

(Model.)

L. E. HOGUE.
INJECTOR.

No. 515,683.

Patented Feb. 27, 1894.

Fig. 1.

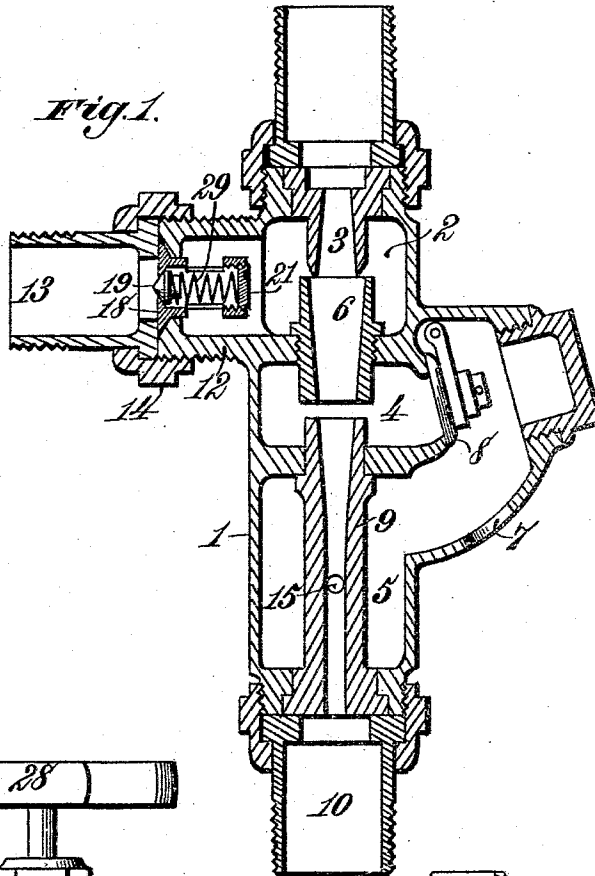


Fig. 2.

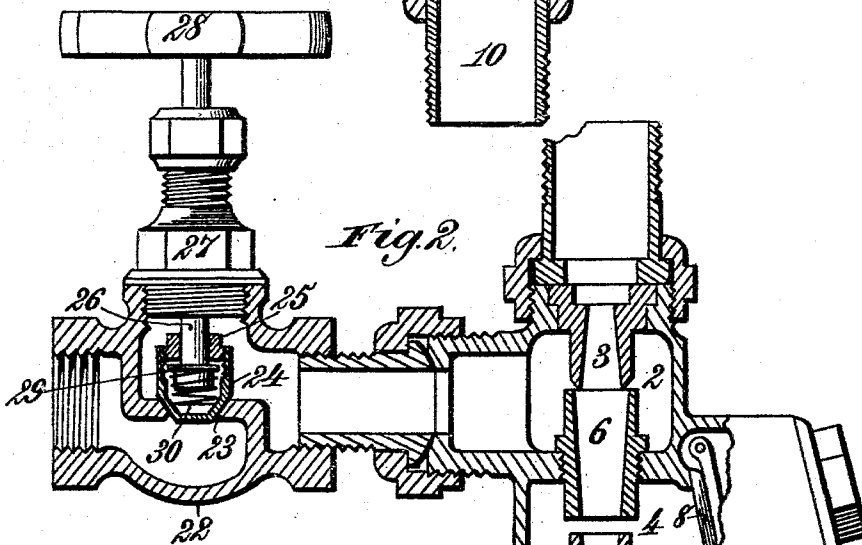


Fig. 3.

Witnesses: 19 17
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UNITED STATES PATENT OFFICE.

LOVREN E. HOGUE, OF GREENVILLE, MERCER COUNTY, PENNSYLVANIA,
ASSIGNOR OF ONE-HALF TO W. R. FIELD, OF SAME PLACE.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 515,683, dated February 27, 1894.

Application filed December 7, 1893. Serial No. 493,068. (Model.)

To all whom it may concern:

Be it known that I, LOVREN E. HOGUE, a citizen of the United States, residing at Greenville, in the county of Mercer and State of Pennsylvania, have invented new and useful Improvements in Injectors, of which the following is a specification.

