No. 693,961. Patented Feb. 25, 1902.

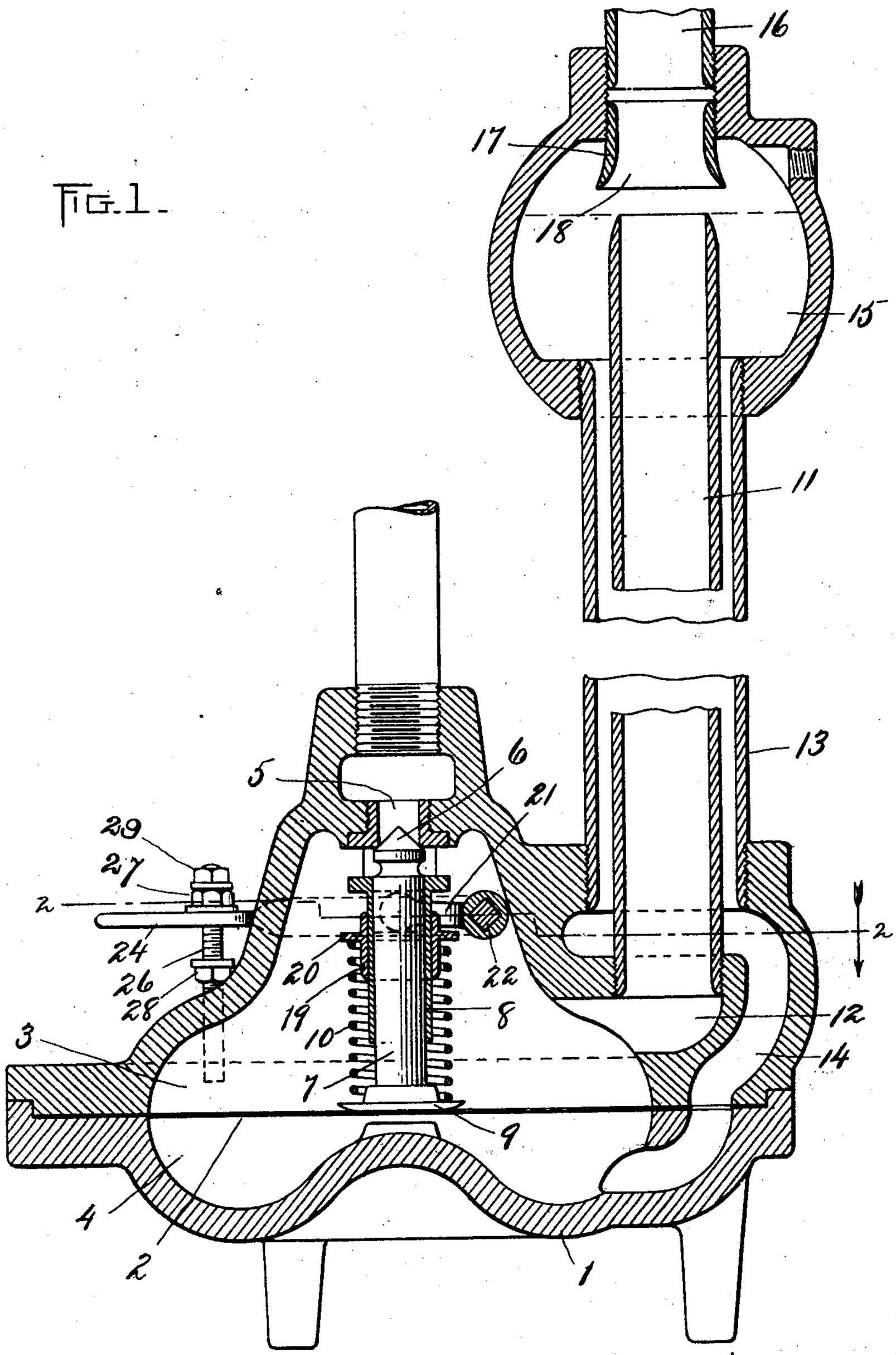
R. J. FLINN.

STEAM TRAP.

(Application filed Mar. 16, 1901.)

(No Model.) 2 Sheets--Sheet 1.

FIG. 1.



