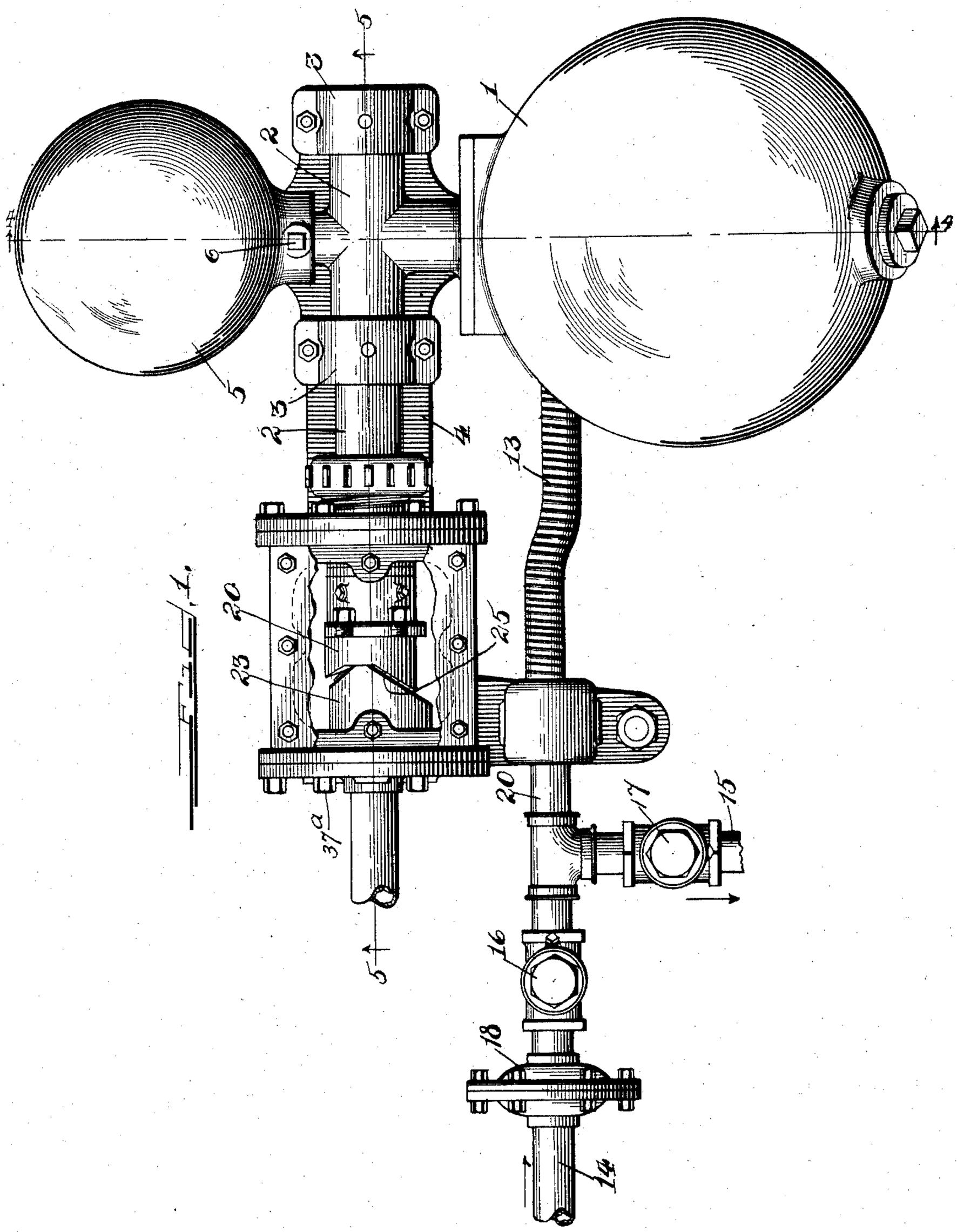
No. 864,869. PATENTED SEPT. 3, 1907.

A. SORGE, Jr.

STEAM TRAP.

APPLICATION FILED NOV. 29, 1901. RENEWED JAN. 16, 1905.

7 SHEETS—SHEET 1.



Witnesses
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Ira D. Perry

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by Lemuel W. Serrell
Atty

No. 864,869. PATENTED SEPT. 3, 1907.

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7 SHEETS—SHEET 2.

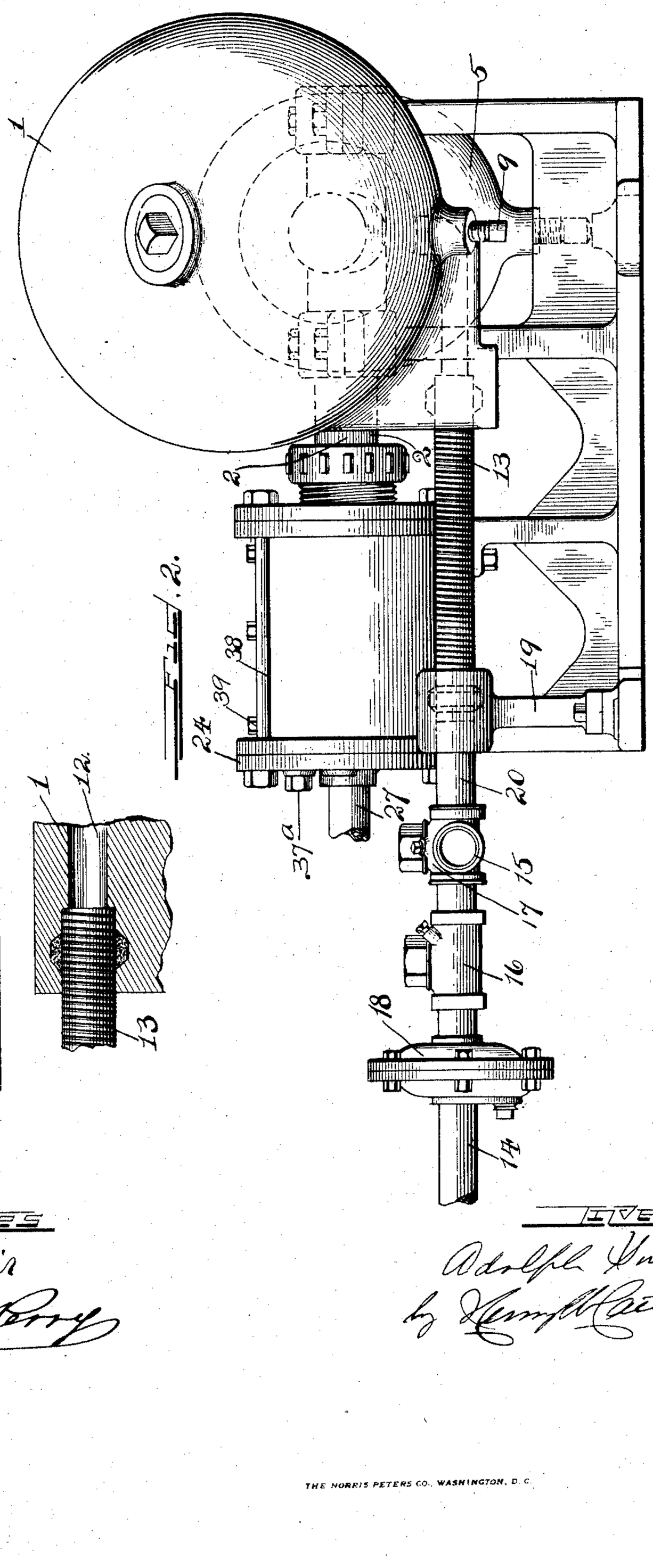

Fig. 2.

