

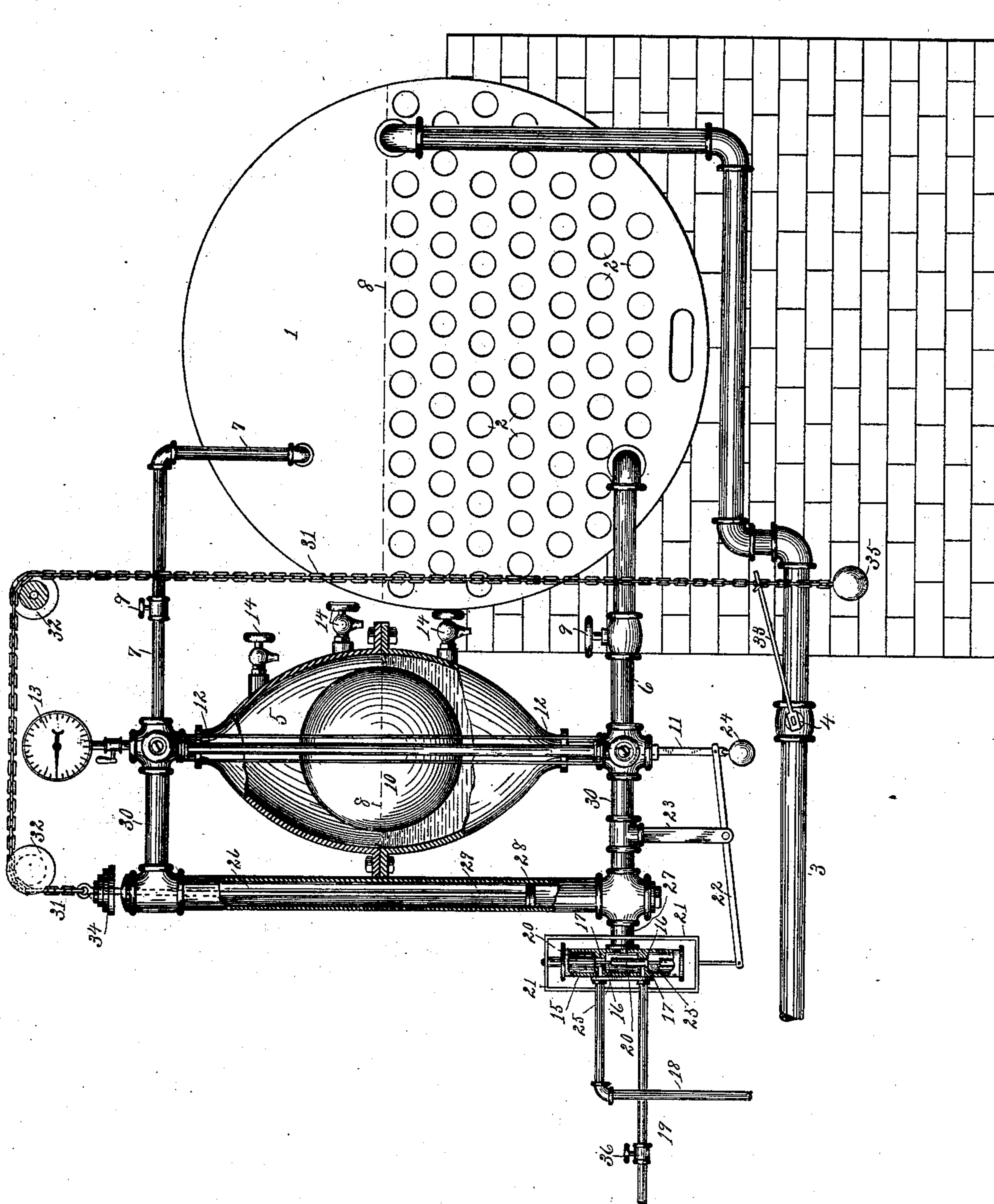
(No Model.)

P. J. DUFF.

AUTOMATIC FEED WATER REGULATOR.

No. 393,623.

Patented Nov. 27, 1888.



WITNESSES.
C. M. Newman.
Bertha E. Lee.

INVENTOR
Patrick J. Duff.
By A. M. Wooster
Atty.

