

L. B. FULTON.  
FEED WATER REGULATOR.  
APPLICATION FILED FEB. 18, 1909.

959,334.

Patented May 24, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

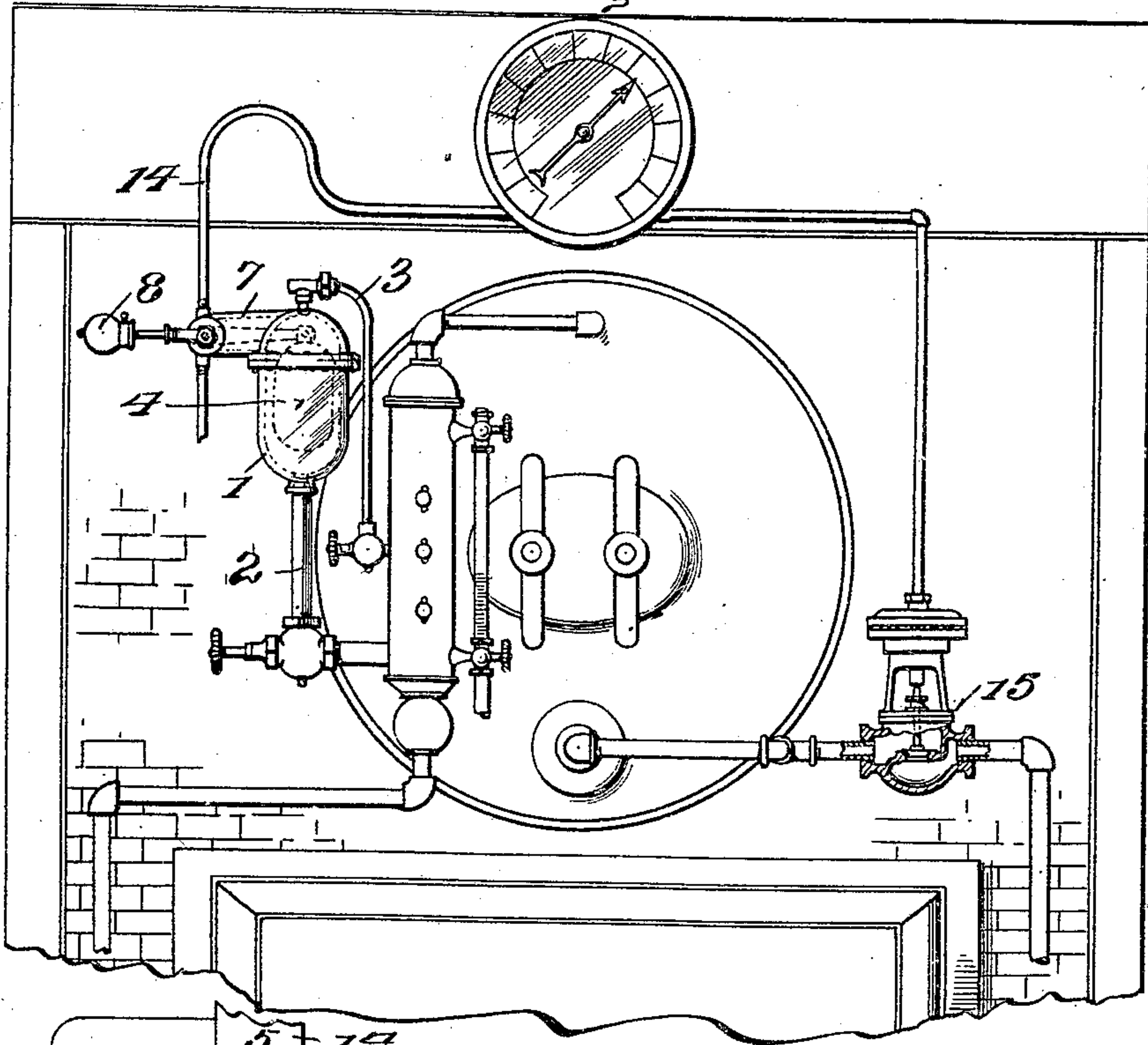


Fig. 4.