Fig. 12.

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7 SHEETS—SHEET 3.

Fig. 3.

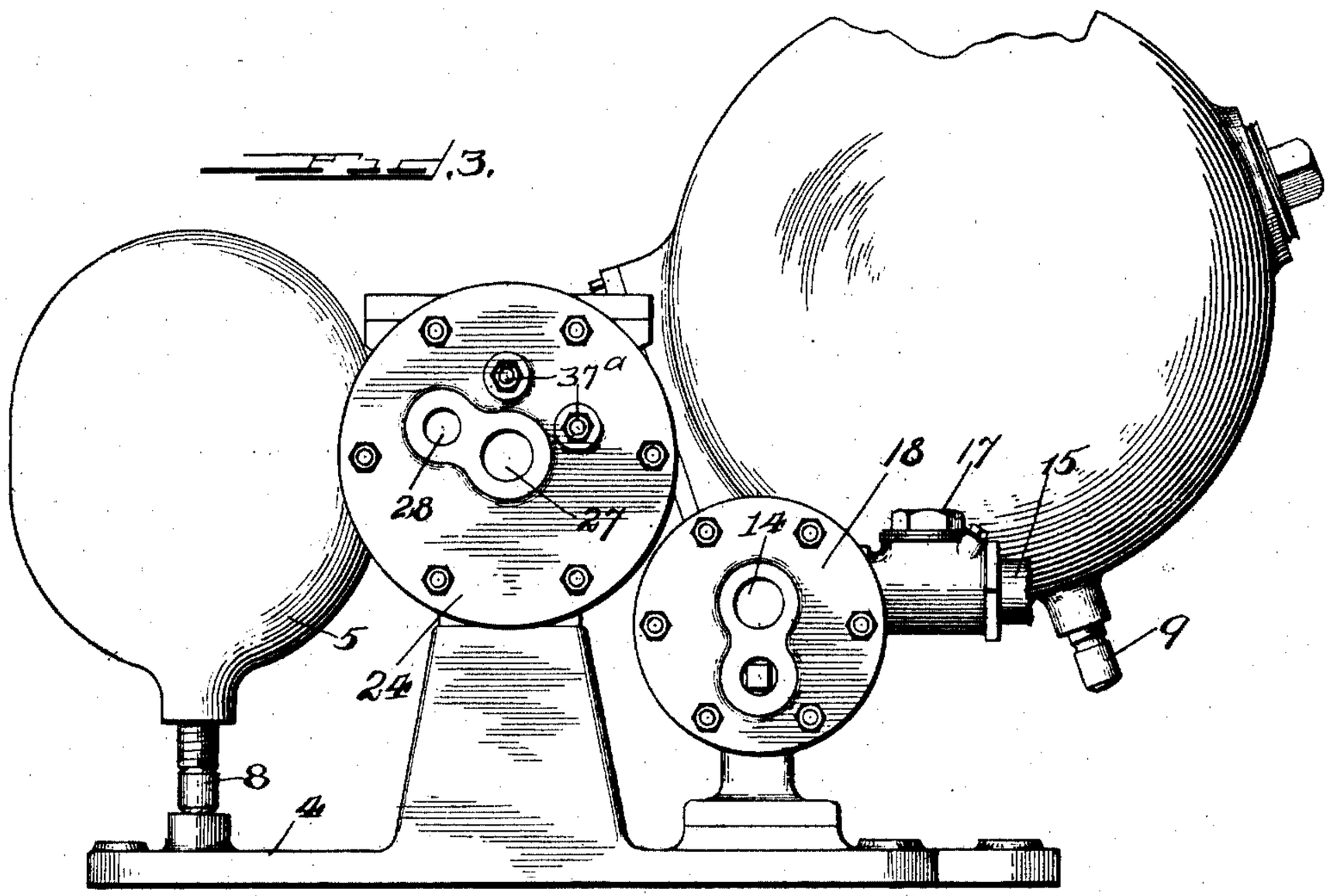
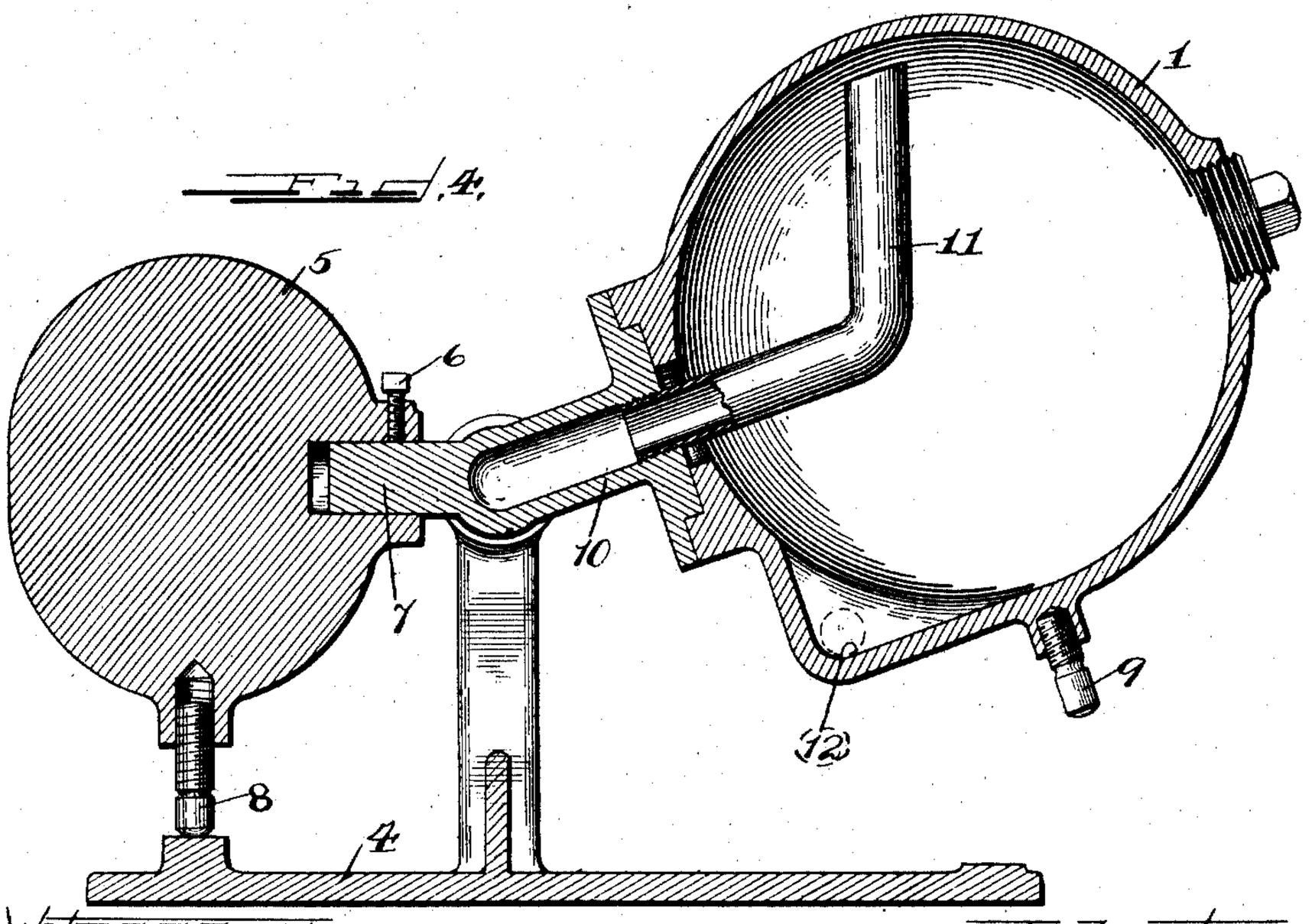