UNITED STATES PATENT OFFICE

PATRICK J. DUFF, OF BRIDGEPORT, CONNECTICUT.

AUTOMATIC FEED-WATER REGULATOR.

SPECIFICATION forming part of Letters Patent No. 393,623, dated November 27, 1888.

Application filed May 17, 1888. Serial No. 274,160. (No model.)

To all whom it may concern:

Be it known that I, PATRICK J. DUFF, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Automatic Feed-Water Regulators; and I do hereby 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 for its object to produce a device of this class which shall be simple in construction, economical in cost, safe and sure in operation, and which may be readily attached to boilers already in use, it being applied in the same manner as an ordinary combination water-column and performing the functions thereof.

With these ends in view I have devised the novel construction of which the following description, in connection with the accompanying drawing, is a specification, numbers being used to denote the several parts.

The drawing is an elevation of the front of a boiler with the head removed, showing the manner in which my novel feed-water regulator is attached, portions thereof being in section, and the parts of the feed-water regulator greatly enlarged relatively to the size of the boiler.

1 denotes the boiler, 2 the flues thereof, and 3 the pipe by which water is supplied to the boiler. It will of course be understood that the pressure in this pipe must be sufficient to overcome the steam-pressure in the boiler. Where the ordinary pressure—as of city water—is not sufficient to accomplish this result, water may be supplied from a tank or in any suitable manner. The source of supply, not being a portion of my invention, has not been illustrated. A cock, 4, is provided in the supply-pipe, the operation of which will presently be fully explained.

5 denotes an independent chamber supported in any suitable manner and connected with the boiler by means of a pipe, 6, which extends from the bottom of the chamber and enters the boiler near the bottom thereof, and a pipe, 7, which extends from the upper end of the chamber and enters the boiler above the water-line.

The dotted line 8 denotes the water-line in the boiler and the chamber. This line will of course be the same in both chamber and boiler, as the parts are connected both above and below the water-line. Suitable cocks, 9, are provided in pipes 6 and 7 for convenience in use when required. They have nothing, however, to do with my present invention.

10 denotes a float in the chamber, which is connected to a rod, 11, extending down through the bottom of the chamber, the rod being suitably packed, but the packing not shown, as it forms no portion of my present invention.

12 denotes the usual water-glass, which is preferably placed in front of the chamber, as indicated in the drawing.

13 denotes the usual pressure-gage, and 14 the usual gage-cocks, which are shown as attached to the chamber instead of the boiler itself.

15 denotes a small cylinder, which is divided by diaphragms 16 into middle and upper and lower chambers. Each of the diaphragms is provided with a central opening, 17, the opening in the upper diaphragm connecting with a waste-pipe, 18, and the opening in the lower diaphragm connecting with a supply-pipe, 19. Ordinary water-pressure is quite sufficient in this pipe, as the resistance to be overcome is slight.

20 denotes a rod in cylinder 15, which extends through both diaphragms and up through the top of the cylinder, the top of the rod being connected to a frame, 21.

22 denotes a lever pivoted to a bracket, 23. One end of this lever is connected in any suitable manner to frame 21, and the other to rod 11, which extends downward from the float. A weight, 24, is secured to the lower end of rod 11 to overcome any friction of said rod in the packing. (Not shown.) Rod 20 is provided with cut-away portions 25, which, when they register with the openings in the diaphragms, permit the water to pass freely, it being of course understood that rod 20 fits closely in openings 17, so that no water can pass except when the cut-away portions register with the openings. The opening into one of the pipes, 18 or 19, is always open and the other always closed. In the drawing the upper cut-away portion 25 is shown as registering with the opening through the upper diaphragm, so that

any water remaining in the cylinder after rod 20 has been moved downward, as will presently be explained, can pass out at the waste-pipe.

5 The parts are shown in the drawing as at their normal position—that is to say, the water in the boiler and in chamber 5 is at the proper water-line. As the water goes down in the boiler it must go down also in the cham-
10 ber. This of course permits the float to drop, carries rod 11 downward, and tilts the opposite end of lever 22 upward. The tilting of the lever moves frame 21 upward, carrying rod 20 with it. This upward movement of rod
15 20 quickly carries the upper cut-away portion 25 above the upper diaphragm and causes the closing of the opening in said upper diaphragm by the full diameter of the rod passing into it. At the same time the lower
20 cut-away portion 25 is caused to register with the opening in the lower diaphragm, which permits water from pipe 19 to enter the cylinder and pass freely into the middle chamber. This position of the parts is not shown in the
25 drawing, as it is so obvious as not to require illustration.