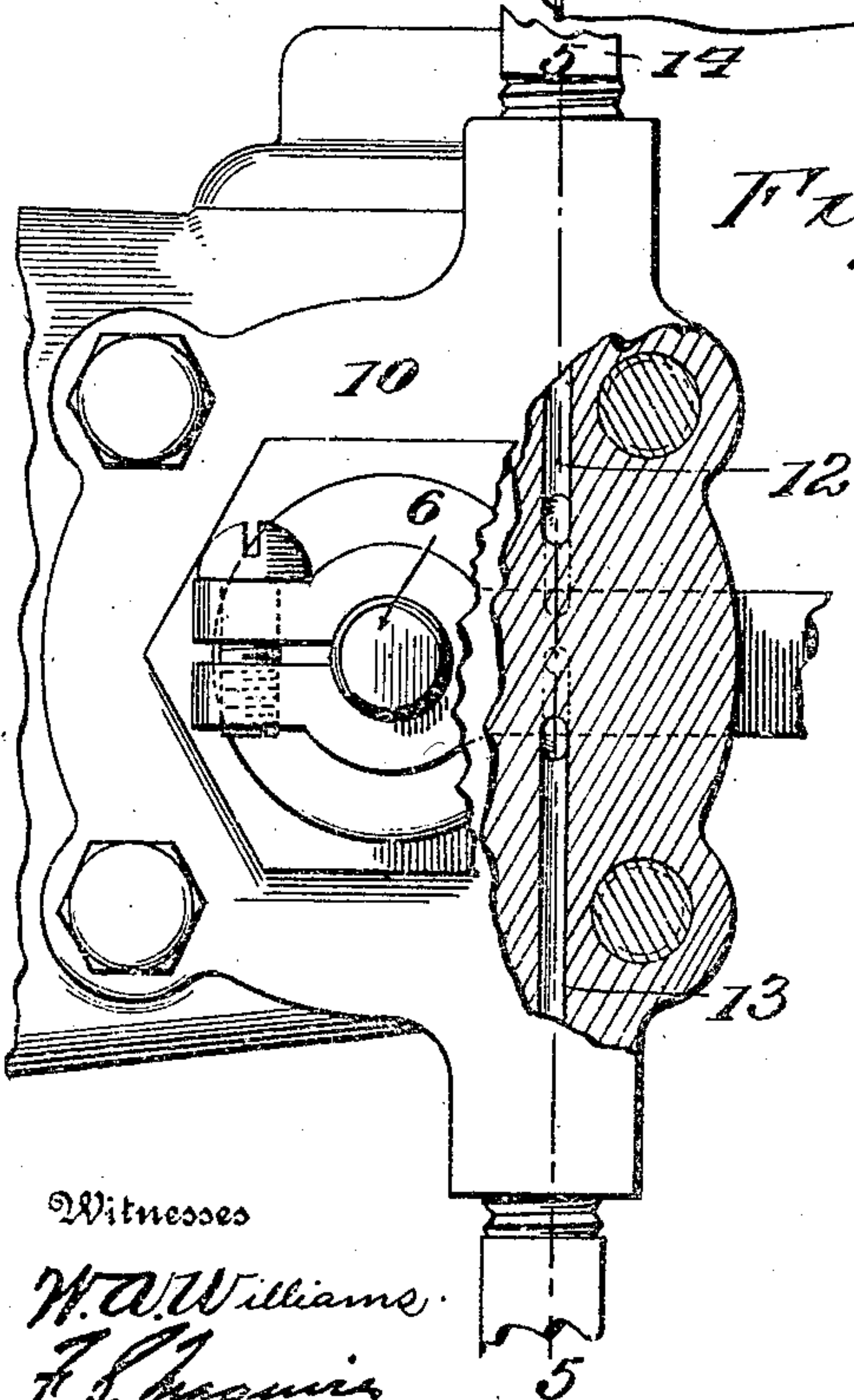