This invention relates to that type of apparatus, particularly injectors, for feeding steam boilers, wherein a liquid, such as water, is drawn into the apparatus or injector by the action of steam or other fluid under pressure delivered by a suitable fluid conduit for the purpose of forcing the liquid to a point desired, for example into the water space of a boiler.

In apparatus of the character alluded to, especially injectors, the water delivery pipe or conduit is ordinarily provided with a globe or other valve which requires to be more or less closed by the engineer or attendant whenever the steam pressure is low, in order that the quantity of water delivered to the injector will not exceed the power of the steam to properly force the water into the boiler, as this would result in slobbering, or an objectionable overflow. Conversely, when the pressure of the steam increases and a greater quantity of water should be permitted to flow through the water-delivery pipe or conduit into the injector, the globe or other valve must be more or less opened.

The objects of the present invention are to avoid the necessity of manually adjusting the valve to increase or diminish the quantity of water drawn in by the suction; to relieve the engineer from the necessity of attending to the valve; and to provide means whereby the quantity of water flowing through the water-delivery pipe is automatically varied to suit the conditions required when the pressure of the steam or forcing fluid varies. These objects are accomplished in the manner and by the means hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a longitudinal central sectional view of an injector or water forcing apparatus provided with my invention. Fig. 2 is a similar view of a portion of the apparatus, showing a modified form of automatic valve;

and Fig. 3 is a detail perspective view of the automatic valve shown in Fig. 1.

In order to enable those skilled in the art to make and use my invention, I will now describe the same in detail, referring to the drawings, where I have exhibited my invention in connection with a feed-water injector, composed of a casing 1 having a vacuum chamber 2, into which water is drawn by suction through the medium of steam under pressure flowing through a steam nozzle 3 and creating a partial vacuum in the vacuum chamber. The casing is also provided with chambers 4 and 5, a suction jet 6, an overflow 7, a relief-valve 8, and a combining tube 9, which is coincident, or in line with, a feed-pipe 10, adapted to connect with the water space of a boiler. The casing is also provided with a lateral nipple 12, to which a water-delivery pipe or conduit 13 is connected by a coupling 14.

The construction and arrangement of the parts above described are such that the steam under pressure creates a vacuum in the vacuum chamber, and thereby draws the liquid or water through the pipe or conduit 13, and forces it through the suction-jet into the combining-tube, from which the water is forced through the feed-pipe into the boiler. The combining-tube is provided with a lateral orifice 15, for the purpose of carrying off the water on starting the injector, the water ceasing to flow through this orifice when the desired velocity is attained. The overflow 7 and relief-valve 8 perform their usual functions.

The water-delivery-pipe 13 is ordinarily provided with a globe, or other valve, for regulating the quantity of water delivered to the vacuum chamber, and such globe or other valve usually requires to be more or less closed by the engineer or attendant when the steam pressure decreases; while if the pressure increases, and a greater quantity of water should be permitted to enter the injector, the globe, or other valve, must be more or less opened. In contradistinction to this I provide an automatically-operating valve, which, as shown in Figs. 1 and 3, is composed of a tubular portion 16 having lateral water passages 17 and a valve-seat 18, upon which seats a conoidal or other suitably shaped valve-

disk 19, which is acted upon by a spring 20, bearing at one end against the valve-disk, and at the opposite end against a plug screwing into the tube 16, and adapted to be adjusted for varying the tension of the spring, as is required according to the lift of the injector. The spring resists the opening of the valve-disk, thus offering resistance to the inflowing water, whereby the passage of water into the injector is graded or graduated. The valve-disk stands normally closed, or nearly closed, and the passage of steam through the steam-nozzle creates a vacuum in the vacuum-chamber 2, whereby the valve is more or less opened to permit water to flow into the injector. The variations in the steam pressure will more or less open the valve, and, consequently, the quantity of water delivered to the injector is increased or diminished according to the conditions required by variations in the pressure of the steam or forcing fluid. The communication between the chamber 4 and the overflow is normally closed by the relief-valve 8, but an undue quantity of water will open the relief-valve, and such water will pass into the overflow and air chamber 5. If the steam pressure decreases and the superabundance of water opens the relief-valve, the pressure on the automatic valve 19 is lowered, and this valve instantly responding to the opening of the relief-valve is automatically closed more or less to diminish the flow of water through the water-delivery pipe or conduit. If the steam pressure increases a greater quantity of water can be properly forced to the boiler or other point, and the amplified suction power opens the automatic valve 19 to a greater extent for permitting a larger volume of water to flow into the injector. These movements of the regulating valve 19 are automatically effected by the varying pressure of the steam or forcing fluid, and therefore the engineer is entirely relieved from the care and attention incident to manually adjusting the ordinary valve to suit the varying conditions required by changes or variations of the pressure of the steam, or other forcing fluid.

