No. 618,981. Patented Feb. 7, 1899.

A. E. BURROWS.

AUTOMATIC FEED WATER REGULATOR.

(Application filed Nov. 26, 1897. Renewed Jan. 7, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1

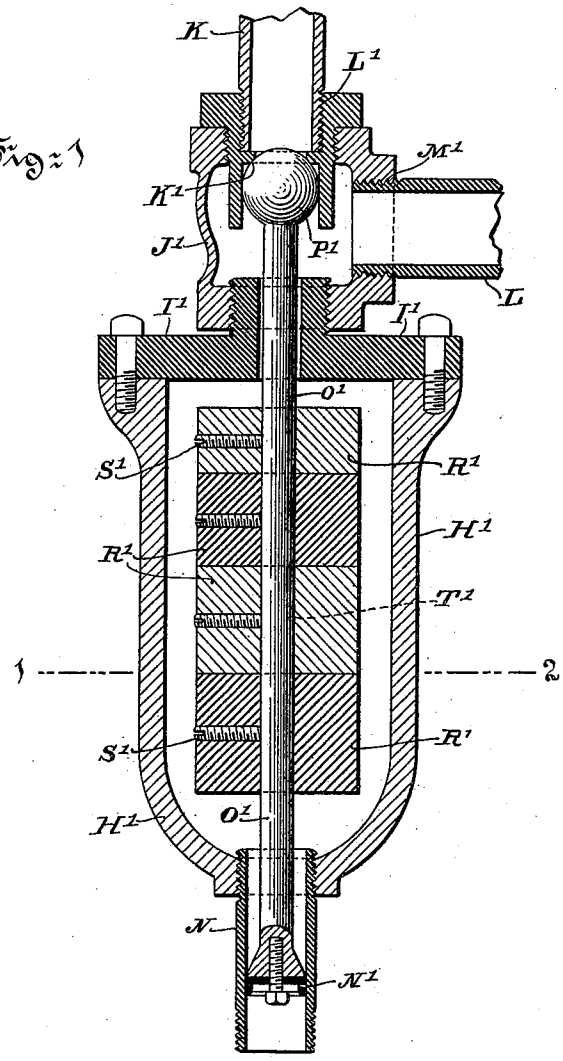
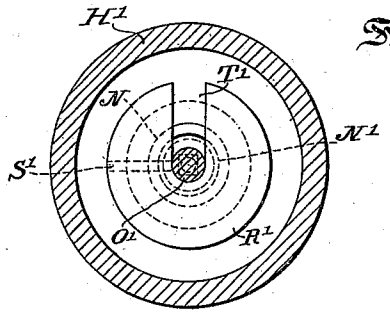


Fig. 2



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(No Model.) 3 Sheets—Sheet 2.