26 denotes a cylinder, the lower end of which is connected with the middle chamber of cylinder 15 by a pipe, 27. Within cylinder 26 is
30 a piston, 28, whose rod 29 extends upward through the top of the cylinder.

30 denotes brackets extending from chamber 5, by which cylinder 26 is supported. The brackets supporting chamber 5, being ordinarily at the back, are not shown in the drawing.
35 It is sufficient to say that chamber 5 is supported in any ordinary simple manner. A chain, 31, is connected to the upper end of rod 29, passes over suitable pulleys, 32, and then
40 extends downward and is connected to a rod, 33, which operates cock 4 in the boiler-supply pipe.

34 denotes weights at the upper end of the piston-rod, which are sufficiently heavy to
45 overcome the friction of said rod in its bearing at the upper end of cylinder 26, and also to force the water downward in said cylinder, out into the middle chamber of cylinder 15, and then through the opening in the upper
50 diaphragm and out through waste-pipe 18, as soon as the pressure is removed, as will presently be more fully explained.

35 is a weight at the lower end of the chain, which is sufficiently heavy to overcome the
55 inertia of the chain on the pulleys, and also the friction of cock 4 in the supply-pipe, just as soon as the piston is raised. A cock, 36, is provided in water-pipe 19, for use if required. It forms, however, no portion of my present
60 invention.

The operation is as follows: When the water in the boiler, and consequently in chamber 5, falls below the water-line, the float of course falls with it, carries down rod 11, raises the
65 end of lever 22, which is not connected to the float-rod, and raises frame 21, and with it rod 20 in cylinder 15. This raising of rod 20 cuts

off escape of water from cylinder 15 through the waste-pipe and permits water to enter freely through pipe 19. From cylinder 15
70 the water passes through pipe 27 into cylinder 26 under the piston, forcing the latter upward against the power of weights 34. Weight 35 at the lower end of the chain, which is connected to the upper end of the piston-rod, overcomes
75 the inertia of the chain, and also the friction of cock 4 in the supply-pipe, the operating-rod of this cock being connected to the chain. Consequently, as the piston is forced upward, the chain is drawn down and opens cock 4 in
80 the supply-pipe, which permits water to enter the boiler freely through said supply-pipe. As the water-line in the boiler rises it of course rises equally in chamber 5, there being, as
85 already explained, connections between the upper end of said chamber and the steam-space of the boiler and between the lower end of said chamber and the lower portion of the boiler. As the water in the chamber rises
90 the float of course is carried up with it. This raises rod 11, and with it the end of lever 22, which is connected to the float-rod, draws down frame 21, and with it rod 20 in cylinder
95 15, thereby cutting off the entrance of water into said cylinder through pipe 19 and opening the passage from said cylinder outward through waste-pipe 18. This prevents the entrance of any more water into cylinder 26 under the piston. As soon as the pressure of
100 the water is removed, weights 34 act to press the piston-rod and piston downward, forcing the water in the bottom of cylinder 26 out through pipe 27 into cylinder 15 and out from said cylinder through waste-pipe 18. At the
105 same time the lower end of the chain is drawn upward against the power of weight 35, and operating-rod 33 is turned backward to close cock 4 in the supply-pipe and stop the entrance of water into the boiler. It will be seen that
110 this action is entirely automatic. As soon as the water in the boiler goes down sufficiently to affect the float, cock 4 will begin to open, which will allow water to pass into the boiler. As soon as the water reaches the water-line in
115 the boiler and in the chamber, of course the float will have been raised sufficiently to cut off the entrance of water into the boiler through the intermediate mechanism described or equivalent mechanism.

