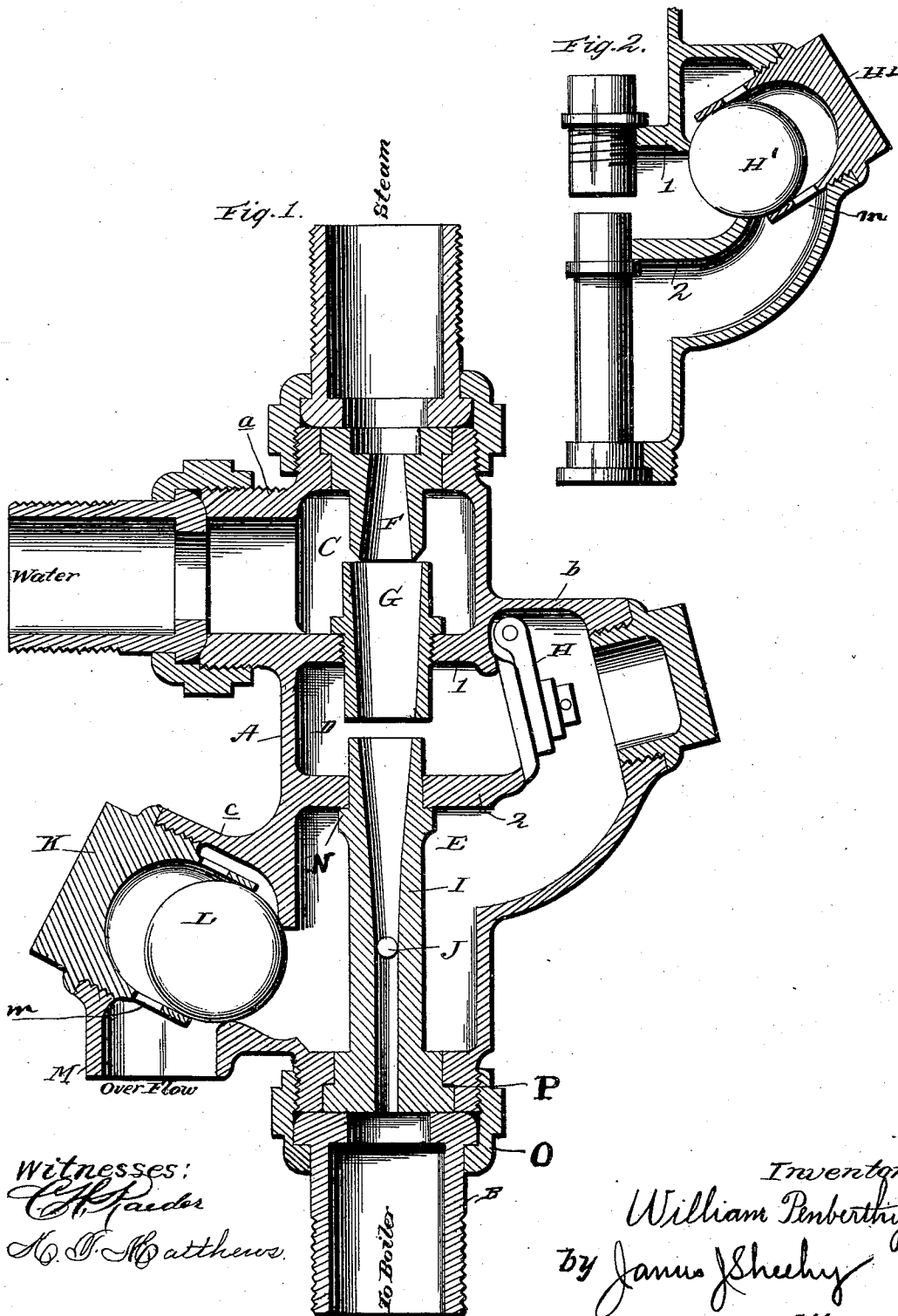


(Model.)

W. PENBERTHY.
AUTOMATIC RESTARTING INJECTOR.

No. 484,044.

Patented Oct. 11, 1892.



Witnesses:
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WILLIAM PENBERTHY, OF LEADVILLE, COLORADO.

AUTOMATIC RESTARTING-INJECTOR.

SPECIFICATION forming part of Letters Patent No. 484,044, dated October 11, 1892.

Application filed April 17, 1891. Serial No. 389,314. (Model.)

To all whom it may concern:

Be it known that I, WILLIAM PENBERTHY, a citizen of the United States, residing at Leadville, in the county of Lake and State of Colorado, have invented certain new and useful Improvements in Automatic Restarting-Injectors; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has relation to improvements in restarting-injectors for feeding steam-boilers; and the novelty will be fully understood from the following description and claims, when taken in connection with the accompanying drawings, in which—

Figure 1 is a longitudinal sectional view of my improved restarting-injector, and Fig. 2 is a detail sectional view illustrating a modified form of relief-valve.

Referring by letters and figures to said drawings, A indicates the main casing or tubular section of my improved injector, which is provided with three laterally-projecting branches *a*, *b*, and *c*, the branch *a* leading from said main casing adjacent to the upper end thereof and having in practice suitable connection by a separable section with a water-tank or other source of supply. The branch or arm *b* projects from one side of the main casing and connects the intermediate and overflow water-chambers, a communication between said chambers being effected by overcoming the relief-valve, which normally rests between the same.

Projecting from the side of the casing, preferably opposite to the branch *b*, is another branch *c*, which leads from the overflow-chamber and is provided with an overflow-valve, as will be presently described.

Suitably connected in a separable manner to the lower end of the casing or tubular section A is a feed-pipe B, which leads to the boiler to be fed, and connected in a similar manner to the upper end of the tubular section or casing is the steam-feeding pipe, which leads from the boiler and discharges into said casing, being provided at a suitable point in its length with a regulating cock or valve whereby the steam may be turned on or off.