In some instances it is very desirable that the automatic valve be so constructed and arranged that it can be entirely moved and held away from its seat; and to accomplish this I provide the construction illustrated in Fig. 2, in which figure the parts of the injector are constructed the same as described with reference to Fig. 1, and like reference numerals indicate corresponding parts. Instead, however, of securing the automatic valve between the nipple 12 and the water-delivery pipe, or conduit 13, as shown in Fig. 1, I insert into the water-delivery pipe, or conduit, a valve casing 22, similar to the casing of an ordinary globe-valve.

The valve-casing contains a partition having a valve-seat 23, upon which seats the automatic valve 24, which, as here shown, is composed of a hollow cylindro-conoidal body,

and a screw-threaded ring or plug 25 loosely fitted upon a cylindrical stem 26 which extends through the stuffing-box 27, and is provided with a suitable handle 28. The cylindrical stem 26 is provided with a rigid collar 29, located beneath the ring or plug 25, and a spring 30 bears at one end against the collar 29, and at the opposite end against the hollow cylindro-conoidal valve 24, so that the power of the spring tends to constantly press the valve 24 downward against the valve-seat 21, but permits the valve 24 to rise independent of any movement of the cylindrical stem 26.

The operation of this form of valve by the partial vacuum created in the vacuum-chamber is the same, or substantially the same, as described with reference to Fig. 1. The steam, or other forcing fluid, passing through the steam-nozzle 3 creates a partial vacuum in the vacuum-chamber 2, and the valve 24 is thereby raised more or less from the valve-seat 23 for the passage of water to the injector. If the pressure of the steam, or forcing fluid, decreases, the valve 24 will commence to close, and if the pressure of the steam, or forcing fluid, increases, the valve 24 will more or less open.

The connection of the valve 24 with the valve-stem 26 enables the valve to be raised and held away from the valve-seat 23 by simply turning the handle 28 in the proper direction.

For some purposes the construction of valve described with reference to Fig. 2 will be found more desirable than the valve described with reference to Fig. 1.

Having thus described my invention, what I claim is—

1. The combination with a liquid-supply pipe or conduit, and a fluid-conduit for the passage of fluid under pressure to create suction and draw liquid through the supply-pipe, or conduit, of an automatic spring-pressed valve regulating the inflow of liquid from the supply-pipe or conduit and more or less opened or closed by the action of the fluid under pressure in the fluid conduit, substantially as described.

2. The combination with a casing having a liquid-supply pipe or conduit, a vacuum-chamber, and a nozzle for the passage of a fluid under pressure to create a partial vacuum in the vacuum chamber, of an automatic spring-pressed valve interposed between the vacuum-chamber and the liquid-supply pipe or conduit, and more or less opened or closed by the variations in pressure of the said fluid, substantially as described.

3. The combination with a casing having a water-supply pipe or conduit, a vacuum-chamber, a steam nozzle, a suction-jet, and a combining tube, of an automatic spring-pressed valve more or less opened or closed by variations in pressure of the steam for increasing or diminishing the quantity of water flowing from the water-supply pipe or

conduit into the suction chamber, substantially as described.

4. The combination with a casing having a liquid-supply pipe, and a fluid conduit for the
5 passage of fluid under pressure to create suction and draw the liquid into the casing of a valve-casing connected with the supply-pipe, a valve-stem, and a spring-pressed valve mounted upon and movable independent of
10 the valve-stem, said valve being more or less opened or closed by variations in the press-

ure of the said fluid for increasing or diminishing the quantity of liquid delivered to the casing, substantially as described.

In testimony whereof I have hereunto set 15
my hand in presence of two subscribing witnesses.

LOVREN E. HOGUE.

Witnesses:

ALBERT H. NORRIS,
G. W. REA.