

(No Model.)

H. CAMPBELL.
FEED WATER REGULATOR.

No. 437,914.

Patented Oct. 7, 1890.

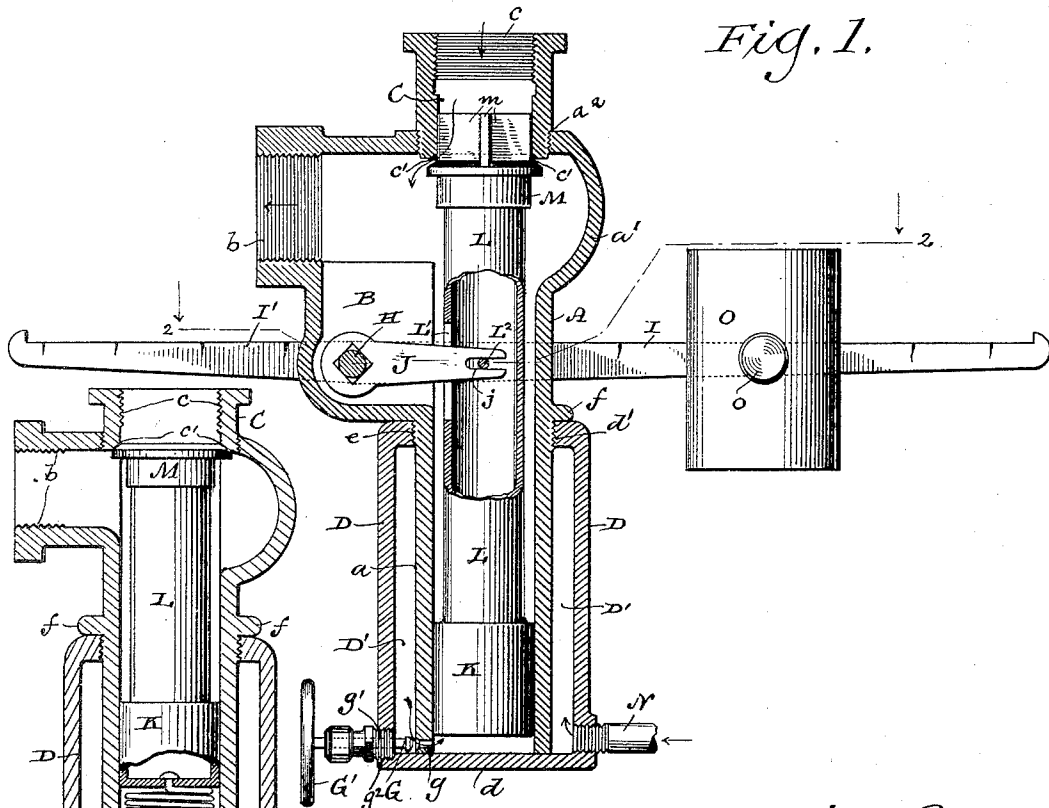


Fig. 1.

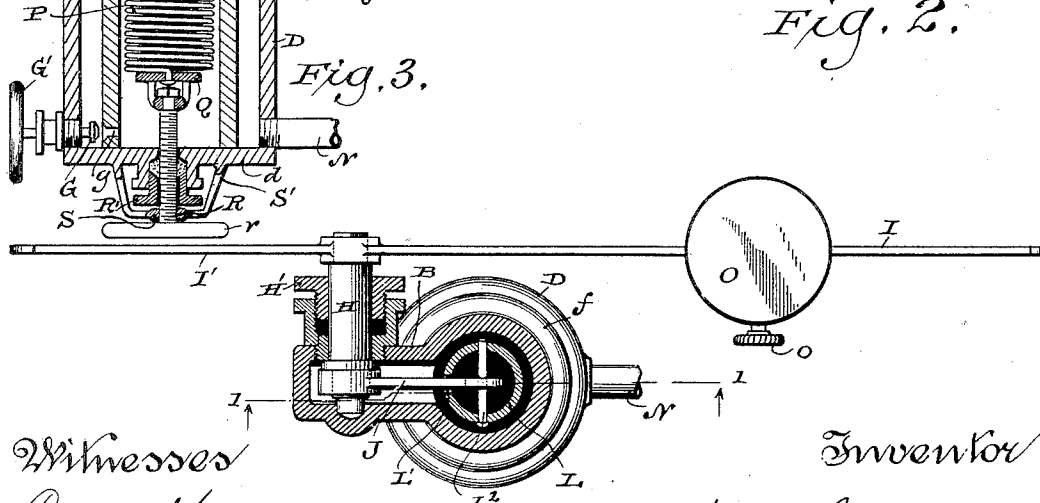


Fig. 2.