Fig. 4.



Witnesses

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Atty

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7 SHEETS—SHEET 4.

Fig. 5

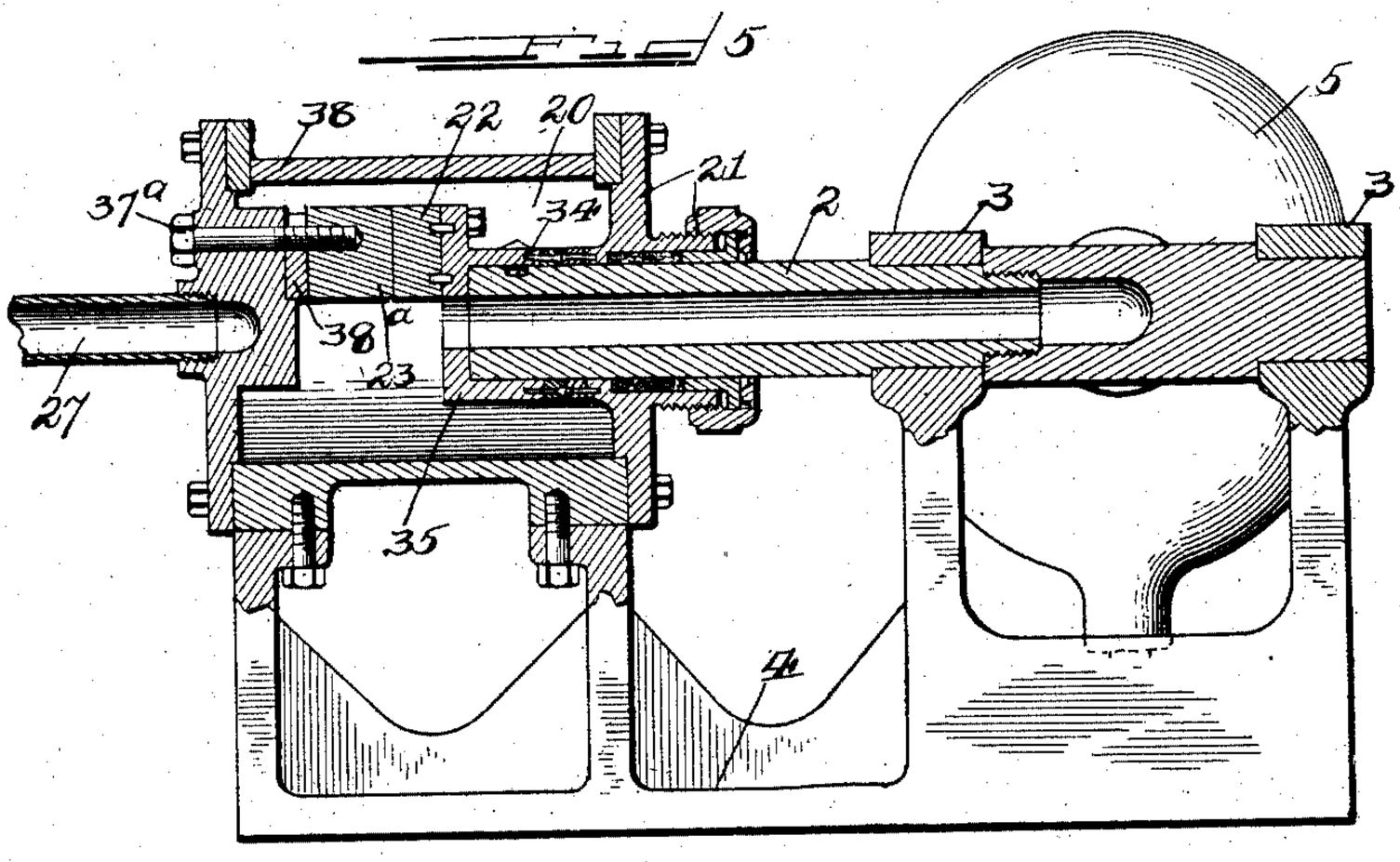


Fig. 6.

