2 Sheets--Sheet 1.

W. H. JENKINS.

Feed-Water Apparatus for Steam-Boilers.

No. 168,398. Patented Oct. 5, 1875.

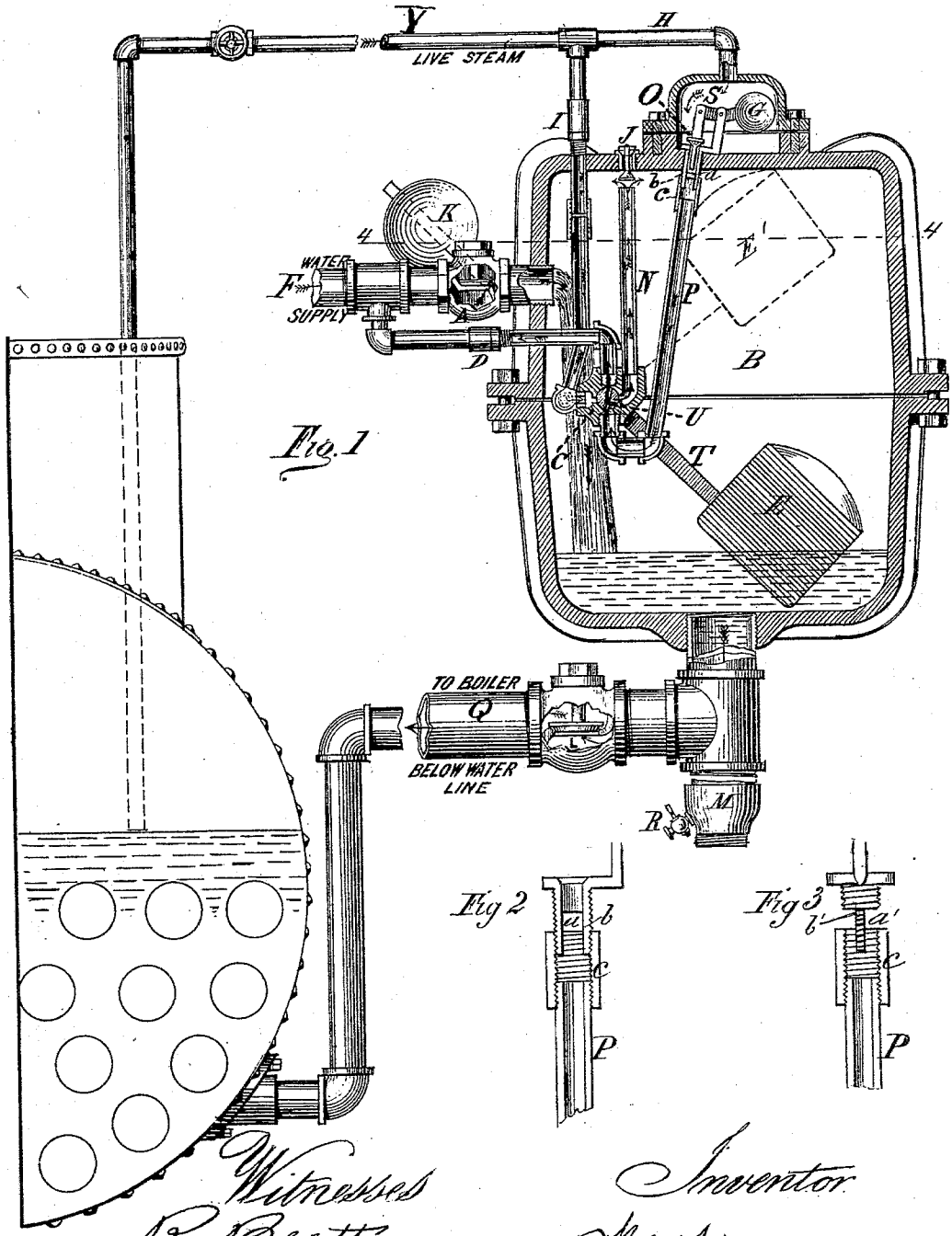

Fig. 1

Fig 2

Fig 3

Witnesses
R. Beatty
Jas. F. Bayes

Inventor
W. H. Jenkins

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

2 Sheets--Sheet 2.

W. H. JENKINS.

Feed-Water Apparatus for Steam-Boilers.