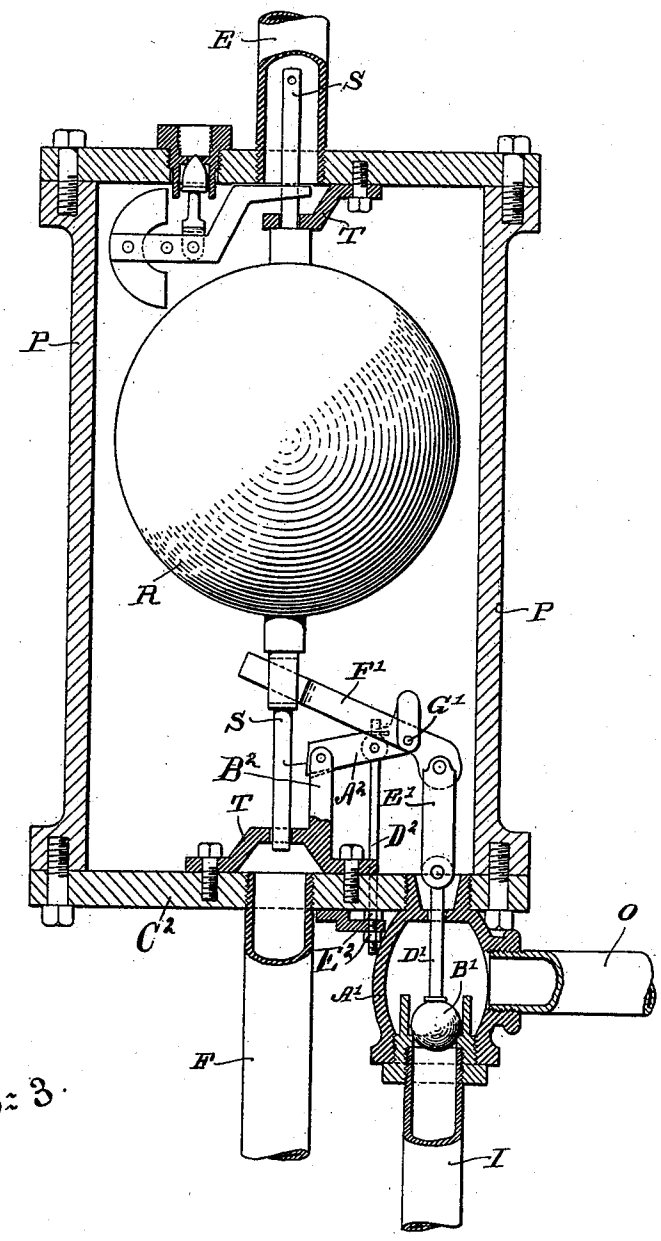

Fig. 3.

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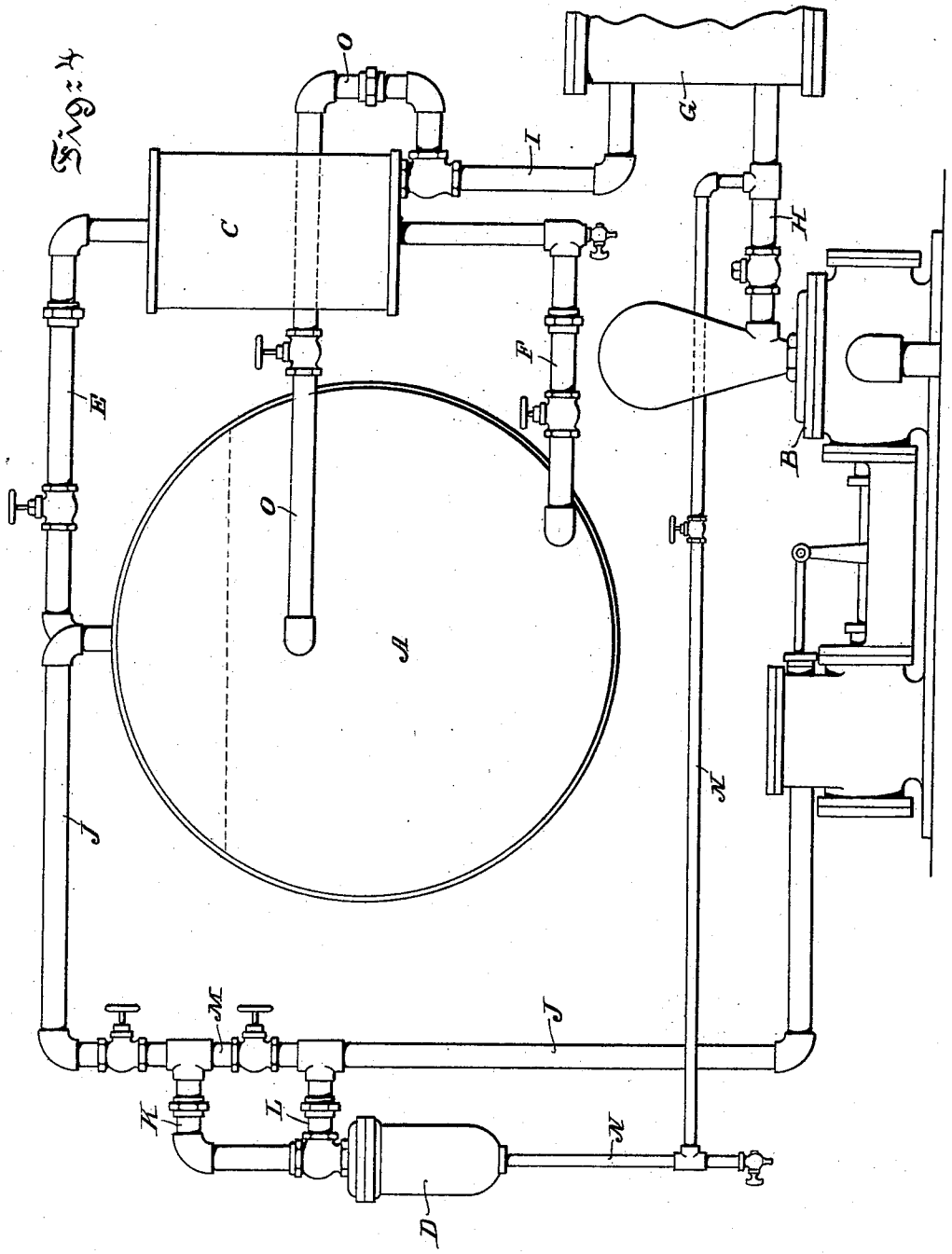
(No Model.) 3 Sheets—Sheet 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC FEED-WATER REGULATOR.