WITNESSES!
P. H. Pezzetti
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INVENTOR!
R. J. Flinn
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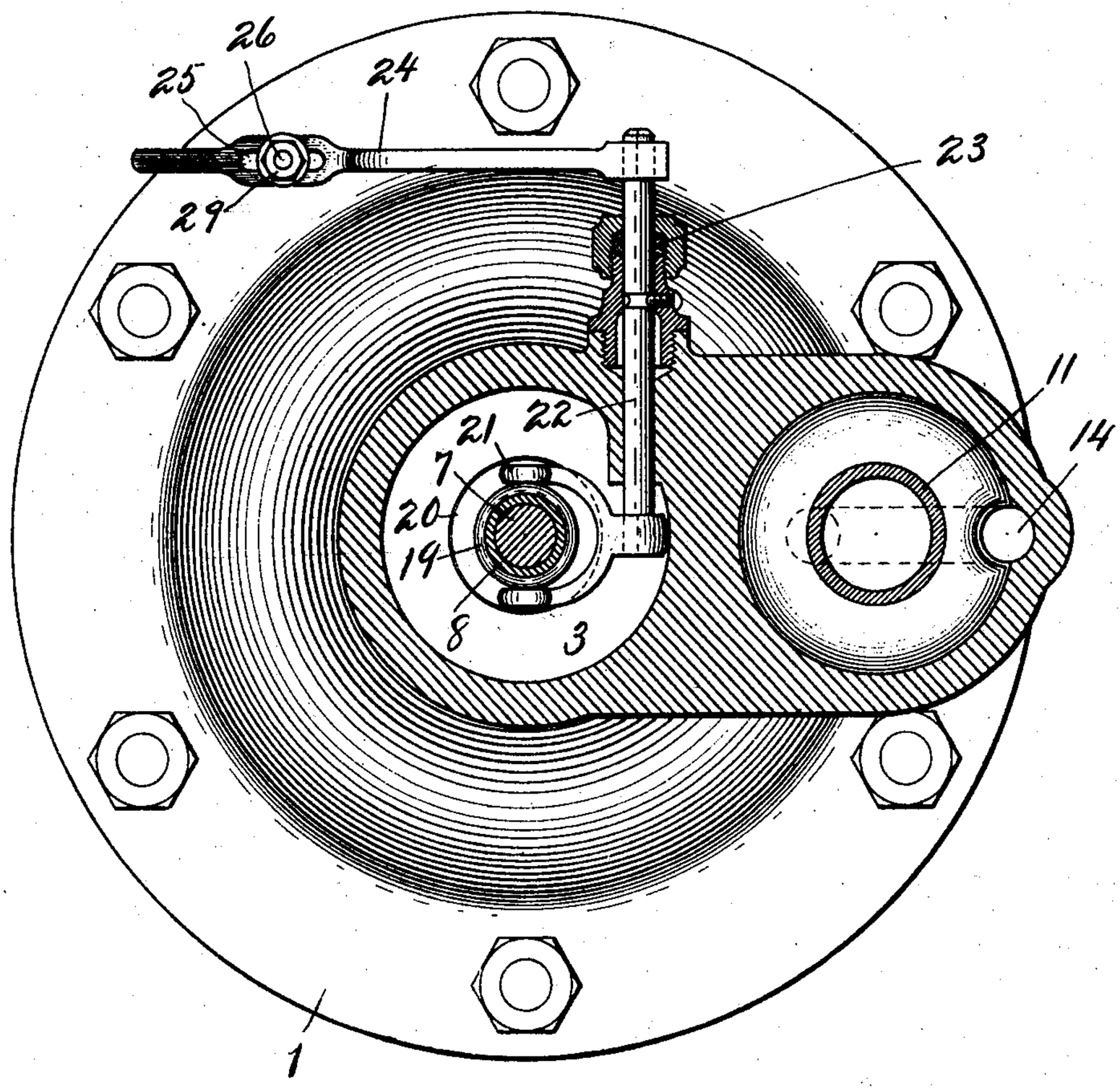
FIG. 2.



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UNITED STATES PATENT OFFICE.

RICHARD J. FLINN, OF BOSTON, MASSACHUSETTS.

STEAM-TRAP.

SPECIFICATION forming part of Letters Patent No. 693,961, dated February 25, 1902.

Application filed March 16, 1901. Serial No. 51,438. (No model.)

To all whom it may concern:

Be it known that I, RICHARD J. FLINN, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Steam-Traps, of which the following is a specification.

This invention relates in general to steam-traps and in most of its features in particular to differential traps, such as that described in Letters Patent No. 514,883, granted to me February 13, 1894.

One object of the present invention is to provide for greater delicacy of operation, this being done by making provisions for a direct velocity impact of the drainage-water on the upper side of the trap-diaphragm during a copious flow of water of condensation, whereby the valve tends to have a full and quick opening, there being also provisions for otherwise directing the water of condensation during a light flow.

A second object of the invention is to provide for an opening of the valve independently of the action of the trap for blowing out the upper diaphragm-chamber or clearing the outlet or for other purposes and also to provide an external adjustment and lock for varying the tension of the spring which acts on the valve.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a vertical section, partly broken away, of a steam-trap constructed in accordance with my invention. Fig. 2 represents a section on the line 2 2 of Fig. 1.