No. 168,398. Patented Oct. 5, 1875.

Fig 4

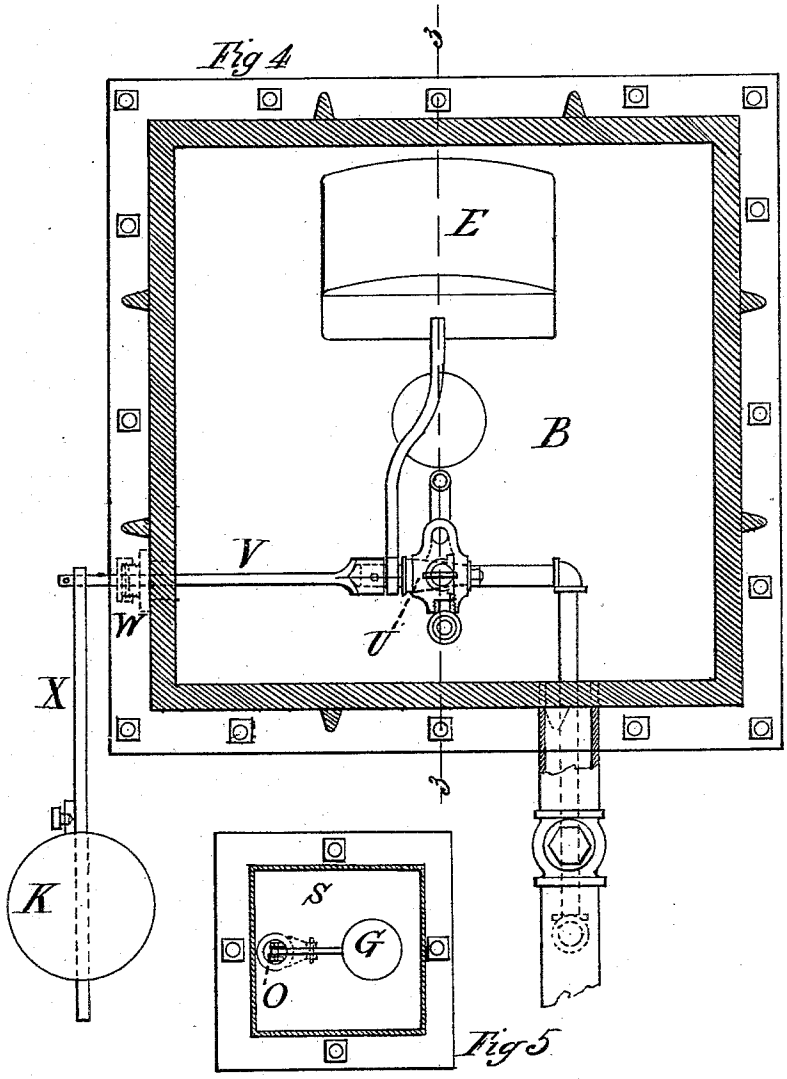

Fig 5

Witnesses
R. Beatty
Jas. L. Bayes

Inventor
Wm. H. Jenkins

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM H. JENKINS, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN FEED-WATER APPARATUS FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. **168,398**, dated October 5, 1875; application filed August 28, 1875.

To all whom it may concern:

Be it known that I, WILLIAM H. JENKINS, of Philadelphia, county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Automatic Boiler-Feeders and Return Steam-Traps, which improvement is fully set forth in the following specification, reference being had to the accompanying drawings.

Figure 1 is a vertical section through center, as shown by line 3 3 in Fig. 4, which is a plan above the flanges. Fig. 5 is a plan of chamber S and valve O.

The object of my invention is to reduce the first cost and increase the reliability of automatic boiler-feeders and return steam-traps, thereby reducing the danger of explosion, and effecting a saving in fuel, by the combination, in a boiler-feeder, of the four-ported valve-seat C, Fig. 1, with the plug-valve U and counterbalanced valve O and ball G, connected to the valve-seat C by the pipe P, and operated by the float E; also, the combination with them of the pipe I and the pipe N, for admitting steam into the case B, and the pipe D, for discharging steam from the case B into the water-supply pipe F, thereby facilitating the condensation, and forming a vacuum more rapidly; also, the double-seated valve J with the pipe N, and the pocket M and valve R, for expelling the air and sediment from the case B.