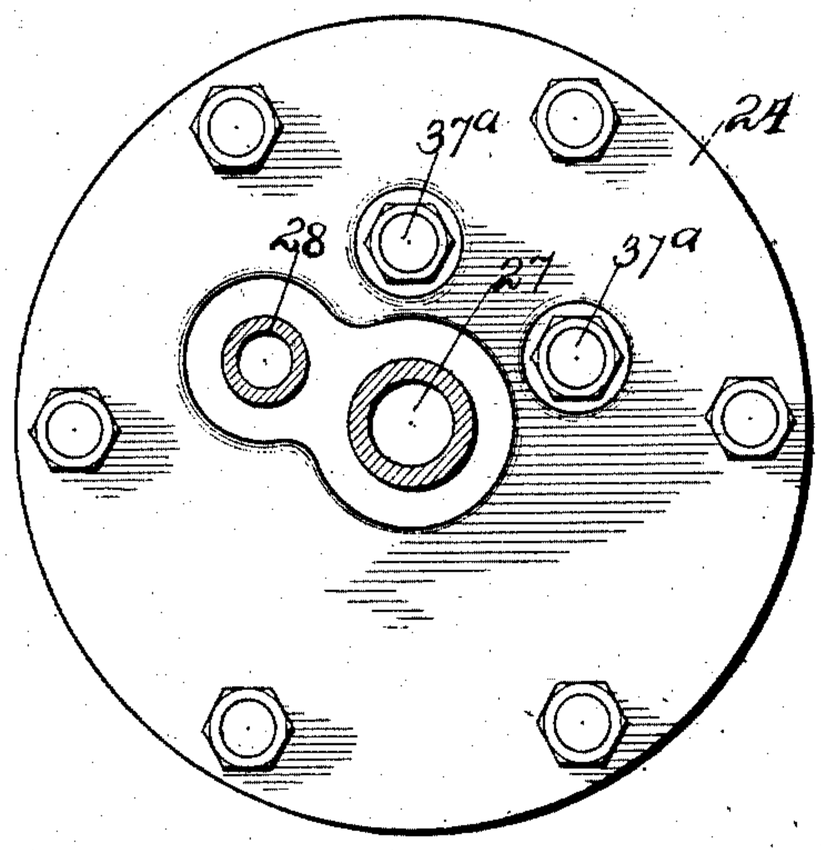
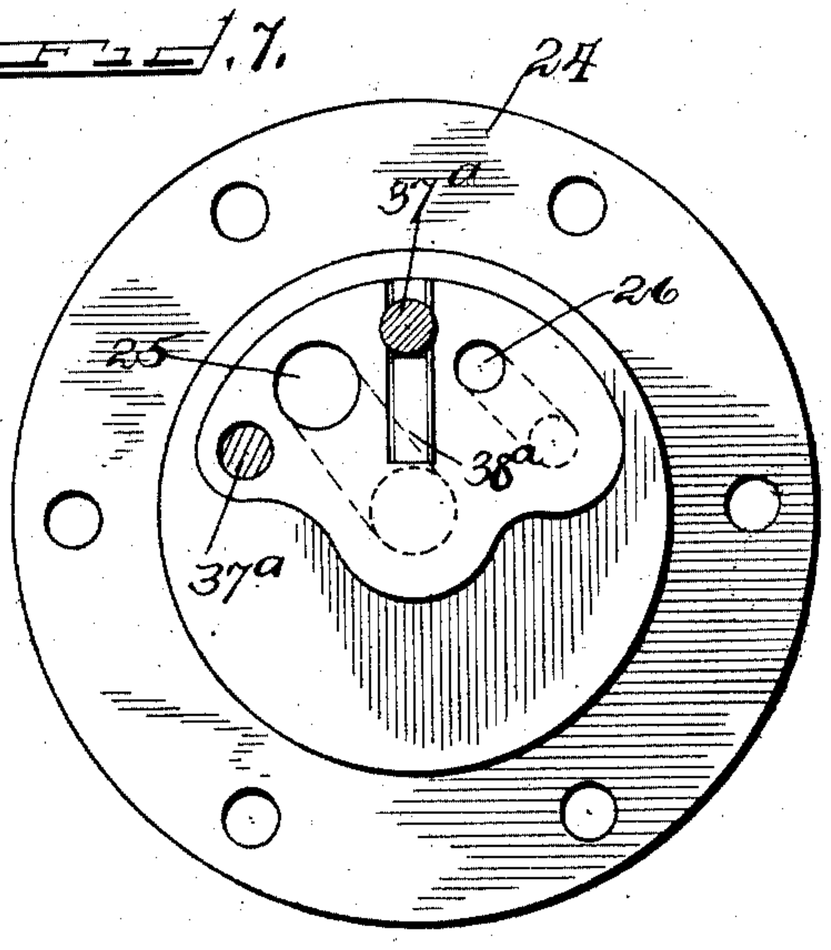


Fig. 7.



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No. 864,869. PATENTED SEPT. 3, 1907.

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STEAM TRAP.

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7 SHEETS—SHEET 5.

