

(No Model.)

N. C. LOCKE.  
BOILER FEED PUMP REGULATOR.

No. 545,083.

Patented Aug. 27, 1895.

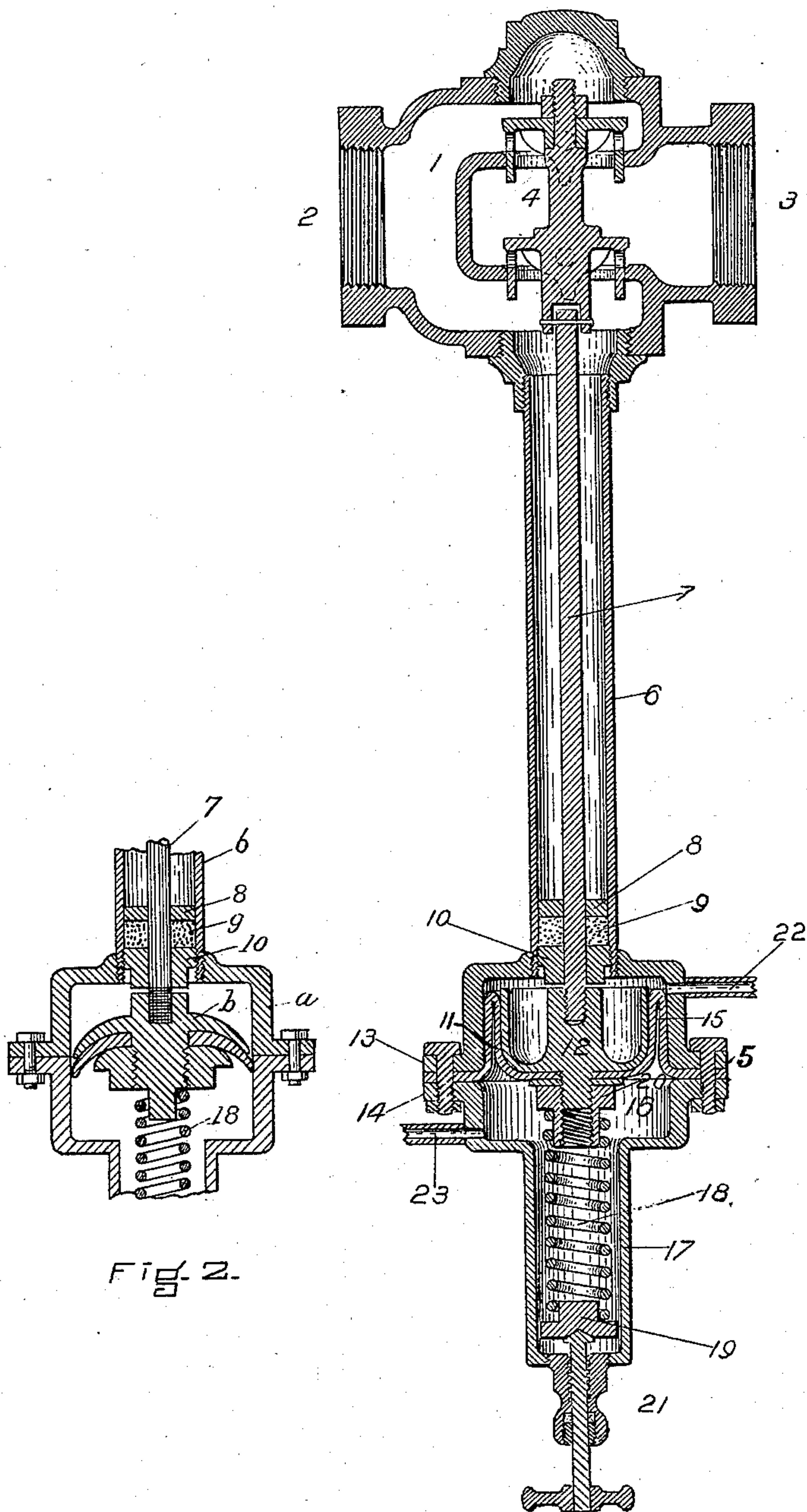


FIG. 2.

FIG. 1.

WITNESSES:

*W. J. Matthews*  
*A. J. Crawford.*

INVENTOR

*Nathaniel C. Locke*

BY

*Edward S. Beach,*  
ATTORNEY.



# UNITED STATES PATENT OFFICE.

NATHANIEL C. LOCKE, OF SALEM, MASSACHUSETTS.

## BOILER FEED-PUMP REGULATOR.

SPECIFICATION forming part of Letters Patent No. 545,083, dated August 27, 1895.

Application filed February 2, 1895. Serial No. 537,072. (No model.)

*To all whom it may concern:*

Be it known that I, NATHANIEL C. LOCKE, of Salem, in the county of Essex and State of Massachusetts, have invented a new and useful Boiler Feed-Pump Regulator, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a central lengthwise section of one form of apparatus embodying my invention. Fig. 2 shows a modification.