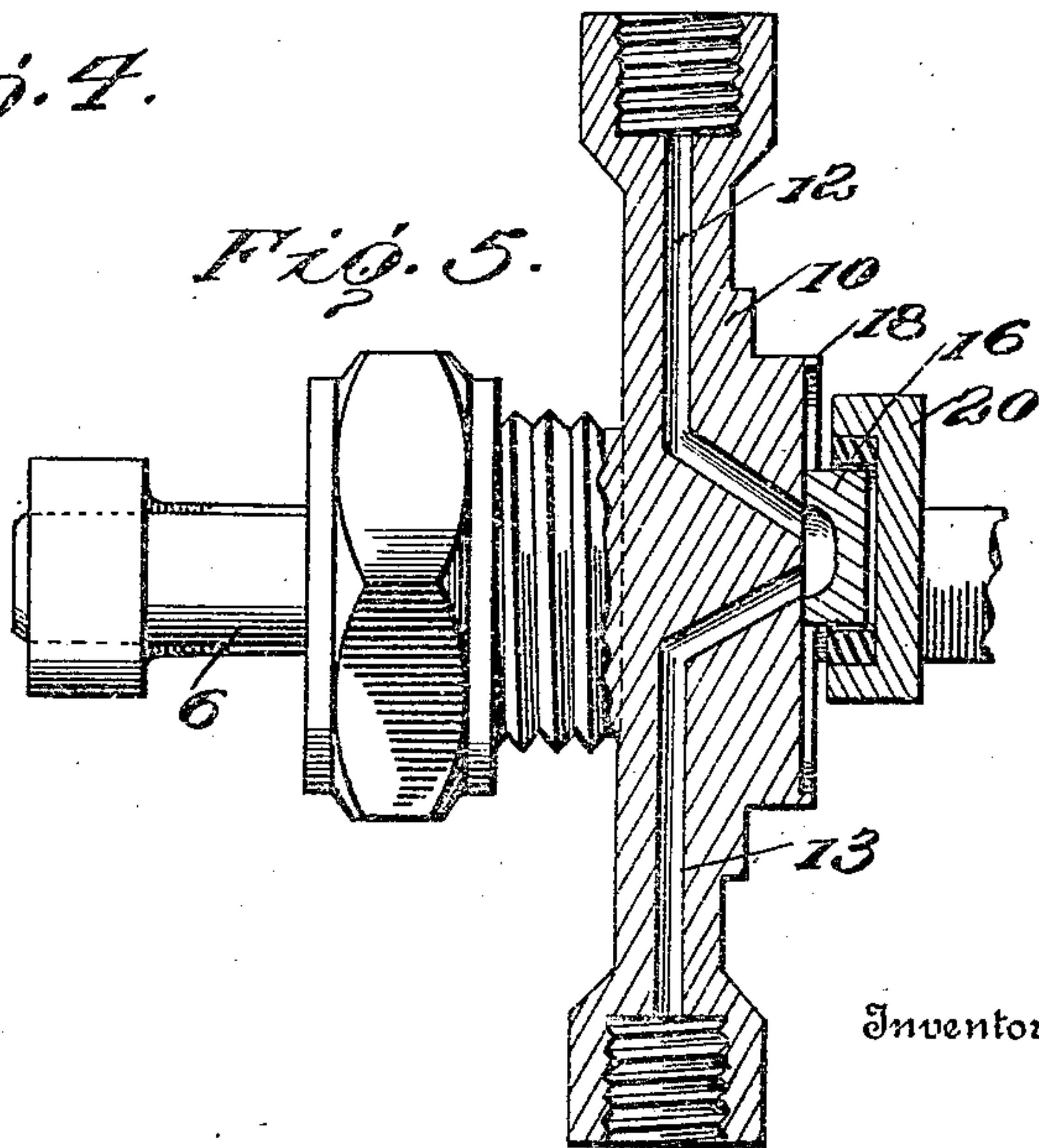