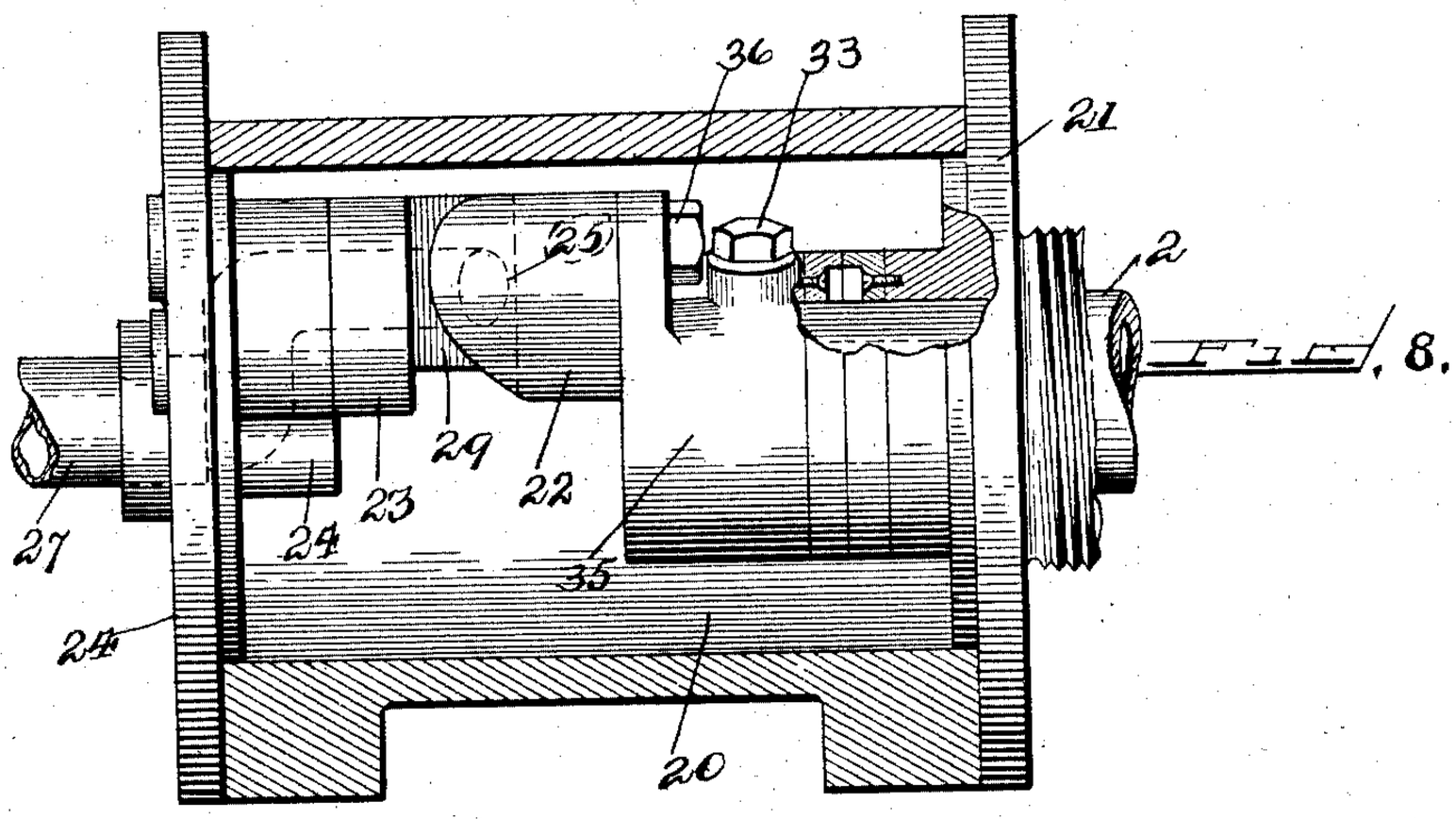


Fig. 8.

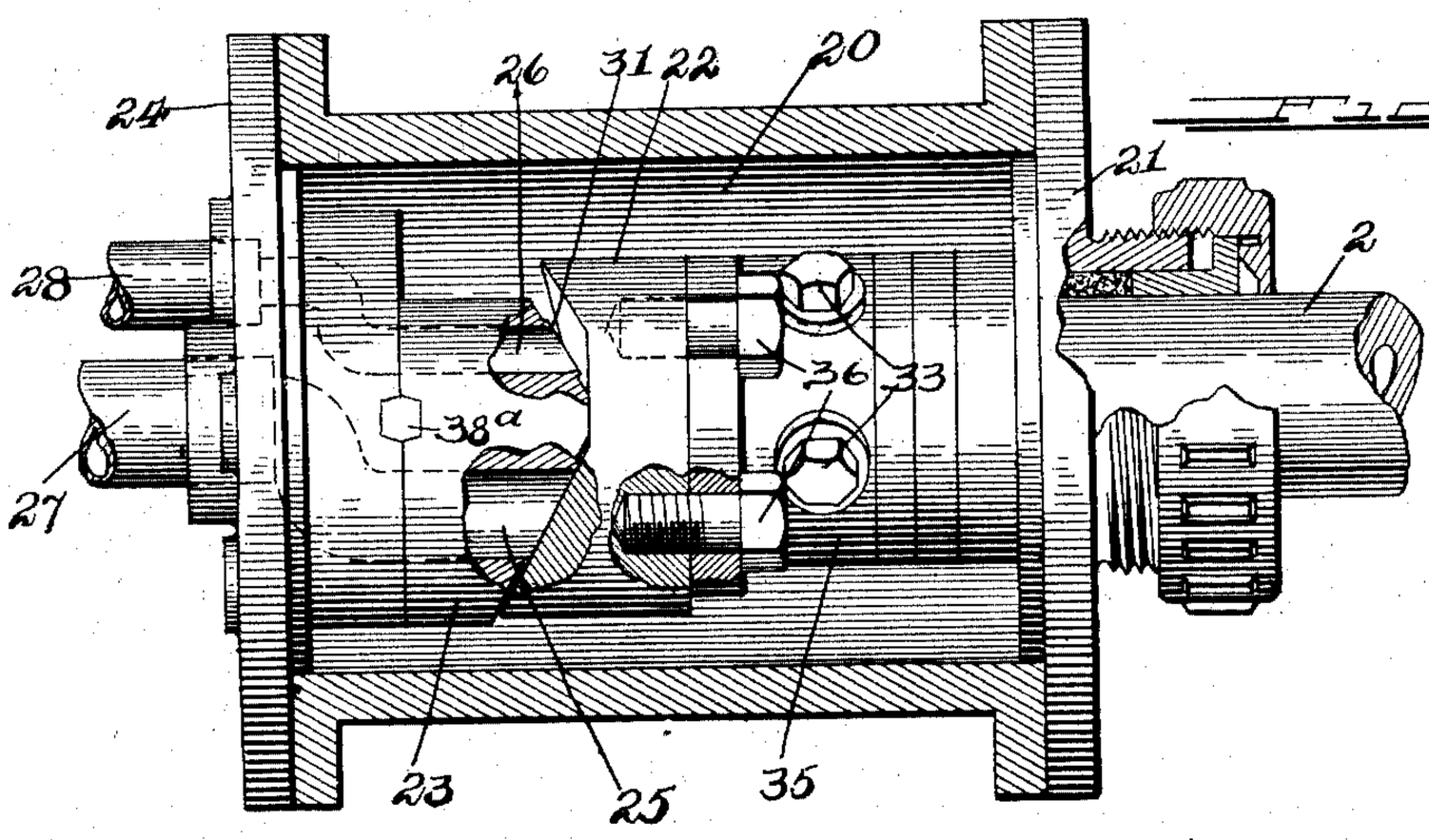


Fig. 9.

Fig. 10.

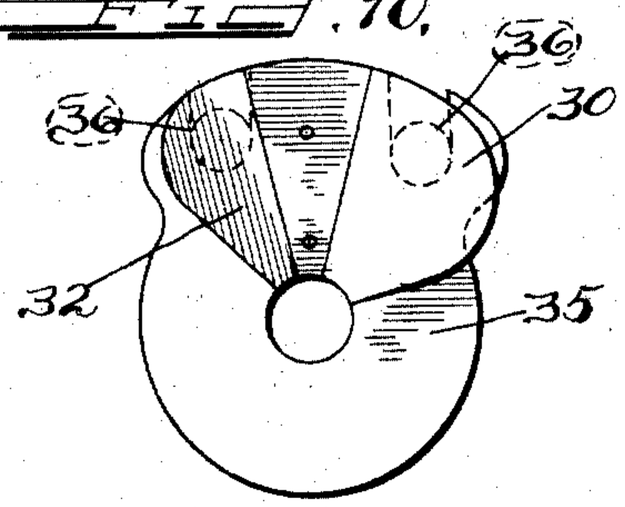
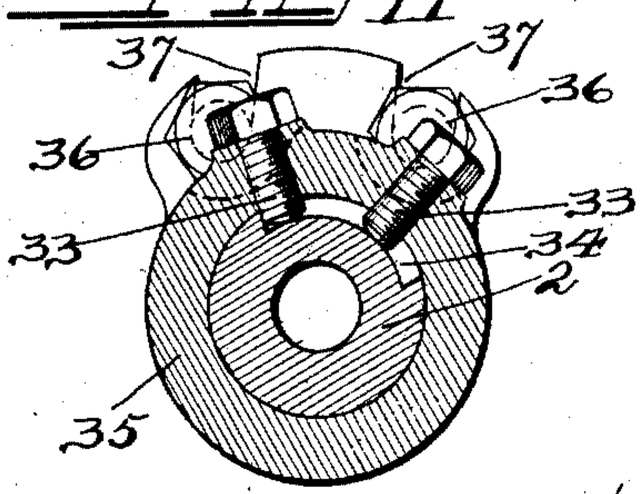


Fig. 11



Witnesses

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No. 864,869. PATENTED SEPT. 3, 1907.