I have termed this device a "feed-water
120 regulator," and have illustrated it in connection with a boiler, that being a common form of its application. It should be understood, however, that its use is not in any way limited to its use in connection with boilers. The
125 operation would be precisely the same if any other suitable reservoir were substituted for the boiler, there being, of course, an air-space instead of a steam-space above the liquid in the chamber and the reservoir.
130

Having thus described my invention, I claim—

1. In combination, a reservoir, a chamber connected to said reservoir at top and bottom,

a supply-pipe, 3, for the reservoir, a float in the chamber having a rod connected thereto, a cylinder, 15, having a supply-pipe, 19, a waste-pipe, and a rod adapted to alternately
 5 open and close passages leading to said pipes, a pivoted lever connected to said rod and to the float-rod, a cylinder, 26, a pipe connecting the bottom of said cylinder with cylinder 15, a piston in cylinder 26, having a rod connected
 10 thereto, and a chain extending from said rod and connected to a cock in supply-pipe 3, whereby the lowering of the liquid in the reservoir will open the cock in supply-pipe 3 and the raising of the liquid in the reservoir will
 15 close said cock.

2. In combination, a reservoir, a chamber connected to said reservoir at top and bottom, a supply-pipe, 3, having a cock, 4, a float in the chamber having a float-rod, a cylinder, 15,
 20 having a supply-pipe, 19, a waste-pipe, a rod adapted to alternately open and close passages leading to said pipes, and a frame carrying said rod, a pivoted lever connected to said frame and to the float-rod, a cylinder, 26, a
 25 pipe connecting the bottom of said cylinder with cylinder 15, a piston in cylinder 26, having a piston-rod, a chain extending from said rod and connected to cock 4, and suitable weights on the piston-rod and the chain, sub-
 30 stantially as and for the purpose set forth.

3. The combination, with a reservoir and a chamber connected thereto at top and bottom, of a supply-pipe for the reservoir, having a cock, a float in the chamber, a cylinder, 15,
 35 having supply and waste pipes, and intermediate connections, substantially as described, whereby the lowering or raising of the float will open or close said cock, thereby controlling the supply to the reservoir.

40 4. The combination, with a reservoir, a chamber connected to said reservoir at top and bottom, a float in said chamber, and a supply-pipe for the reservoir, having a cock, of a cylinder, 15, having supply and waste pipes, and
 45 a suitable rod adapted to alternately open and close passages leading to said pipes, a cylinder, 26, connected to cylinder 15 and having a piston and piston-rod, and a chain connecting said piston-rod with the cock in the reservoir
 50 supply-pipe.

5. The reservoir, the chamber, connections between said reservoir and chamber at top and

bottom, a supply-pipe for the reservoir, having a cock, and the float in the chamber, having a rod, in combination with cylinder 26, having
 55 a piston and a piston-rod connected to the cock in the supply-pipe, and a cylinder, 15, having supply and waste pipes, a pipe connecting cylinders 15 and 26, a rod in cylinder 15, which alternately opens and closes passages to the
 60 supply and waste pipes, a frame to which said rod is connected, and a pivoted lever whose opposite ends are connected to said frame and to the float-rod, whereby the lowering of the float will open or close the cock to admit fluid
 65 to or cut it off from the reservoir.

6. The combination, with the reservoir having a supply-pipe, the chamber having a float, cylinder 26, having a piston, and intermediate
 70 pipes and connections, substantially as described, of cylinder 15, having upper and lower diaphragms with central openings and openings leading from said openings to supply and waste pipes, and a vertical rod whose full diameter closes said central openings, and which
 75 is provided with cut-away portions, whereby the passages to said pipes are alternately opened and closed when said rod is raised or lowered.

7. The combination, with the reservoir having a supply-pipe and a cock, 4, of a cylinder, 26, having a supply-pipe at its bottom, a piston, a piston-rod extending upward from the top, and a chain connecting the piston-rod
 80 with the cock in the supply-pipe, whereby when said piston is raised the cock is opened, and vice versa.

8. In combination, the reservoir having a supply-pipe with a cock, the chamber having a float, cylinder 26, having a piston, cylinder
 90 15, having supply and waste pipes, a rod adapted to open and close said pipes alternately, and intermediate connections, substantially as described, whereby the lowering of fluid in the reservoir admits water to cylinder
 95 26 and raises the piston, which opens the cock in the reservoir supply-pipe.

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

PATRICK J. DUFF.

Witnesses:

A. M. WOOSTER,
 BERTHA E. LEE.