No. 689,757. Patented Dec. 24, 1901.

E. SHACKLETON & F. FLATHER.

APPARATUS FOR FEEDING WATER INTO BOILERS.

(Application filed Mar. 27, 1901.)

(No Model.) 2 Sheets—Sheet 1.

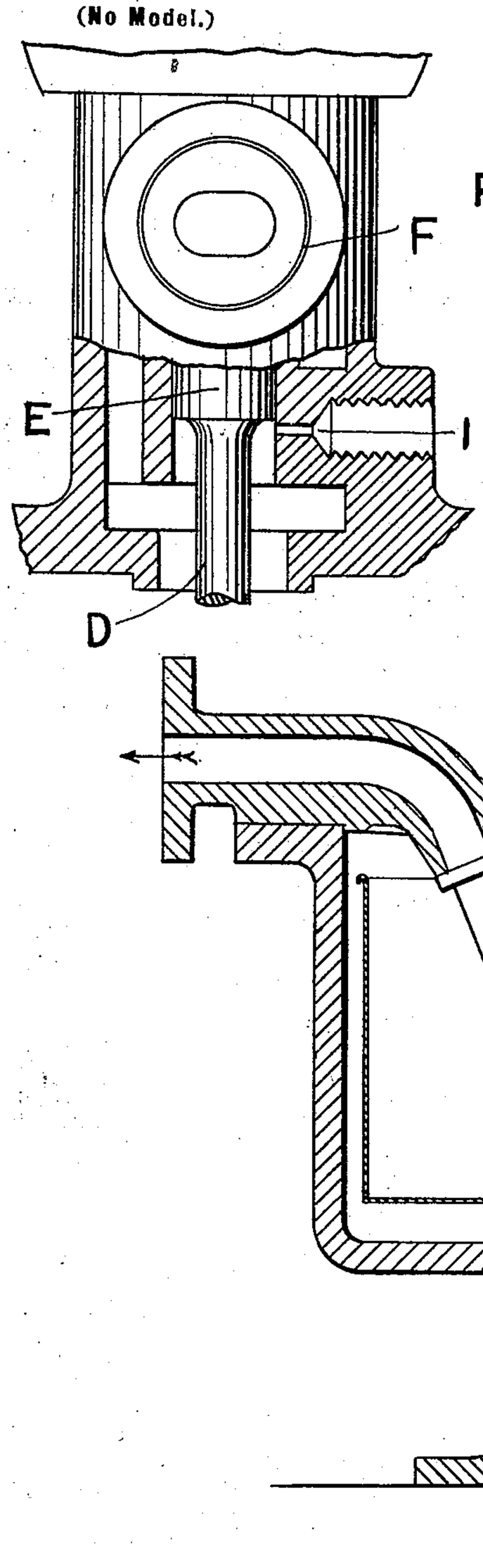

FIG. 2.

FIG. 1.