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STEAM TRAP.

APPLICATION FILED NOV. 29, 1901. RENEWED JAN. 16, 1905.

7 SHEETS—SHEET 6.

Fig. 13.

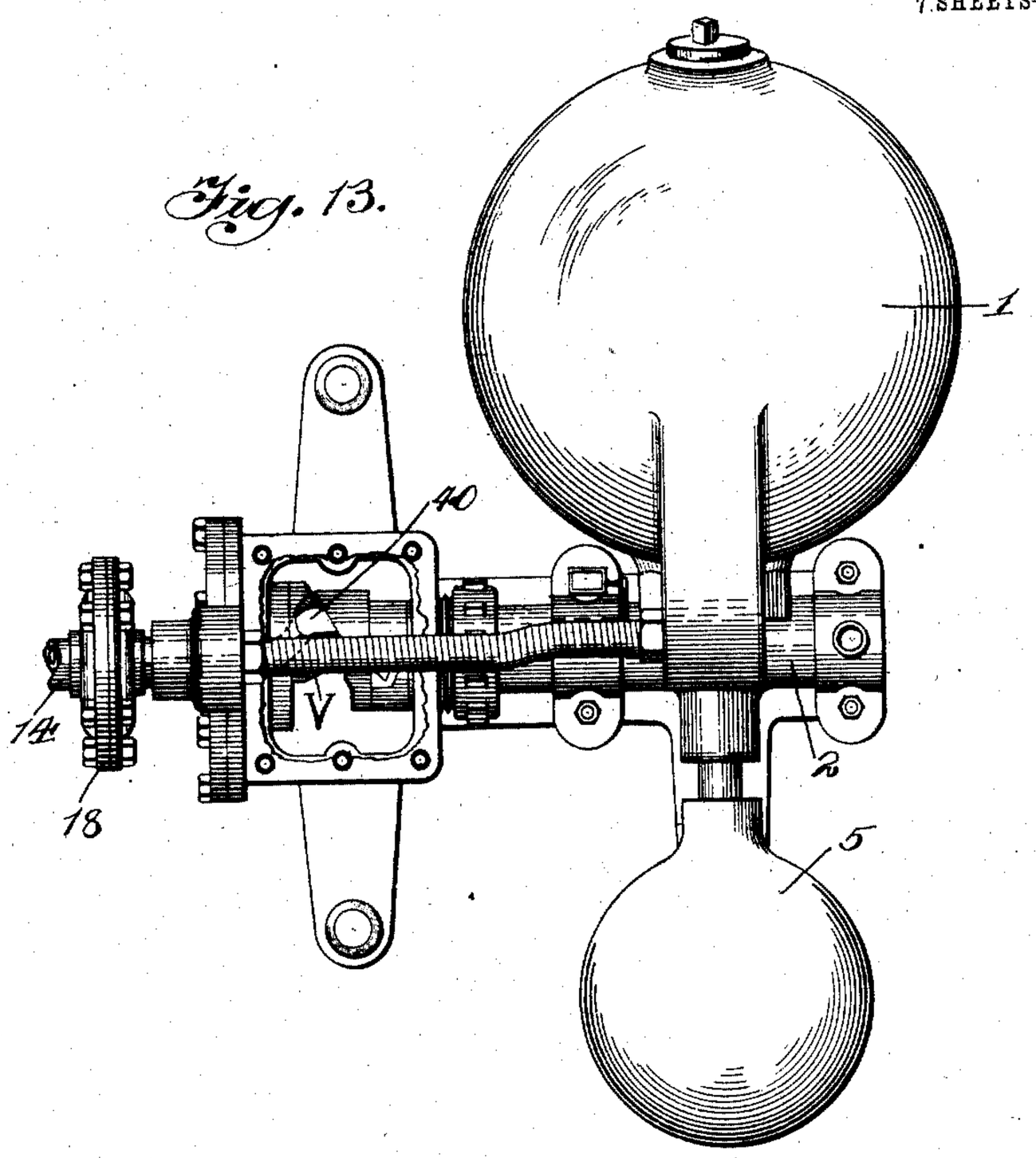
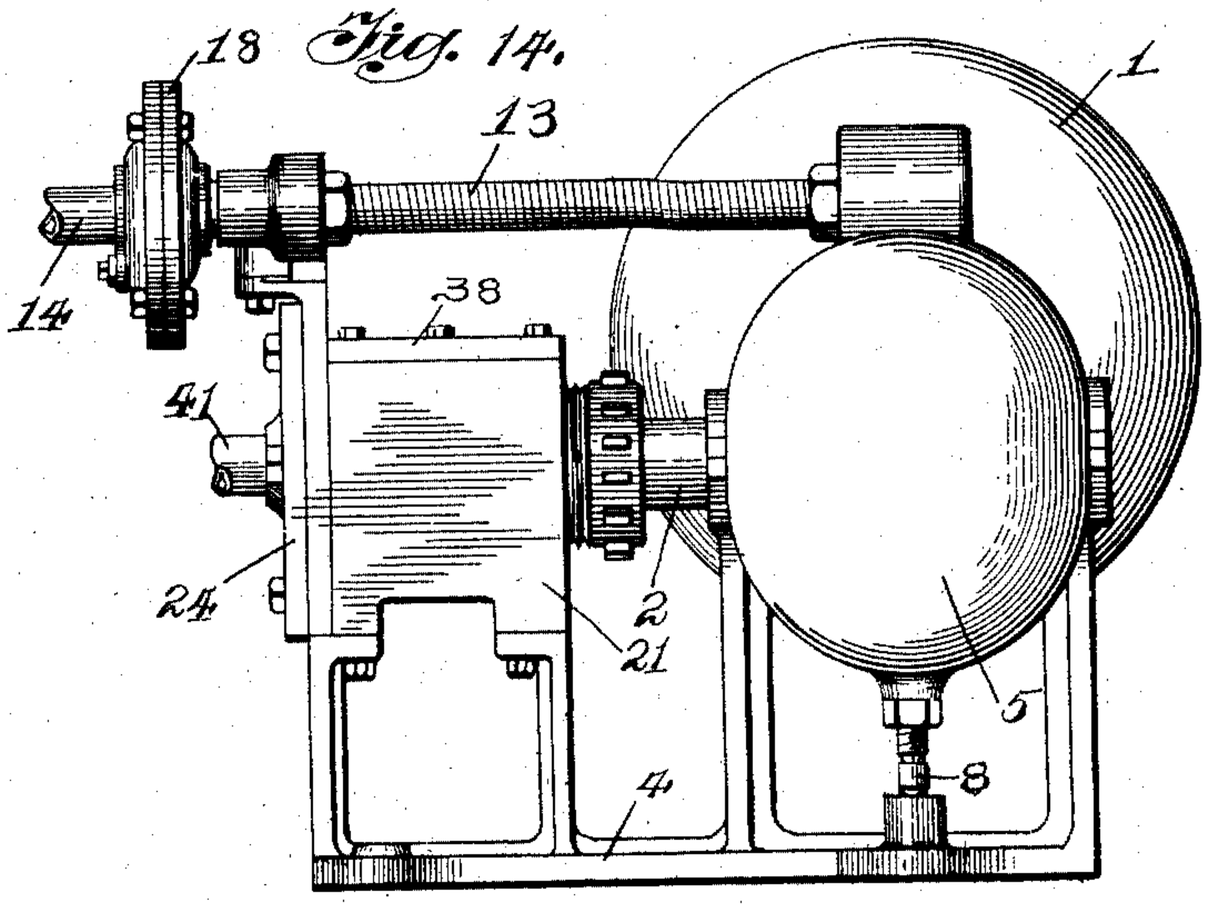