The nature of my invention or improvement consists of a four-ported valve-seat with two-ported plug-valve, counterbalanced valve, pipes, and double-seated valve, arranged and combined together with check-valves and with a closed case, in the manner and so as to operate essentially as hereinafter explained.

B, Fig. 1, is a cast-iron case, made in two parts, in any shape or proportions that may be found most suitable for the purpose intended, provided with flanges, gum-joint, bolts, nuts, stuffing-box, &c., to make it sufficiently steam-tight. S is a small cast-iron chamber, Figs. 1 and 5, on the upper part of case B, to accommodate the motion and action of the counterbalanced valve and lever O G, provided, like case B, with flanges, gum-joint, bolts, &c., to make it steam-tight. C, Fig. 1, is a four-ported valve-seat, in which is fitted an ordinary plug-valve, U. I is a live-steam pipe, connected to the valve-seat C on one side. N is an equilibrium-pipe, connected to the seat C on the opposite side, through which the steam, after passing through the plug-valve U, passes to the upper part of the case B. H is also a live-steam pipe, connected to pipes I and Y, through which steam is admitted to the chamber S. D is a discharge-pipe for steam, connected to the upper port of the valve-seat C, through which the steam, after entering the lower port, and passing through the valve U, is discharged into the water-supply pipe F beyond the check-valve A. E is a metal case of any size or proportion that may be found to best suit the purpose, filled with wood or other light substance, and connected to one end of a lever, T, the other end of which is connected to the plug-valve U. V, Fig. 4, is a steel stem, connected by a socket on its inside end to the plug-valve U, its other end extending to the outside of the case B through the stuffing-box W. On the outside end of the stem V is fastened another lever, X, on which is a weight, K, sufficiently heavy to counterbalance the entire weight of the case E minus half the weight of its displacement, thereby causing the case E to act by positive displacement as a float. To the lower part of the guide *b* of the counterbalanced valve O, Figs. 1, 2, and 3, the pipe P is attached by the socket *c*, so as to reduce the area of the opening *a* between the case B and the end of the socket *c* to something less than the area of the counterbalanced valve O. The other end of the pipe P, Fig. 1, is connected firmly to the lower port of the valve-seat C. M is a case or pocket, attached to the feed-pipe Q between the case B and the check-valve L, for the purpose of catching any dirt or sediment that may pass into the machine before it reaches the check-valve L.

R is a valve attached to the lower part of the pocket M, for the purpose of allowing the air to escape when starting the machine, where it has to lift its water, and at the same time blow out any dirt or sediment that may have collected therein.

The mode of operation, when the feeder has to lift its water, is as follows: Admit the steam to the pipes I and H by opening the valve in the steam-pipe Y, Fig. 1, which will fill the

chamber S and pipe I, and close the counterbalanced valve O by the steam blowing through it out into the discharge-pipe D and supply-pipe F. Then open the valve R and press the ball K on the lever X downward, thus raising the float E to the upper part of the case B, as indicated by the dotted lines E′, which will bring the port in the plug-valve U in such relation to the ports on each side of the seat C as to admit live steam from the pipe I through the plug-valve U and pipe N into the case B. After the case B has become filled with steam close the valve R, and allow the ball K to rise and the float E to resume its original position, which will bring the plug-valve U in such relation to the upper and lower ports of the seat C as to reopen the passage through the plug-valve U and the pipe D into the water-supply pipe F, so that the charge of steam in the case B will be discharged, passing through the opening *a* into the pipe P and valve U, into the water-supply pipe F, where it will be condensed and form a vacuum both in the case B and the water-supply pipe F, which will raise the water, open the check-valve A, and fill the case B. The float E, resting on the surface of the water, will, as it rises, turn the plug-valve U and admit live steam from the pipe I in the same manner as before described, until an equilibrium of pressure has been established between the boiler and the case B. The counterbalanced valve O, being closed by the steam-pressure on its upper surface, will, as soon as the equilibrium is established, be opened by means of the weight G. The pressure in the case B will close the check-valve A. The weight of the column of water in the case B (the feeder being at least thirty inches above the water-line in the boiler) will raise the check-valve L, and the water will then, by its own gravity, flow into the boiler through the feed-pipe Q. As the level of the water in the case B falls, the float E resting on its surface will also fall until the plug-valve U closes the ports connecting with the pipes I and N, after which the equilibrium will be maintained by the steam that comes through the port of the counterbalanced valve O. The float E will continue to fall until the plug-valve U opens communication between the pipes P and D, which will start a direct current from the counterbalanced valve O into the water-supply pipe F. The direct condensation ensuing will increase the current through the port of the valve O, and draw it to its seat, when the pressure of the steam from the boiler on its upper surface will hold it shut until an equilibrium is again established. The pressure in the case B will also be reduced by the steam passing through the opening *a* into the pipe P, then into the water-supply pipe F, being there condensed, forming a vacuum, raising the check-valve A, and filling the case B with water, as before described, the pressure in the boiler having previously closed the check-valve L as soon as the pressure within the case B began to decrease.