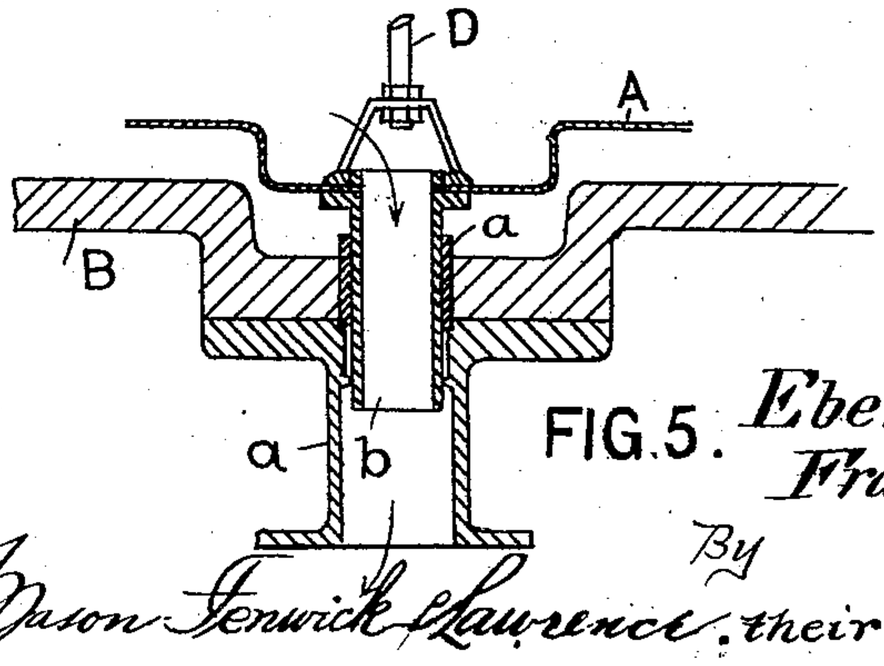

FIG. 5.

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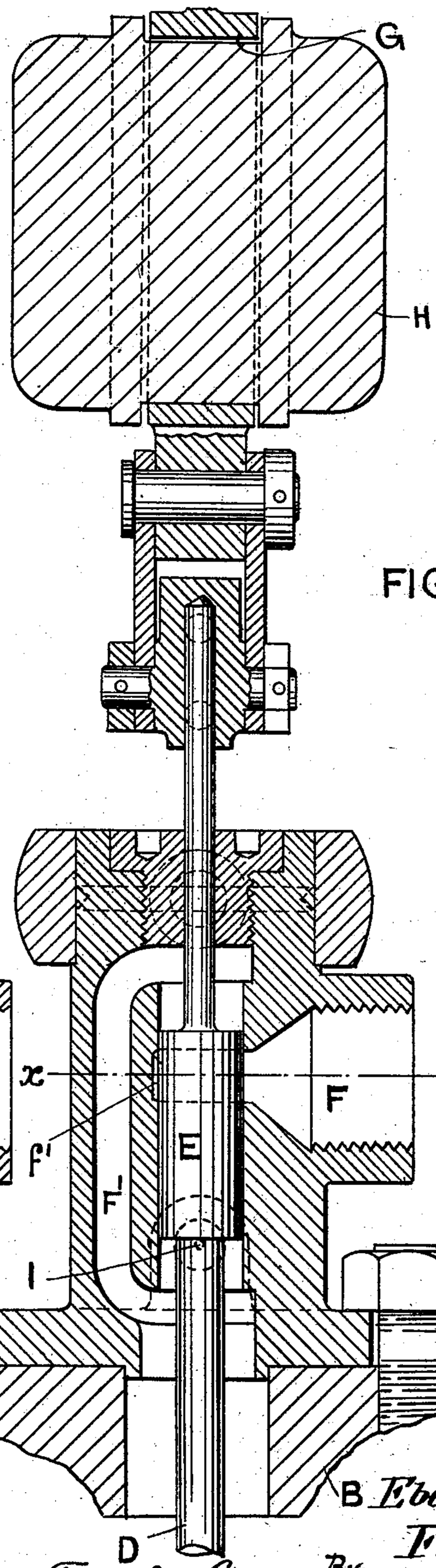

FIG. 3.

FIG. 4.

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UNITED STATES PATENT OFFICE.

EBENEZER SHACKLETON, OF BIRKENHEAD, AND FRANK FLATHER, OF SEACOMBE, ENGLAND.

APPARATUS FOR FEEDING WATER INTO BOILERS.

SPECIFICATION forming part of Letters Patent No. 689,757, dated December 24, 1901.

Application filed March 27, 1901. Serial No. 53,132. (No model.)

To all whom it may concern:

Be it known that we, EBENEZER SHACKLETON, residing at Birkenhead, and FRANK FLATHER, residing at Seacombe, in the county of Chester, England, subjects of the King of Great Britain, have invented certain new and useful Improvements in Apparatus for Feeding Water into Boilers, of which the following is a specification.

This invention has for its object a very simple apparatus for forcing liquids into steam-boilers or other steam-containers by means of the live steam of said boilers or containers, and is applicable specially to steam-traps used for collecting condensed water from steam-heaters, steam-coils, engine drain-pipes, and the like.