SPECIFICATION forming part of Letters Patent No. 618,981, dated February 7, 1899.

Application filed November 26, 1897. Renewed January 7, 1899. Serial No. 701,524. (No model.)

To all whom it may concern:

Be it known that I, AMOS E. BURROWS, a citizen of the United States, and a resident of Picture Rocks, Lycoming county, Pennsylvania, have invented certain new and useful Improvements in Automatic Feed-Water Regulators, of which the following is a specification.

My invention relates to improvements in devices for automatically controlling the flow of water to steam-boilers, and more particularly to improvements in that form of automatic feed-water regulators which are controlled by the movements of a float which is placed in a closed vessel which has communication at the top with the steam-space and at the bottom with the water-space of the boiler and in which and in the boiler the water is always at the same level; and the object of my invention is, first, to furnish an improved form of regulator, and, second, to furnish a device for automatically reducing the pressure in the feed-pipe leading from the pump to the regulator to a point but slightly above the boiler-pressure.

In the accompanying drawings, forming part of this specification and in which similar letters of reference indicate similar parts throughout the several views, Figure 1 is a central sectional elevation of my pressure-regulating device; Fig. 2, a section of Fig. 1 on line 1 2; Fig. 3, a central sectional elevation of my improved feed-water regulator; Fig. 4, a diagrammatic view showing the arrangement of the boiler, the pump, the pressure-regulator, the feed-water regulator, and the piping connecting these several parts.

Referring to Fig. 4, A is the boiler; B, the pump; C, the feed-water regulator; D, the pressure-regulator; E, a pipe connecting the steam-spaces of the boiler and feed-water regulator; F, a pipe connecting the water-spaces of the boiler and feed-water regulator; G, a feed-water heater; H, a pipe leading from pump to feed-water heater; I, a pipe leading from water-heater to valve-chamber of feed-water regulator; J, a steam-pipe leading from boiler to pump; K, a pipe leading from steam-pipe J to valve-chamber of pressure-regulator; L, a pipe leading from valve-chamber of pressure-regulator to steam-pipe J; M, a stop-valve in steam-pipe J between the pipes K L; N, a pipe leading from pressure-regulator to feed-pipe leading from feed-regulator to boiler.

Referring now to Fig. 3, P is the shell of the feed-water regulator; R, a float within this shell; S, a vertical stem carried by the float R; T, guides in which stem S works. A′ is a valve-chamber screwed into the under part of casing P and connected with pipes I O. B′ is a ball-valve. D′ is a stem connected to ball B′, the upper end of which is pivoted to the lower end of a link E′, the upper end of which is pivoted to one end of a lever F′, which is carried by a pivot G′, which is carried by the outer end of an arm A^2, the inner end of which is pivoted to a standard B^2, carried by the base C^2 of the shell P. D^2 is a rod the upper end of which is loosely attached to arm A^2 and the lower end of which passes out through the bottom C^2 of shell P and is threaded and furnished with nuts E^2, by means of which it, the arm A^2, lever F′, link E′, rod D′, and ball B′, may be raised or lowered to adjust the bearing of the ball upon its seat. The inner end of lever F′ is adapted to be engaged by stem S and rises and falls with the movement of this stem and the float R. As the water lowers in the boiler it also lowers in the shell P, and the float R falls, and through the lever F′, the link E′, and stem D′ the valve B′ is opened, and the water forced by the pump passes through this valve to pipe O and thence to boiler. As the water rises in boiler it rises in shell P, and with it float R, and when the predetermined height is reached the valve B′, through lever F′, link E′, and stem D′, is closed, and the flow of water from the pump to the boiler is shut off.