The steam-pipe Y extends through the top of the dome or upper part of the boiler, as shown in Plate 1, to the water-line, and as the water opens and closes the pipe Y by the rising and falling of the water in the boiler the machine is stopped and started respectively.

When, as before explained, the float E opens the ports communicating between the pipes I and N, to admit steam to establish an equilibrium between the case B and the boiler, steam will pass up and into the case B if the water is below the end of the pipe Y; but if the water is above the end of the pipe Y water will pass into the case B and supply the pressure by filling the machine, which will balance the weight of the water in the feeder and stop its feeding until the water in the boiler has fallen below the pipe Y, when the water in the pipe Y will run out, and steam pass up in its place, causing the water in the feeder to flow into the boiler by gravity, as before explained.

When used as a non-lifting feeder or return steam-trap the operation is as follows: The double-seated valve J is used, as shown in Fig. 1, only when the feeder receives the water from pressure, flowing into the case B, as from a tank above the machine, or when used as a return steam-trap. The valve J closes the lower port when driven upward, and the upper port when falling downward. When the water is admitted to the case B it will fall to the bottom of said case, and as the level of the water rises within the case the air will be driven to the upper part, when, as it forms a slight pressure, the valve J then resting on its upper seat will be raised by it, and the air allowed to escape. When the float E arrives at the required height steam will be admitted from the pipe I through the plug-valve U into the pipe N, and through it directly against the lower end of the double valve J, driving it up to its lower seat, closing the port, and preventing the escape of steam, and remaining in that position until the pressure within the case B has decreased sufficiently to allow it to fall by its own weight to its upper seat, where it will remain until steam is again admitted, when it will again be driven up to its lower seat, as before explained.

I am aware that the principle of working water into a boiler by gravity under an equilibrium of pressure; also, that of causing the water to flow into the case B by a decrease of pressure within said case, caused by condensation; also, the automatic manner of starting and stopping the flow of water through the feed-pipe Q by extending the steam-pipe Y down to the surface of the water in the boiler; also, that of using a solid case, E, and lever T, lever X, and counterbalancing-weight K as a float, working by positive displacement, are all old. I therefore make no claim to said principles, but confine my claims to parts in combination with said principles, which facilitate condensation, enabling a vacuum to form more rapidly, thereby increasing the capacity and

durability of the machine. I also confine my claim on the counterbalanced valve O to the upper part of the case B, instead of the bottom, as in my steam-trap patented September 29, 1874.

I claim as my invention—

1. The combination, with the seat of the counterbalance-valve O and four-ported valve-seat C, of the pipe P, substantially as and for the purpose set forth.

2. The four-ported valve-seat C, constructed substantially as described, in combination with the steam-outlet pipe D, inlet-pipe I, pipes N and P, and chamber S, with valve and lever O G, as and for the purpose specified.

3. In combination with the valve-seat C, case B, and pipe N, the double-seated valve J, substantially as and for the purpose herein set forth.

4. The case B and water-pipe Q, in combination with the valve L, pocket M, and valve R, constructed and arranged as and for the purpose set forth.

5. The counterbalance-valve O and ball G, arranged on the upper part of the case, in combination with pipe P and H, substantially as herein specified.

6. The four-port valve-seat C, the pipes D, F, I, N, P, check-valve A, and case B, all combined and arranged as and for the purpose set forth.

WM. H. JENKINS.

Witnesses:

A. C. SELTZER,

R. BEATTY.