Fig. 5.



Witnesses

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2 SHEETS—SHEET 2.

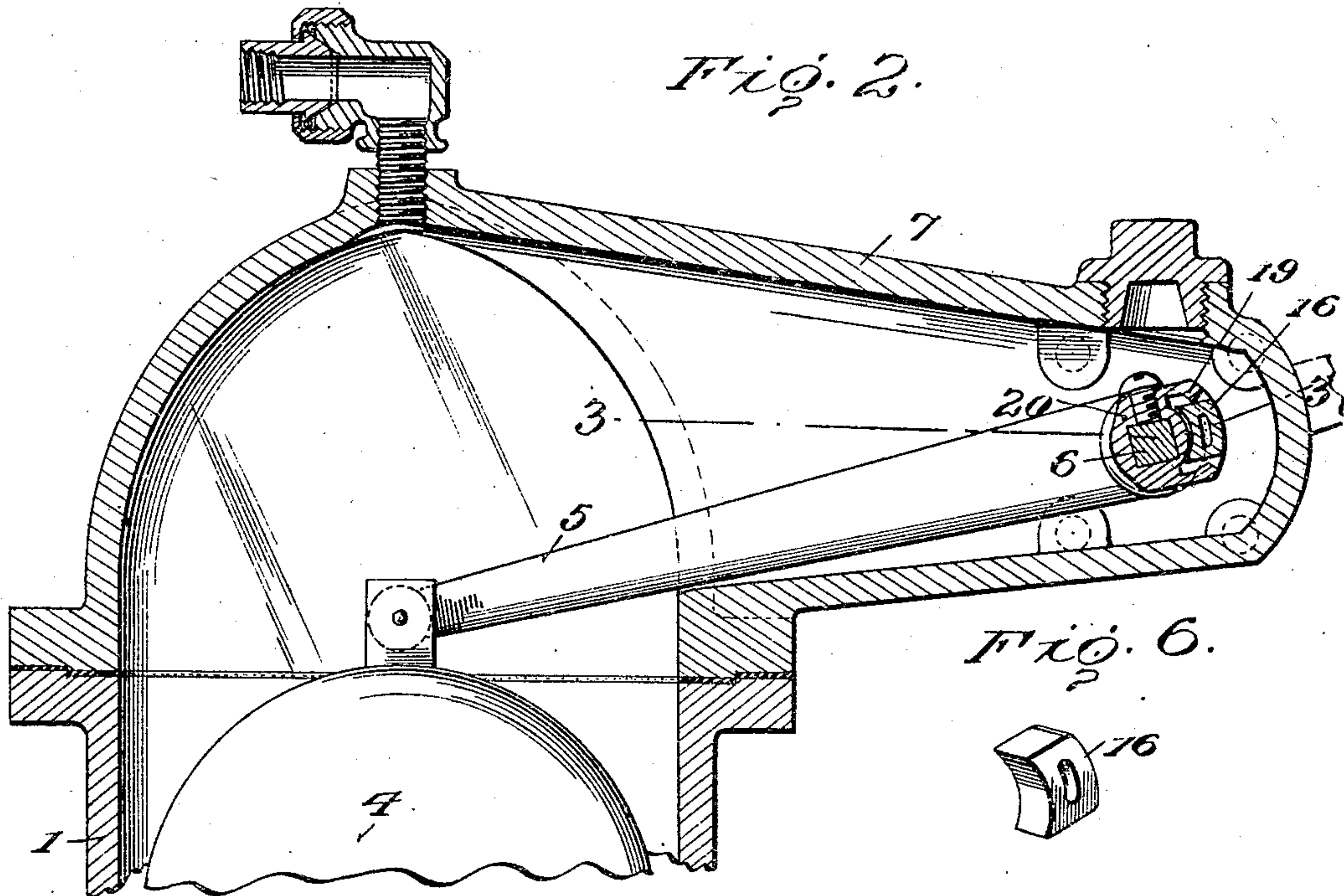


Fig. 6.