The main casing or tubular section A comprises three chambers C, D, and E, formed by the division-walls 1 and 2, and the upper of these chambers, which I shall denominate a "vacuum-chamber" and which is indicated by C, is situated opposite the feed-water pipe, which discharges directly into said chamber.

Seated in an annular recess in the upper end of the main casing is a steam-jet section F, which may be secured by threads or may be retained in position by the upper collar-nut, as illustrated, and this jet-section F, which has a bore increasing in diameter from its upper to its lower end and which is of the proportional size as shown, extends down into the chamber C to about midway the height thereof. The lower end of the jet-section F, which is preferably beveled, as shown, discharges into the upper end of a suction-jet section G, a small space being allowed between said sections, whereby a vacuum may be created in the chamber C when the steam has been turned on.

The suction-jet G, which rests in the upper partition-wall, is preferably secured in said wall by screw-threads, as shown, and its lower end extends down into the intermediate chamber D, where it discharges into the upper end of the combining-tube, presently to be described, which extends up to within a slight distance of said jet-section.

Secured by a hinge to the casing A, adjacent to the upper horizontal partition-wall thereof, is a disk relief-valve H, which may be of any approved construction and is designed and adapted to normally close communication between the intermediate and overflow chambers. The seat of said valve H is arranged on a nearly-vertical plane, so that the valve when seated will readily open to a slight pressure in chamber D.

In Fig. 2 of the drawings I have illustrated a modified form of relief-valve constituted by a ball H', which may be of any suitable material, and this ball-valve, which is guided in an inwardly-directed angular flange of a socket-nut H², normally rests upon a seat afforded by the partitions 1 and 2, the latter being curved upwardly for that purpose. Said socket-nut is arranged at such an angle in relation to the main casing that the flanges will

be in a plane nearer horizontal than vertical, the injector being designed to operate in a vertical position, by which arrangement the ball-valve will open to a slight increase of pressure in chamber D.

I indicates the combining-tube, which extends from a point in the chamber D slightly below and separated from the end of the jet-section G to the lower end of the main casing, where it preferably rests against the end of the feed-pipe B and is secured in position, together with said pipe, by the lower collar-nut, as shown. This combining-tube, which is shouldered at points adjacent to its ends, whereby it is held in position, is provided with a longitudinal bore, as shown, which increases in diameter from its lower to its upper end, and formed in the wall of said combining-tube at about the elevation illustrated is a hole J, which is designed to carry off the water on starting the injector, the water ceasing to flow through said hole when a sufficient velocity has been attained to carry it on through the tube to the pipe leading to the boiler, when the overflow-valve will immediately settle in its normal position and prevent any air from being carried in and entering the hole J.

Secured by screw-threads or the like in the branch c, which leads from the overflow-chamber E, is a socket-nut K, which is provided with an inwardly-directed annular flange, which serves to seat a ball-valve L, which rests against the wall of the opening and serves to normally close communication between the overflow-chamber and the discharge-spout, which spout M may discharge into a suitable conveyer or the like. The inwardly-directed flange of the socket-nut K, as well as that of the nut H², is provided with apertures m, whereby the water behind or above the ball-valves L and H' may escape and permit the valves to return back into the socket. The diaphragm 2 is made thin to be slightly elastic. The combining-tube is formed with a shoulder N, bearing against the diaphragm 2. The discharge-tube has a shoulder P, adapted to bear against a corresponding shoulder on the casing. The diaphragm 2 being made elastic, when the tube is forced against said diaphragm (in placing the parts in position) by the tail-nut O a tight joint will be made at P.

In the operation of my improved restarting-injector when steam has been admitted into the jet-pipe F and passes through the tapered bore thereof into the suction-jet it opens the swing-valve H and passes on through the overflow. The action of the steam passing through the suction-jet produces a vacuum in the upper chamber, and when the water arrives at

that point the swinging or relief valve immediately falls and the water is conducted down through the suction-jet and into the combining-tube, and from thence through the hole J and out through the overflow. When a sufficient velocity has been attained, the water ceases to flow through the hole J and passes on to the boiler, and the overflow-valve, as before described, drops into its seat at the same time the hinge-valve closes, thus preventing air from being carried into the injector.

From the foregoing description it will be seen that my improved injector is operated by a jet of steam, which, after establishing the flow or current of water in the manner described, is discharged from the injector and passes on to the boiler.

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

1. In an injector, the combination, with suction-tube G and chamber D, formed by walls 1 and 2, of the disk valve H, hinged and arranged at an angle to the vertical casing, as shown and described.

2. In an injector, the combination, with suction-tube G and chamber D, of the ball-valve H' and the flanged socket-nut H², arranged at an angle to the casing, as shown and described.

3. In combination with the overflow of an injector, the ball-valve L and flanged socket-nut K, arranged at an angle to the vertical casing, as shown and described.

4. In combination with tube G, chamber D, combining-tube I, chamber E, connecting chamber D with the overflow, the disk valve H, and ball-valve L, and flanged socket-nut K, arranged, as shown, in relation to the vertical casing, as and for the purpose described.

5. In combination with the overflow-passage of an injector, the ball-valve and socket-nut provided with inwardly-extended flanges having apertures m.

6. The combination of the combining-tube with the tail-pipe B and screw-nut and diaphragm 2, said diaphragm being made thin to allow of a slight longitudinal movement, as and for the purpose set forth.

7. In combination with the overflow of an injector, the ball-valve L and the flanges or guides for the same, arranged at an angle to the vertical line of the casing, as shown and described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM PENBERTHY.

Witnesses:

C. C. KELLOGG,
C. F. DOWLING.