The main feature of this apparatus is a bucket which sinks when full and rises when empty, thereby operating a valve for admitting and shutting off the steam from the boiler, such valve being perfectly balanced and of such a simple design that it insures regularity of work with minimum of wear.

In most existing steam-traps a defect exists in that it is necessary to blow the water and some of the steam to waste at atmospheric pressure. Our present invention allows the whole of the condensed water to be returned to a boiler at any pressure.

Referring to the accompanying drawings, Figure 1 is a view in elevation, partly in section, of the whole apparatus; Fig. 2, an enlarged view, partly in section, of a portion of the construction shown in Fig. 1. Fig. 3 is an enlarged vertical sectional view of the upper portion of the construction shown in Fig. 1, taken at right angles thereto. Fig. 4 is a view in cross-section on the line $x\ y$, Fig. 3. Fig. 5 is a detail sectional view showing a slight modification of the construction shown in Fig. 1.

In the drawings, A is a bucket inclosed in a steam-tight vessel B, which is a little larger than the bucket. Dipping down into the bucket A is a pipe C, preferably a siphon-pipe, which is a fixture in the vessel B. One end of this pipe dips down to near the bottom of the bucket, its other end communicating with the boiler through a back-pressure valve, the vessel B being located above the boiler in order that the water may flow into the boiler by gravity. As an alternative, the siphon-pipe may be dispensed with and in its place a discharge-pipe *b*, Fig. 5, may be attached to the bottom of the bucket and pass through a pipe *a a* in the bottom of the vessel B in a telescopic fashion in such manner as to be steam-tight.

A stem or spindle D, attached to the bucket A, extends upward through the cover of the vessel B and actuates the valve E, Fig. 3, which admits live steam from the boiler to the vessel B. F is the live-steam inlet. The spindle D is continued upward beyond the valve and attached to a rocking lever or fall-over gear G, Fig. 1. This gear is arranged in a peculiar manner, being pivoted or hinged at one end at *g* and the rod D directly coupled thereto by links near the said pivot *g*, so as to transmit a reciprocating motion thereto. This rocking lever has a roller-weight H therein, and when the bucket rises the weight will roll to one end of the lever and take up a position immediately above the pivot, where it does not exert any downward pressure upon the bucket as it is being filled, while when the bucket descends this weight will roll down to the opposite end of the lever and give a quick action to the valve E and retain the bucket at rest in its bottom position. This lever G is not quite straight, but is slightly bent in a longitudinal direction. The position shown of the lever and that of its roller-weight H are the positions they would assume when the valve E is in the center of its stroke. When the bucket is nearly full, its weight causes it to descend to the bottom of the chamber, rolling the roller-weight to the end of the rocking lever, which gives a quick action to the valve and retains the bucket at rest in its bottom position. When the bucket has been emptied, it again rises, forcing the roller-weight to roll to the opposite end of the rocking lever, where it takes up a position immediately above the pivot and does not in that position exert any downward pressure upon the bucket as it is being emptied. The valve E is so arranged that when the bucket A is at or near its lowest depth in the vessel B the valve shall be open and admit steam into said chamber. The valve is simply com-

posed of a solid cylinder, with steam from the steam-inlet F entering through perforations in its periphery, or the perforations may be dispensed with and steam admitted by the top of the cylindrical valve dropping below the top of the port *f*. The steam admission is so arranged as to surround the cylindrical valve E at the port *f*, so that it is possible to admit steam all around its circumference, and this gives a large area for the admission of steam and insures equal distribution of the pressure. F′ is the passage which conveys steam from the valve to the vessel B, and this passage steam-jackets the chamber containing the valve. This, though not essential, is advantageous, as it avoids the contraction and expansion of the valve or its chamber. The valve is coupled directly to the bucket A without any intermediate gear, such as lever and bell-crank connections, to operate it. It moves in a vertical direction with the rise and fall of the bucket. The valve E is so arranged that when the bucket A is at or near its lowest depth in the vessel B it will be open and admit steam to such vessel. In the passage or valve-chest leading from the valve to the chamber is a small port I, capable of exhausting the chamber of steam under pressure in a short space of time. As the valve E descends it opens the passage F for live steam and closes the small escape-port I, but opens it as soon as live steam is cut off.