Fig. 3.

Witnesses
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HENRY CAMPBELL, OF MILWAUKEE, WISCONSIN.

FEED-WATER REGULATOR.

SPECIFICATION forming part of Letters Patent No. 437,914, dated October 7, 1890.

Application filed May 10, 1890. Serial No. 351,215. (No model.)

To all whom it may concern:

Be it known that I, HENRY CAMPBELL, of Milwaukee, in the county of Milwaukee, and in the State of Wisconsin, have invented certain new and useful Improvements in Feed-Water Regulators; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to feed-regulating valves for steam-boilers; and my invention consists in certain peculiar and novel features of construction and arrangement, as hereinafter described, and pointed out in the appended claims.

In order that my invention may be fully understood, I will proceed to describe it with reference to the accompanying drawings, in which—

Figure 1 is a central transverse vertical section of a feed-water regulator constructed in accordance with my invention, the section being taken on the line 1 1 of Fig. 2. Fig. 2 is a horizontal cross-section of the same on the line 2 2 of Fig. 1. Fig. 3 is a view similar to Fig. 1, but illustrating an adaptation of my invention to the requirements of marine boilers.

The objects of my invention are to provide a feed-water regulator which shall automatically maintain a uniform difference between the steam-pressure by which the pump is actuated and the water pressure or resistance at the discharge-point of the pump; also, to provide means whereby the feed-regulator will either operate to assist or to resist the water or the steam pressure, and, finally, to provide means for insuring a steady and uniform action of the regulator during the operation of the pump. These objects I attain by virtue of the construction which I will now proceed to describe.

Referring to Figs. 1 and 2, A designates the main casing or cylinder of the regulator, the lower part *a* of which is of elongated cylindrical shape of uniform bore, and the upper part of which is formed on one side with a swell or enlargement *a'* and at the opposite side with an offset B. The upper end of this cylinder A is further formed with an internally-screw-threaded opening *a*² to receive the externally-screw-threaded lower end of a

coupling C, the upper end of which is internally screw-threaded, as shown at *c*, to receive a pipe (not shown) leading from the boiler. The lower end of this coupling C constitutes the seat for the regulating-valve, to be hereinafter described, and said seat exactly corresponds in internal diameter with the internal diameter of the lower part *a* of cylinder A. At its upper end the offset B is formed with a lateral internally-screw-threaded opening *b*, to which is coupled a pipe (not shown) leading to the steam-chest of the pump.

D designates a shell, having a closed bottom *d* and an internally-screw-threaded opening *d'* in its upper end. This opening screws upon an externally-screw-threaded portion *e* of casing A, so that the upper end of shell D abuts closely against the under side of the offset B, and also against a shoulder *f* on the opposite side of casing A. As shown in Fig. 1, when the shell D is in the position just described its bottom *d* tightly closes the lower end of cylinder *a*, and an annular chamber or space D' surrounds said cylinder between the outer side thereof and the inner surface of the shell D. At one side of the cylinder *a*, in the extreme lower end thereof, is formed a horizontal inlet-port *g*, communicating at its inner end with the interior of said cylinder and at its outer end with the interior of the chamber D'. A valve G is let into the lower end of the casing D at one side thereof and finds its seat in the outer end of port *g*, the outer end of the stem of this valve being provided with a hand-wheel G', and being externally screw-threaded, as shown at *g'*, to work in a socket *g*², as shown. A pipe N, which leads from the discharge of the pump, is inserted into the lower end of the shell D at the side opposite from the valve G and communicates with the chamber D', as shown.

Within the offset B is journaled a transverse horizontal rock-shaft H, one end of which protrudes through a stuffing-box H' in one side of said offset and carries a tilting-lever I I', which is secured midway of its length to said protruding end of the shaft. Within said offset the shaft H carries a rigid inwardly-extending rock-arm J, the inner end of which is forked or bifurcated, as shown at *j*, for a purpose to be hereinafter explained.

K designates a piston or plunger, which fits accurately the bore of the cylindrical part *a* of casing A, and L designates a tubular stem, which extends upward, from the upper end of said piston. At its upper end this tubular stem carries a valve M, which fits the seat *c'* of coupling C, and the upper side of which is formed with wings or guides *m*, which work within said coupling, as shown. The rock-arm J, before referred to, extends through a vertical slot L' in the adjacent side of the tubular stem L, and the bifurcated end of said arm embraces a pin L², which extends transversely through the adjacent portion of the stem. A weight O slides upon one or the other arm of the lever I I' and is retained in any desired position of adjustment thereon by a set-screw *o*.

