full boiler-pressure is on both sides of piston C while the trap is feeding to the boiler, the total force acting against the water in the cylinder is in excess by the force exerted by the steam on the small piston C', less the friction of the working parts. By properly proportioning the piston C' the trap can serve to lift the water of condensation when said trap is located below the water-line or below the boiler.

My object in using two valves, E' and I, is to procure the full boiler-pressure upon piston C' to the end of its stroke. As the piston engages finger N^3 valve I gradually closes the steam-port i^2, but valve E' is not moved to close its port until sufficient steam has entered cylinder J to move piston J'.

It will be observed that when the piston C is at the end of its working stroke the water which has been forced into the float-chamber is confined therein, since the branch g is closed by the piston C, which comes into contact with the interior face of the cylinder-head, and this water serves on its release to condense the exhaust-steam which enters the cylinder.

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

1. The combination, with the water-receiving cylinder A and its piston C, of the auxiliary cylinder D, the piston therein connected with the piston C, a chamber communicating

with the cylinder A, a float therein, and an equalizing-valve connected with said float, which distributes steam to both cylinders, substantially as shown and described.

2. The combination, with the water-receiving cylinder A and its piston C, of the auxiliary cylinder D, the piston C′, connected with piston C, a chamber communicating with the cylinder A, a float therein, and an equalizing-valve connected with said float, which distributes steam to both pistons on their working stroke, and is operated by piston C′ to distribute steam to the piston C′ on its return-stroke, substantially as shown and described.

3. The combination, with the water-receiving cylinder A and the cylinder D, of the connected pistons C C′, the chamber G′, communicating with cylinder A, the hinged float G therein, the valve I, the arms L L′ L^2, and link M, connecting the same with the float, the finger N^3, adapted to be engaged by piston C′, arm N^2, link M′, and lever N N′, for tripping the link M and moving the valve I on its seat, the spring S, the piston J′, and the valve E′, connected thereto to distribute steam to the cylinder, substantially as set forth.

4. The combination, with the water-receiving cylinder A and its piston C, of the auxiliary cylinder D and its piston C′, connected with piston C, a chamber communicating with the cylinder A, a float therein, the valve I, operated by the float to admit steam to both cylinders, and by piston C′ to admit steam to cylinder D, the steam-ports e^2 e^3, the exhaust-ports e e′, one of which, e′, is in communication with the chamber, the equalizing-valve E, controlling said ports to bring the two exhaust-ports in communication while the cylinder is receiving, substantially as shown and described.

5. The combination, with the water-receiving cylinder A and the cylinder D, of the connected pistons C C′, the chamber G′, communicating with cylinder A, the hinged float G therein, the valve I, the arms L L′ L^2, and link M, connecting the same with the float, the finger N^3, adapted to be engaged by piston C′, an arm, N^2, link M′, and lever N N′, for tripping the link M and moving the valve I on its seat, the spring S, the piston J′, the auxiliary valve E′, connected thereto to distribute steam to the cylinder, and the connection for leading the exhaust-steam into the receiving-cylinder, substantially as described.

In testimony whereof I have hereunto set my hand and seal in the presence of two subscribing witnesses.

JOSEPH H. BANKS. [L. S.]

Witnesses:

W. HAUFF,

E. F. KASTENHUBER.