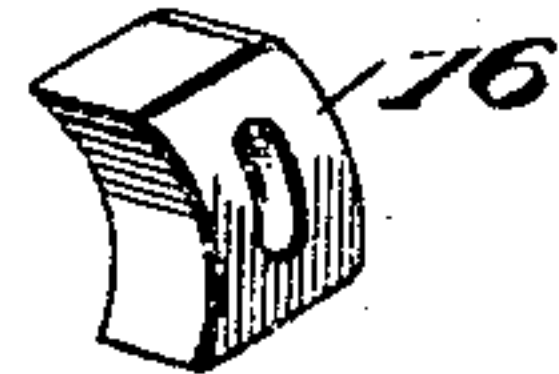


Fig. 3.

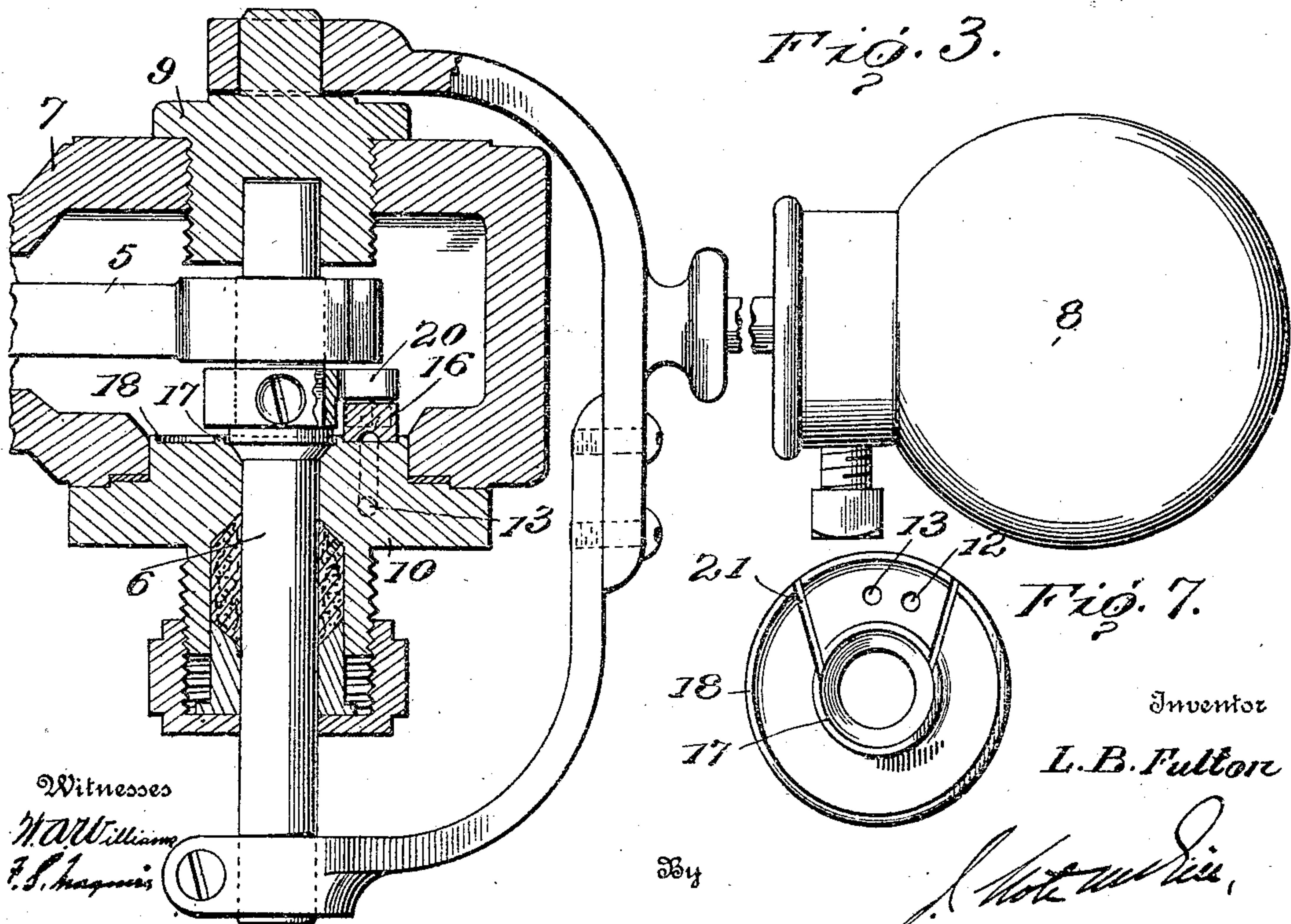