The object of my invention is to produce a simple, compact, and efficient automatically-acting boiler feed-pump regulator; and my invention consists in the combination of a valve-casing, valve, and valve-stem prolonged beyond the valve-casing with a plurality of pressure-chambers, one feeling pump-pressure and the other boiler-pressure, which are separated by a diaphragm connected to the valve-stem, the valve-casing and casing in which the two pressure-chambers are formed being secured together preferably by a water-leg.

In the drawings illustrating my invention in the best form now known to me, 1 is a valve-casing, 2 and 3 the ports thereof, and 4 a valve. Pressure-chamber case 5 is connected with the valve-casing at a distance therefrom, preferably by means of a water-leg 6, which in this case surrounds the valve-stem 7, being provided with a central guide 8, packing 9, and removable guide-plug 10, near its foot, for the valve-stem, which is connected with diaphragm 11, preferably by means of the pressure-cap 12. The diaphragm is confined between the flanges 13 and 14 of the two caps which make up pressure-chamber case 5, the diaphragm forming a flexible partition between the pressure-chambers 15 and 16. Case 5 is formed with an extension 17, the chamber of which forms part of the pressure-chamber 16, and in this extension 17 is mounted a spring 18 between the diaphragm and a slide 19. The nut 20, which clamps the diaphragm on the pressure-cap 12, affords a bearing for the upper end of spring 18, and prevents it from cutting or abrading the diaphragm. The slide 19 is adjusted in extension 17 by a tension device 21, operated from outside, conveniently in the form of a set-screw and through the wall of the extension. A conduit leads into connection with a pump or conduit 23 and connects with the boiler.

The operation of this device will be readily understood by the following: As shown, valve 4 is open and all ports in the position for a feed-water pressure exceeding the boiler-pressure by about ten pounds—that is, spring 18 is supposed to be exerting a pressure against the piston or diaphragm 11, in a direction opposite to the pressure of the feed-water in pressure-chamber 15, equal to about ten pounds per square inch. The regulator being in a line of pipe leading from the boiler to the pump, having the small pipe 23 from the pressure-chamber 16 under the diaphragm connected with the steam-boiler, (preferably below water-line,) and having a pipe 22 connecting the upper chamber 15 with the feed-water pipe leading from the pump to boiler, the regulator is in condition for operation. With a boiler-pressure of, say, eighty pounds exerting upward pressure on the piston or diaphragm 11, the added spring-pressure of ten pounds per square inch, a total upward pressure of ninety pounds per square inch. If the pump is running, it is increasing the feed-water pressure in chamber 15 and continues so to do until the feed-water pressure in chamber 15 reaches ninety pounds per square inch—that is, ten pounds above the boiler-pressure. Any tendency of the feed-water-pressure to exceed ninety pounds will wholly or partially close the valve. This illustrates the principle of my invention.

My present construction may be departed from without departure from my invention in many details. Thus this regulating-valve is designed to maintain a water-pressure above that of the boiler-pressure and stop the pumps when the pressure exceeds the boiler-pressure ten pounds, or any other excess of pressure which the regulator may be set for. This regulator is constantly changing itself as the boiler-pressure changes. For instance, if the boiler-pressure is one hundred pounds, the pump slows down at one hundred and ten pounds, but if the pressure falls to ninety pounds, the pump stops at one hundred pounds, the water always maintaining the same relative higher pressure, no matter what the boiler-pressure may be. The difference between the water and the boiler pressure can be changed by changing the screw at the bottom of the regulator. A very even water-line



may be kept by properly setting the feed-valves, as this regulator will control the pump so that there will always be the same pressure of the feed-water higher than the boiler-pressure.

In Fig. 2 I show a form of plug-shaped piston *b* that might be substituted for the diaphragm.

The combination of the water-leg and inclosed valve-stem with the ring-guide, packing, and removable guide-plug is not claimed herein, as it is claimed in my application, Serial No. 537,073, filed herewith.

What I claim is—

1. The combination of a valve-casing having inlet and outlet ports, a valve and a valve-stem; with a diaphragm connected with the valve-stem; a diaphragm-case divided into independent chambers by the diaphragm which is exposed and susceptible to variations of pressures in each of said chambers; an adjustable spring mounted opposite the valve-stem within the chamber on the other

side of the diaphragm from the valve-stem; means for regulating the tension of said spring; each of said pressure chambers being provided with a conduit, all substantially as and for the purpose set forth.

2. The combination with a valve-casing having inlet and outlet ports; a valve; and valve-stem of a diaphragm connected with the valve-stem; a casing for the diaphragm, said casing being separated from the valve-casing by a water-leg inclosing the valve-stem and being divided into pressure chambers by the diaphragm, a pump conduit for one chamber and a boiler conduit for the other chamber which is provided with means inclosed by a pressure chamber for mechanically loading the diaphragm, additional to the boiler-pressure load, against the pump pressure.

NATHANIEL C. LOCKE.

Witnesses:

EDWARD S. BEACH,  
A. I. CRAWFORD.