The same reference characters indicate the same parts in both of the figures.

In the drawings, 1 represents a casing, the interior of which is separated by a flexible diaphragm 2 into upper and lower diaphragm-chambers 3 4, the upper chamber having a discharge-outlet 5, controlled by a valve 6, which has a stem 7, mounted to slide in a tubular guide 8. The lower end of the valve-stem has a head 9 resting on the diaphragm, and a compression-spring 10 exerts downward pressure on this head, tending to open the valve.

11 is a stand-pipe connecting directly by a lateral passage 12 with the upper diaphragm-chamber 3, and 13 is a second stand-pipe surrounding the stand-pipe 11 and connecting by a passage 14 with the lower diaphragm-chamber 4.

15 is an elevated chamber termed the "reservoir," affixed to the upper end of stand-pipe 13 and inclosing the upper end of stand-pipe 11, which projects above the termination of stand-pipe 13.

16 is an inlet-pipe for conducting the steam and the drainage-water or water of condensation from the system which the pipe drains into the trap. During the operation of the trap the stand-pipe 13 and the chamber 15 contain a column of water up to the level of the upper end of pipe 11, the pressure of which acting on the lower side of the diaphragm 2 tends to hold the valve 6 against its seat. A shorter column of water stands in pipe 11, and when the pressure of this column acting on the upper side of the diaphragm 2 plus the pressure of spring 10 equals the pressure on the lower side of the diaphragm the valve 6 is ready to open, and any further increase in the height of the column in pipe 11 serves to open the valve and permit the excess water of condensation to escape through the outlet 5, the valve closing when the pressures on opposite sides of the diaphragm again become equalized. In former traps of this pattern the connection or passage between the longer stand-pipe and the upper diaphragm-chamber has passed below the level of the diaphragm and has been of considerable length and tortuosity. It will be noted that in the present case the passage 12 is a very short and direct one, located above the level of the diaphragm throughout its length, whereby the velocity impact of the water of condensation falling from the pipe 16 into the stand-pipe 11, through the open orifice of said pipe 11 alined with pipe 16, is transmitted directly without appreciable loss from friction or other cause to the top of the diaphragm 2 and tends to open the valve 6. During a copious flow of water of condensation to the trap it is important to have the valve 6 open widely and quickly. By the herein-described structure the velocity pressure of the incoming water, which is exerted in the direction of flow of the water, is utilized to give the diaphragm 2 a greater movement and the valve 6 a larger opening than in former constructions, hence obtaining an increased discharge capacity of the trap.

The lower end or nozzle of the drainage-inlet through pipe 16 is formed by a nipple 17 of substantially the same minimum aperture as pipe 11, but having a flaring lower orifice 18, which overhangs the upper edge of said pipe 11. The tendency of a light flow of water of condensation through the nozzle 17 will be to seek the sides of said nozzle and become discharged from its edge or lip into the chamber 15, surrounding the pipe 11. By this means I provide a supply of water for the chamber 15, the stand-pipe 13, and the lower diaphragm-chamber 4 sufficient to keep them filled to the level of the top of stand-pipe 11, and at the same time I avoid exposing the water in said stand-pipe 13 and chambers 15 4 to the velocity pressure of the water when it is flowing copiously through the pipe 16. Most of the flow then passes directly into the stand-pipe 11 and only an inappreciable quantity escapes into the chamber 15.

The tubular guide 8 has a cylindrical exterior and is surrounded by a sliding collar or sleeve 19, having a flange 20, against which the upper end of the spring 10 abuts. Engaged with the upper sides of this flange is the inner end of a forked lever 21, attached to a cylindrical stem or spindle 22, which projects through a stuffing-box 23 in the side of casing 1 and has secured to its outer end a lever or arm 24. By the oscillation of the lever 24 an adjustment of the tension of the spring 10 may be effected for the purpose of varying the pressure at which the valve opens. A downward movement of sufficient amplitude will increase the pressure of the spring to such an extent as to open the valve independently of the action of the trap and allow the chamber 3 to be emptied by the pressure of the steam blowing out the water from said chamber and the stand-pipe 11. This opening of the valve is effected when it is desired to empty the trap and also for the purpose of clearing the valve-seat and discharge-aperture of any sediment which may hinder the proper seating of the valve. The lever 24 is slotted near its outer end, as at 25, to receive a fixed vertical screw-threaded spindle 26, provided with nuts 27 28 above and below the lever. The upper nut 27 forms a stop, which limits the maximum tension of the spring 10 and may be raised and lowered to vary said tension. The lower nut 28 may form a stop to limit the downward movement of the lever 24 in opening the valve, and hence prevent an undue distention of the diaphragm 2. After the upper nut 27 has been given its desired adjustment and preferably clamped by a lock-nut 29 the nut 28 may be screwed up against the lower side of the lever and said lever locked or fixed at the adjustment thus determined, whereby any disturbance of its proper position due to jarring or tampering is prevented.