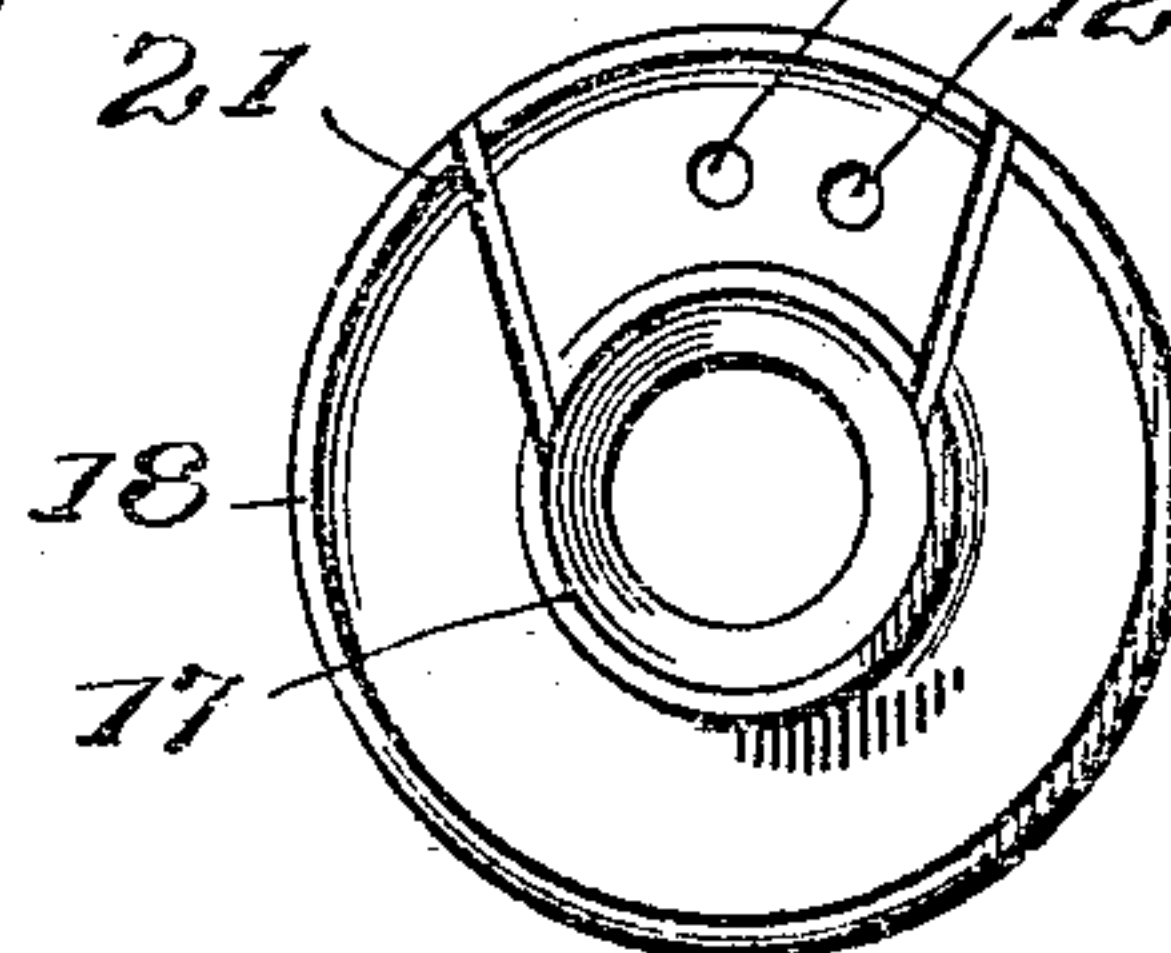


Fig. 7.