When the pressure in the feed-pipe leading from pump to valve-casing A′ is just slightly greater than the boiler-pressure—say ten pounds greater—the water-regulator will operate in a perfectly satisfactory manner; but when the pressure is much greater than the boiler-pressure—say from forty to sixty pounds greater—the action of the regulator has been found to be in a greater or less degree unsatisfactory, and hence I have devised

the apparatus (best shown in Figs. 1 and 2) for cutting off the supply of steam to the pump, and thereby reducing the pressure in the pipe leading from the pump to the feed-water regulator.

The pressure-regulator D consists of a shell H′, the top of which is closed by a cap I′, which carries a valve-casing J′, which is furnished with a valve-seat K′ and with opening L′ M′, the former to receive the pipe K and the latter the pipe L, both of which are connected to steam-pipe J.

The pipe N, leading from the bottom of shell H′ to the feed-water pipe H from the pump, is fitted with a piston N′, the rod O′ of which passes up through the shell H′ and into valve-casing J′ and carries at its upper end a ball-valve P′, which is adapted to engage the valve-seat K′ and cut off the flow of steam, as presently described.

R′ is a weight or weights carried by the valve-stem O′, which may be adjusted as desired. These weights are clamped to the stem by means of screws S′ and are furnished with slots T′, Fig. 2, to permit their being placed on or removed from the stem.

The operation of the above part of the device is as follows: The stop-valve M in the pipe that supplies steam from the boiler to the pump is closed, and the steam in passing from boiler to pump has to pass through pipe K, valve K′, and pipe L. The pipe N, leading from the lower part of shell H′ to feed-water pipe leading from pump, is filled with water at the pump-pressure, and if this pressure increases beyond the point that has been determined as proper it causes the piston N′ in pipe N to be lifted, and the valve controlled by ball P′ is shut off and the flow of steam to the pump is reduced, and hence the pressure in the feed-pipe is reduced. If the pump-pressure is too small, the weights R′, carried by piston-rod O′, cause this rod and the piston N′ to fall and the steam-valve controlled by ball P′ to open and supply a greater amount of steam to the pump.

By changing the weights R′ the amount of steam fed to pump and the pressure of water in feed-pipe leading from pump can be regulated as desired. I have found that an excess of pressure of about ten pounds in the feed-water pipe above the boiler-pressure is about the best for use with the water-regulator, and with the pump-regulator this difference of pressure is easily constantly maintained. Without the pump-regulator, pumps being usually of much greater power than is necessary for overcoming the boiler-pressure, it is not unusual for the pressure in the feed-water pipe to exceed the boiler-pressure by from forty to sixty pounds or more.

Having thus described my invention, I claim—

1. The combination in an automatic boiler-feeding device, of a shell or case P connected at the top with the steam-space and at the bottom with the water-space of a boiler, a float within said shell or case, a stem carried by said float, guides in which said stem works, a valve-body connected with the water-space of said shell, pipes connecting said valve-body with a pump and with the boiler, a ball-valve within said valve-body, a stem connected with said ball, a link one end of which is pivotally attached to said stem and the other to one end of a lever the other end of which is adapted to be engaged by the stem of said float, said lever, an arm to one end of which said lever is pivoted, a standard carried by said float shell or case P to which the other end of said arm is pivoted, a rod passing through the bottom of said float shell or case and loosely connected to said lever-carrying arm, and means whereby said rod may be adjusted in or out, all substantially as and for the purposes set forth.

2. In a pump-regulator, in combination, a pump, a shell or case H′, a valve-casing J′ carried by said shell or case, a pipe leading from the lower end of said shell or case to the discharge-pipe of said pump, a piston working in said pipe, a piston-rod carried by said piston and passing through said shell or case and into said valve-casing, a valve carried by the upper end of said piston-rod, a weight or weights carried by said piston-rod, and a steam connection leading from a boiler to said valve-casing and thence to the pump.

3. In a pump-regulator, in combination, a pump, a shell or case H′, a pipe connecting the discharge-pipe of said pump and the lower end of said shell or case, a piston within said pipe, a weighted piston-rod carried by said piston and passing through said shell or case, a steam connection leading from a boiler to the pump, and a valve, controlled by the movements of said piston and piston-rod, in said steam connection for controlling the flow of steam to said pump.

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