I am aware that it is not new in traps of this character to adjust the tension of the spring by means of a device passing outside of the trap, but so far as I am aware I am the first to provide a rock-shaft for this purpose, a partial rotation of which imparts the whole desired range of distortion to the spring, said device having an adjustable stop to determine the extent of its movement. After each depression of the arm 24 to open the valve the arm will return to the stop-nut 27, leaving the adjustment of the spring the same as before the arm was depressed, a capability which is not possessed by any prior device of which I have knowledge.

I claim—

1. In a differential steam-trap the combination of an upper chamber having an outlet, a lower chamber, a diaphragm separating the two, an outlet-valve operated by said diaphragm and opened by a preponderance of pressure in the upper chamber, an elevated chamber, a stand-pipe connecting said elevated chamber with the lower diaphragm-chamber, a second stand-pipe connecting said elevated chamber with the upper diaphragm-chamber and having a direct or non-tortuous connection with the latter existing above the level of the diaphragm throughout its length, and a drainage-inlet to the elevated chamber alined with the said second stand-pipe.

2. In a differential steam-trap the combination of a discharge-valve, a stand-pipe adapted to contain a variable column of water whose excess pressure opens said valve, a second stand-pipe adapted to contain a column whose pressure tends to close the valve, and a drainage-inlet alined with the inlet-orifice of the first said pipe and having a flaring orifice overhanging the edge of said pipe and adapted to discharge the drainage-water into the second said pipe during a light flow.

3. In a differential steam-trap the combination of a discharge-valve, a stand-pipe adapted to contain a variable column of water whose excess pressure opens said valve, a second stand-pipe adapted to contain a column whose pressure tends to close the valve, a drainage-inlet alined with the inlet-orifice of the first said pipe and having a flaring orifice overhanging the edge of said pipe and adapted to discharge the drainage-water into the second said pipe during a light flow, and means to vary the distance between said orifices.

4. In a steam-trap the combination of a discharge-chamber having a discharge-orifice, a valve controlling said orifice, means for controlling said valve through the differential action of two columns of water, a spring within the discharge-chamber tending to open said valve, a spring-adjusting device passing through the wall of said chamber to the outside of the trap and movable to alter the pressure of the spring, and an adjustable stop outside of said chamber to limit the movement of said device.

5. In a steam-trap the combination of a discharge-orifice, a valve controlling said orifice, means for controlling said valve through the

differential action of two columns of water, a spring tending to open said valve, and a rock-shaft passing outside of the trap and located transversely to the line of movement of the valve, said shaft having an offset oscillatory member adapted to distort the spring by a partial oscillation of the shaft sufficiently to open the valve during the operation of the trap.

6. In a steam-trap the combination of a discharge-orifice, a valve controlling said orifice, means for controlling said valve through the differential action of two columns of water, a spring tending to open the valve and having one end engaging the valve, a sliding member engaging the opposite end of the spring, and a rock-shaft passing outside of the trap and having within the trap an oscillatory arm engaging said sliding member.

7. In a steam-trap the combination of a discharge-chamber having a discharge-orifice, a valve controlling said orifice, means for controlling said valve through the differential action of two columns of water, a spring within the discharge-chamber tending to open the valve, means extending through the wall of said chamber to the outside of the trap for varying the tension of said spring, and a device outside of said chamber adjustable to permit valve-operating movements of said means, or to lock said means against movement.

8. In a steam-trap the combination of a discharge-orifice, a valve controlling said orifice, means for controlling said valve through the differential action of two columns of water, a spring tending to open the valve and having one end engaging the valve, a sliding member engaging the opposite end of the spring, a rock-shaft passing outside of the trap and having within the trap an arm engaging said sliding member, an arm on said rock-shaft outside of the trap, a fixed threaded spindle adjacent to said outer arm, and nuts on both sides of said arm adapted to screw on said spindle into and out of engagement with the arm.

9. In a steam-trap the combination of a discharge-chamber having a discharge-orifice, a valve controlling said orifice, means for controlling the valve through the differential action of two columns of water, a spring within the discharge-chamber tending to open said valve and externally-operated means for distorting the spring, said means having provisions for increasing and decreasing the pressure of the spring without varying its normal adjustment.

In testimony whereof I have affixed my signature in presence of two witnesses.

RICHARD J. FLINN.

Witnesses:

C. F. BROWN,

H. L. ROBBINS.