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# UNITED STATES PATENT OFFICE.

LOUIS B. FULTON, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE CHAPLIN-FULTON MANUFACTURING COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

## FEED-WATER REGULATOR.

959,334.

Specification of Letters Patent.

Patented May 24, 1910.

Application filed February 18, 1909. Serial No. 478,599.

*To all whom it may concern:*

Be it known that I, LOUIS B. FULTON, of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in 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.

This invention relates to that class of feed water regulators embraced by Letters Patent of the United States No. 662,488, issued to me November 27th, 1900, wherein the seating and unseating of a controlling valve in the feed-line is regulated by a prime mover located in a superposed chamber having steam and water connections with the boiler or the water column thereof. In this class of feed water regulators the prime mover is controlled by the presence or absence of water in the superposed chamber, steam being admitted to such chamber to displace the water therein, the elevation of the water into the superposed chamber being caused by the condensation of the steam. On account of the accumulation of air in the upper portion of such chamber it has heretofore been necessary to occasionally release such air by the manual manipulation of an air-valve.

One of the main objects of the present improvement is to effect the automatic release of the air, or at least so much thereof as would otherwise tend to interfere with the travel of the prime mover.

Further objects of the present invention are to provide a valve for controlling the admission of steam to and the exhaust from the diaphragm of the controlling valve which will have but minimum friction; will be firmly held to its seat by the steam pressure within the superposed chamber; which will have but a short travel relatively to the travel of the prime mover; and which will automatically remove any obstruction or foreign substance from its seat.

The invention will be hereinafter fully set forth and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is an elevation showing my improvement

applied to a boiler. Fig. 2 is an enlarged vertical sectional view. Fig. 3 is a view on line 3—3, Fig. 2. Fig. 4 is an enlarged view with parts broken away. Fig. 5 is a section on line 5—5, Fig. 4. Fig. 6 is a view of the steam valve. Fig. 7 is a view of the valve seat.

Referring to the drawings, 1 designates the superposed chamber which is shown as connected at its bottom, by a pipe 2, to the water column at a point beneath the water level, and at its top by a pipe 3 which opens into such column at the normal water level. The prime mover is shown in the form of a displacement body 4 mounted on the long arm of a lever 5 fulcrumed on a shaft 6 mounted in a lateral extension 7 of chamber 1, the outer arm of said lever carrying a counter weight 8. The shaft 6 has its bearing at one end in a plug 9, and its other end is extended through a stuffing box of a plate 10 bolted over an opening in the casing wall. In this plate 10 are formed two ports 12 and 13, the former being connected through a pipe 14 to the diaphragm chamber of a controlling valve 15 in the feed-line of the boiler. The port 13 is for the exhaust. These two ports are formed with branches which open at the face of a thickened portion which constitutes a valve-seat.

16 designates a steam valve which, in longitudinal section, is of the D-type, being formed in one face with a single port through which ports 12 and 13 may be thrown into communication to exhaust the steam from the diaphragm chamber, the space between said ports being sufficient to enable the valve to uncover port 12 to allow steam to pass directly to the diaphragm chamber. This steam valve 16 is shown as a segment of a circle, being curved at its inner and outer ends to conform to the curvature of inner and outer concentric beads or flanges 17 and 18 of the valve seat. The valve is located between pointed lugs 19 of a plate 20 secured on shaft 6, and by such plate it is moved on its seat against which it is held by the steam pressure.

In the valve seat at points somewhat short of the limits of movements of the steam valve are formed transverse grooves 21 which extend through the concentric flanges



17 and 18. These grooves are divergently arranged so that the valve will progressively cover them from the outer to the inner ends, and thus effectively remove from the seat all foreign substances. Furthermore, these grooves prevent the formation of shoulders in the wear of the valve seat, such grooves being located at about the terminations of the travel of the valve.