Fig. 14.



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No. 864,869. PATENTED SEPT. 3, 1907.

A. SORGE, Jr.

STEAM TRAP.

APPLICATION FILED NOV. 29, 1901. RENEWED JAN. 16, 1905.

7 SHEETS—SHEET 7.

Fig. 15

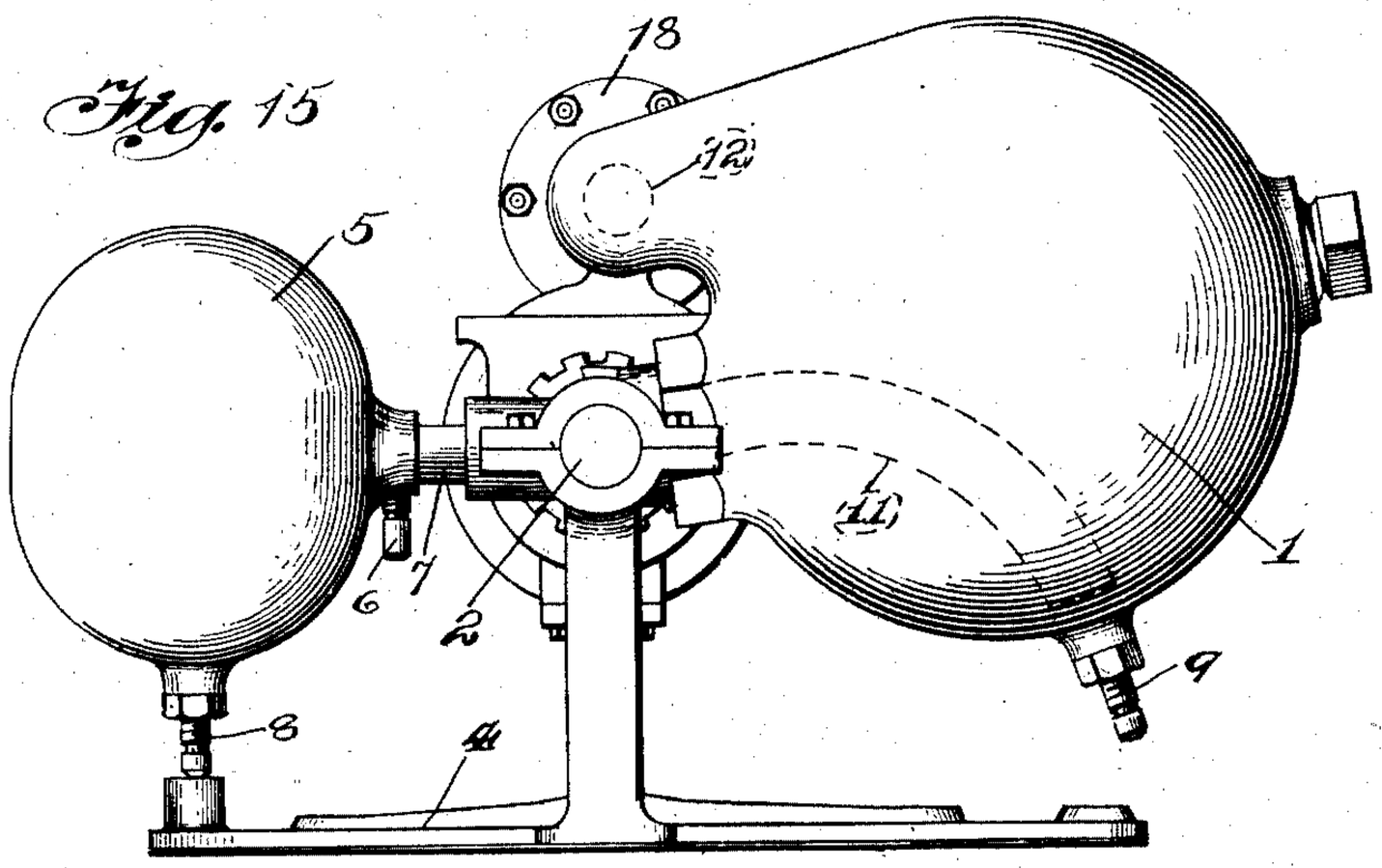
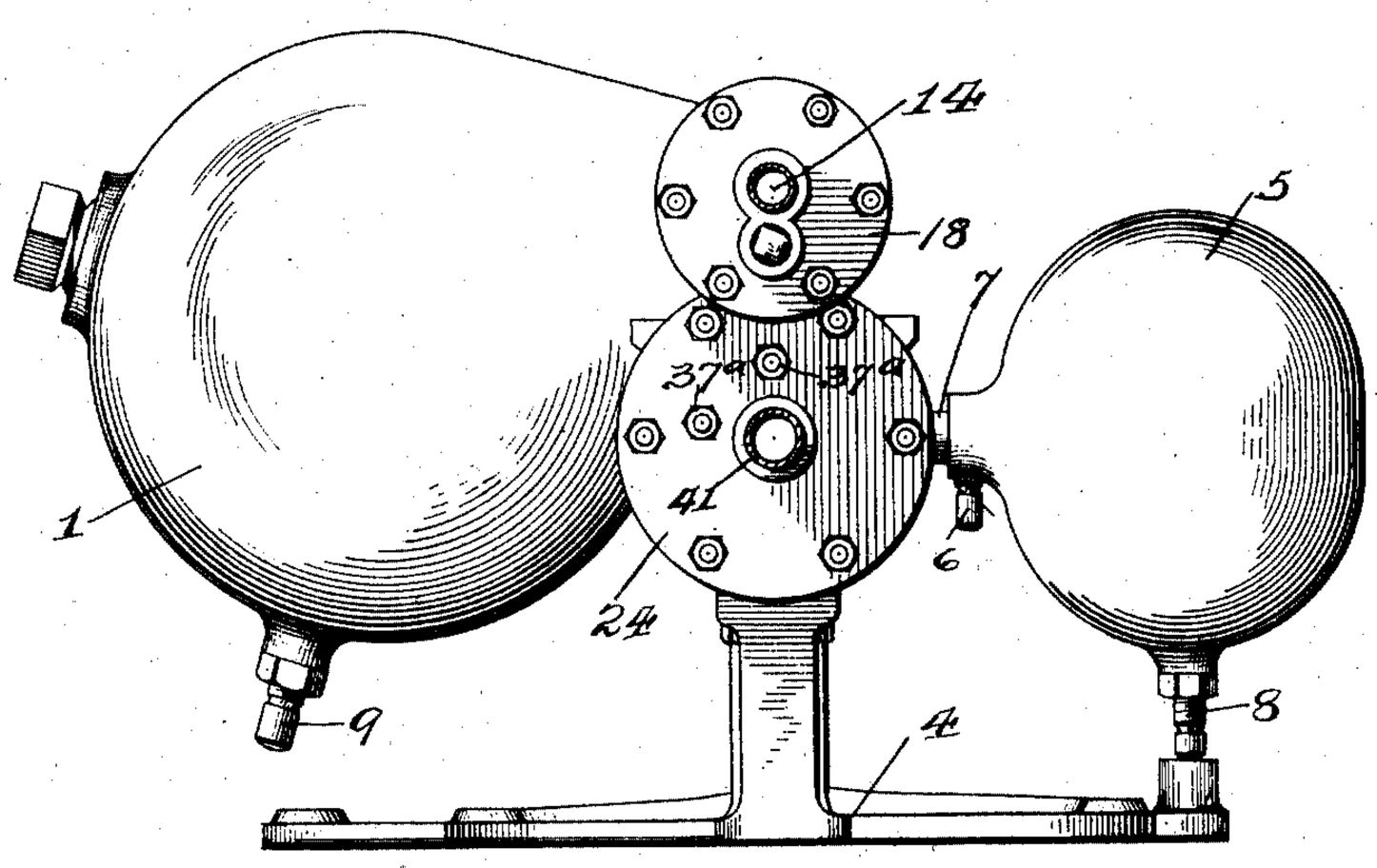