The operation of the above-described structure is as follows: The weight being set upon the right-hand arm I of the lever, as shown in Fig. 1, will tend by gravity to press downward upon the piston K. Steam enters through the coupling C and flows out through the coupling *b* to the steam-chest of the pump, the pressure of the steam tending to force the valve M, the tubular stem L, and the piston K downward. With the valve in the position shown in Fig. 1 a full head of steam will flow to the pump, causing it to work up to its utmost capacity. The water is thus fed to the boiler and a portion enters the chamber D' through the pipe N and flows through the port *g* into the cylinder *a* beneath the piston K. As the steam-pressure in the boiler is reduced and the required water-pressure is reached, the pressure of water beneath piston K consequently exceeds the steam-pressure upon valve M, and the valve is raised into its seat *c'*, and the pump is stopped or its speed checked automatically. As soon as the water-level falls below the required point, the steam-pressure, having been accelerated as usual, will automatically depress the valve M and start or accelerate the motion of the pump, the subsequent operation of the regulator being a repetition of that just described. The action of the regulator is determined by setting the weight O nearer to or farther from the shaft H, the lever being preferably graduated somewhat, as shown, to accurately indicate the required position of the weight. As shown in Fig. 1, the weight O is set upon the arm I of the tilting-lever, and its weight acts against the water-pressure; but where a water-pressure is required that shall be less than the steam-pressure by which the pump is actuated said weight is transferred to the arm I' of the tilting-lever, and thus acts against the steam-pressure to assist the water-pressure. The purpose of the chamber D' is to equalize the pressure of water upon the piston K, a quantity of air being compressed in the upper part of the chamber, and thus preventing the pulsations of the pump from affecting the water-pressure, which would

cause the piston and valve to rise and fall intermittently, and thus render the action of the regulator irregular.

In Fig. 3 I have shown an adaptation of my invention to the requirements of marine boilers. It is evident that the lever I I', with its weight O, would be so affected by the pitching and rolling of a vessel as to seriously deter the regulator from effective action. Hence in this instance I dispense with the rock-shaft H and its lever I I' and forked arm J, as well as with the weight O, and provide a coiled spring P, which is interposed between the lower end of the piston K and a follower Q. This follower is mounted upon the upper end of a screw-stem R, which extends upward through a nut S on a yoke S', and thence through a stuffing-box R' in the bottom *d* of shell D, and the lower end of which preferably carries a hand-wheel *r*, as shown. The length of the spring P is such that when the follower Q is screwed upward to a certain extent the spring will act expansively and tend to force the piston and valve upward, while when the follower is screwed down the spring will act to draw the piston and valve downward. Thus the spring acts as the equivalent of the weight, and yet is not affected by the motions of the vessel. The parts not otherwise specifically mentioned are the same in the structure shown in Fig. 3 as in that shown in Figs. 1 and 2, as indicated by the reference-letters in the former. The slot L' and pin L² are dispensed with, however, and the shoulder *f* is preferably continued completely around the casing A. The offset B is in this instance also preferably dispensed with, and it is obvious that many minor modifications in mere details of construction may be adopted without departing from the essential spirit of my invention.

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

1. In a feed-water regulator, a main casing having at one end ports to communicate, respectively, with the steam-supply and with the steam-chest of a pump, in combination with an outer casing inclosing the opposite end of the main casing, so as to form an air-chamber, a port in said main casing communicating with said air-chamber, a port in the outer casing to communicate with the discharge of the pump, a piston arranged within the main casing between the upper and lower ports, and a counter-balance operatively connected with the piston, substantially as set forth.

2. In a feed-water regulator, a main casing having at one end ports to communicate, respectively, with the steam-supply and with the steam-chest of a pump, in combination with an outer casing inclosing the opposite end of the main casing, so as to form an air-chamber, a port in the outer casing to communicate with the discharge of the pump, a piston arranged within the main casing between the

upper and lower ports, a rock-shaft journaled
in the upper part of the main casing and carrying an arm operatively connected to said
piston and also a two-armed lever, and an ad-
5 justable weight set upon one or the other arm
of said lever, substantially as set forth.

In testimony that I claim the foregoing I

have hereunto set my hand, at Milwaukee, in
the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

HENRY CAMPBELL.

Witnesses:

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M. S. UNDERWOOD.