According to my present improvements the steam for effecting the seating of the controlling valve is taken from within the superposed chamber of the prime mover at a point near the top thereof. In consequence, each time the valve establishes communication with steam pipe 14 some of the air which accumulates within the chamber will be forced therefrom into such pipe, and when the valve establishes communication with the exhaust port such air, along with the steam, will escape to the atmosphere. In this way I am enabled to automatically remove the air which naturally accumulates in the upper portion of such chamber, that is to say, a sufficient portion of the air will pass outwardly with the steam to avoid any interference with the free travel of the prime mover. The latter has about sixteen times the travel of the valve, and hence the friction of the valve against its seat is readily overcome by the pronouncedly greater leverage of the prime mover. By making the valve in the form of a segment I am enabled to reduce friction to a minimum, and furthermore the valve being held to its seat solely by the steam pressure the danger of its being deranged is practically entirely overcome.

It will be understood that when the lower end of pipe 3 is unsealed by the lowering of the water in the boiler, steam will immediately enter the superposed chamber and displace the water therein, the prime mover descending and effecting the partial turning of shaft 6. This will so move the steam valve 16 as to place the two ports 12 and 13 into register and release the steam pressure on the diaphragm. The controlling valve is automatically unseated to supply water to the boiler, and when the necessary quantity has been furnished the lower end of pipe 3 is sealed, and upon the condensation of the steam in the superposed chamber the water is elevated thereinto, causing the prime mover to travel upwardly to effect the movement of the steam valve to open port 12 and allow the steam with a certain quantity of air to effect the reseating of the controlling valve. By reason of the discharge of a portion of the air with the steam the quick seating of the controlling valve is effected, as the air within the superposed chamber cannot in any way impede the upward travel of the prime mover.

I claim as my invention:—

1. In combination with a prime mover, a chamber therefor located above the normal water level in a boiler, and means for alternately admitting steam and water to said chamber for causing the prime mover to travel in opposite directions, a controlling valve in the feed-line, a steam pipe leading from said chamber to said controlling valve, an exhaust outlet, and a slide valve for controlling the passage of steam and air from the upper portion of such chamber through said pipe to the controlling valve and from said pipe to the exhaust outlet, said slide valve being actuated by the movements of the prime mover and located wholly within said chamber, near the top thereof, and held to its seat by steam pressure within the chamber.

2. In combination with a prime mover, a chamber therefor located above the normal water level in a boiler, and means for alternately admitting steam and water to said chamber for causing the prime mover to travel in opposite directions, said chamber having near its top a valve seat and two ports leading therefrom, a controlling valve in the feed-line, a steam pipe leading from one of said ports to said controlling valve, a steam valve fitted loosely on such seat against which it is held wholly by steam pressure within said chamber, and means actuated by said prime mover for moving said valve to permit steam and accumulated air to pass from the chamber to said pipe and to exhaust therefrom.

3. In a feed-water regulator, the combination with a chamber located above the normal water level in a boiler, a prime mover in such chamber, and a shaft actuated by such prime mover, said chamber having supply and exhaust ports and a valve seat through which said ports open, of a controlling valve in the feed-line, a steam-pipe leading from said supply port to said controlling valve, a valve for admitting steam and accumulated air from the chamber through said supply-port to said pipe, said valve having a port for connecting the first mentioned ports to permit the steam and air to escape from said pipe, said valve being held against its seat by steam-pressure, and means mounted on said shaft and engaging said valve for moving it on its seat when the prime mover is actuated.

4. In a feed-water regulator, the combination with a chamber, a prime mover therein, and a controlling valve, of a plate secured to said chamber and having ports for controlling the passage of steam to and its exhaust from said controlling valve, said plate having a valve seat through which said ports open, a segmental valve designed to move on the arc of a circle on said valve seat, said

valve having a single port for connecting  
the first mentioned ports, means actuated by  
the prime mover for moving said valve, and  
grooves extending transversely of said valve  
5 seat at or about the termination of the travel  
of said steam valve.

In testimony whereof, I have signed this

specification in the presence of two subscrib-  
ing witnesses.

LOUIS B. FULTON.

Witnesses:

WM. C. CHAPLIN,  
WM. MCKEE.