The mode of action is as follows: Water from any source passes into the chamber B through suitable back-pressure valves. As it accumulates at the bottom it floats the bucket A, shutting off live steam therefrom and opening the little escape-port I, and as water continues to enter it overflows into the bucket until when nearly full the bucket descends to the bottom of the chamber, rolling the roller-weight to the end of the rocking lever, which gives a quick action to the valve and retains the bucket at rest in its bottom position. The descent of the bucket closes the little escape-port and opens the steam-pressure valve. Steam rushes with force into the chamber, pressing down the water, which at once rises in the pipe C and flows by siphonage (or passes through the outlet-pipe *b* in the bottom) through the back-pressure valve into the boiler. When the bucket has been emptied, it again rises, cutting off the steam and opening the little escape-port I. In this way the action goes on automatically. A small recess or embayment J is by preference provided in the bottom of the bucket, into which the end of the siphon-pipe descends. By this means we are able to almost entirely empty the bucket at each discharge, as the only water left in the bucket after entering will be a small quantity below the end of the pipe in the embayment aforesaid.

It will be obvious that the exact shape and arrangement of the bucket and chamber are immaterial. The main points which we wish to lay stress on are that as soon as the bucket or float is empty it will rise and shut off the entrance of steam, opening the little escape-port, and that when the bucket is nearly full it will sink and the steam be again let on, thus causing water to pass into the boiler.

The apparatus can be used not merely for bringing water of steam-traps back to the boiler, but for forcing water or other liquid into any container by means of steam at substantially the same pressure as that of the boiler.

We declare that what we claim is—

1. In an apparatus of the class described, the combination with an outer steam-tight vessel, and an actuating-bucket contained within said vessel, of a vertical cylindrical valve-casing above the vessel having steam and exhaust side ports and a single vertically-moving valve in said casing formed of a solid cylinder which opens and closes the steam and exhaust ports, and a rod which directly connects the bucket below with the valve above, the valve moving with the rise and fall of the bucket, substantially as described.

2. In an apparatus of the class described, the combination with an outer steam-tight vessel, and an actuating-bucket contained within said vessel, of a vertical cylindrical valve-casing above the vessel having steam and exhaust ports and a single vertically-moving valve in said casing formed of a solid cylinder which opens and closes the steam and exhaust ports, a rocking lever pivoted at one end above and to one side of the valve-casing, a rolling weight within said lever, and a rod in line with the bucket-connecting rod extending upward from and connecting the valve to the rocking lever near its pivot, substantially as described.

3. An apparatus for feeding liquids, comprising a steam-tight casing, a bucket mounted therein, a valve controlled by the said bucket, a loop-lever fulcrumed on the casing outside the same and pivotally connected with the said valve, a shifting weight on said lever, the construction of the lever being such that the weight may assume a position directly over the fulcrum thereof, when it will not exert any influence upon the lever, the weight also being capable of moving out toward the end of the lever for forcing the valve downwardly, substantially as described.

4. An apparatus for feeding liquids, comprising a steam-tight casing, a rising-and-falling bucket mounted therein, a valve connected with the said bucket, and a lever fulcrumed on the casing outside thereof and also connected with the said valve, said lever being bent intermediate its length, and a rolling weight carried by the lever, the structure being such that when the bucket descends the weight will roll to the outer overhanging

end of the lever and cause a quick action of the valve, said weight retaining the bucket at rest in the bottom of the casing, and when the bucket rises again the weight will roll to the fulcrum end of the lever taking up a position immediately above the same so that it exerts no downward pressure on the bucket, substantially as described.

In witness whereof we have hereunto signed our names, this 16th day of March, 1901, in the presence of two subscribing witnesses.

EBENEZER SHACKLETON.
FRANK FLATHER.

Witnesses:
G. C. DYMOND,
I. P. EVANS.