Fig. 16



Witnesses:
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Ira D. Perry

Inventor:
Adolph Sorge, Jr.
by Hamm & Goepel Atty

UNITED STATES PATENT OFFICE.

ADOLPH SORGE, JR., OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO A. SORGE JR. COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF DELAWARE.

STEAM-TRAP.

No. 864,869. Specification of Letters Patent. Patented Sept. 3, 1907.

Application filed November 29, 1901, Serial No. 83,992. Renewed January 16, 1905. Serial No. 241,194.

To all whom it may concern:

Be it known that I, ADOLPH SORGE, Jr., a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Traps, of which the following is a specification.

This invention relates to steam traps or drainers of that character which are designed to collect and discharge or drain off the water of condensation resulting in any given steam containing receptacle or system of piping to which the trap may be applied, and more particularly it relates to improvements in that class of such drainers known as "gravity traps" and which may be either "return traps" for discharging the water of condensation from a lower to a higher pressure and wherein a movable receiver or chamber collects the water when in a raised position and then descends under the weight of the water collected to thereby admit steam to expel the water, and usually to return it to the boiler, or may be "tank traps" designed to discharge the water from a higher to a lower pressure, and which are similarly constructed except that the collected water flows out of the receiver under the pressure of the system drained when the outlet is opened by the descent of the receiver.

The object of the invention is to provide an improved construction in drainers of this character, more efficient and economical in its working and less liable to get out of order than any similar device heretofore known, and to this end it consists in the matters herein set forth and more particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a top plan view of an automatic return trap or drainer constructed in accordance with my improvements. Fig. 2 is a side elevation thereof. Fig. 3 is an end elevation thereof. Fig. 4 is a transverse section thereof taken on line 4—4 of Fig. 1. Fig. 5 is a longitudinal section thereof taken on line 5—5 of Fig. 1. Fig. 6 is an exterior end view of the valve chest. Fig. 7 is an end view of the same with the head of the chest removed. Fig. 8 is a vertical longitudinal section of the valve chest. Fig. 9 is a similar horizontal section thereof. Fig. 10 is a detail view in end elevation of the valve chest. Fig. 11 is a transverse sectional detail of the valve chest. Fig. 12 is a sectional detail showing the manner of connecting the flexible tubing to the receiver. Fig. 13 is a top plan view of a tank trap or drainer constructed in accordance with my improvements. Fig. 14 is a side elevation thereof. Fig. 15 is an end elevation thereof. Fig. 16 is an opposite end elevation thereof.

Referring first to the return trap illustrated in Figs. 1—12, inclusive, 1 designates a water receiving chamber mounted to oscillate upon a hollow trunnion 2 that is supported within bearings 3 on any suitable framework 4. The same trunnion 2 also supports a weight 5 which is arranged opposite to the receiver 1 and is of sufficient weight to over balance the latter when empty. As herein shown this weight is adjustably secured, by a set screw 6 or otherwise, upon an arm 7 which projects laterally from the trunnion, and the limit of movement of the trap in one direction is arranged to be varied as desired by means of an adjustable stop 8, consisting in this instance of a set screw tapped into the weight and adapted to contact with the frame 4 of the trap when the weight swings down, a similar stop 9 being herein shown as provided on the under side of the receiver 1 to adjustably limit the movement of the trap in the opposite direction.

The receiver itself is herein shown as made of hollow spherical form and is bolted to the flanged end of a hollow arm 10 that leads off from the trunnion 2 at a point nearly opposite the weight supporting arm 7. The passage through this hollow arm 10 is in communication at its inner end with the interior of the hollow trunnion 2, while from its outer end a pipe or passage 11 leads upwardly within the receiver 1 to a point near the top thereof, this pipe or passage 11 in connection with the communicating passage through the hollow trunnion 2, forming an inlet by which steam is admitted to the receiving chamber 1. Water is admitted to said chamber, and is also discharged therefrom, through a port 12 located at the bottom of the chamber and communicating with a flexible tube 13 leading to water inlet and outlet pipes 14 and 15 in which check valves 16 and 17, and a strainer 18, if desired, are suitably provided. The tubing 13 will preferably be a flexible metallic tubing and will be soldered or otherwise secured at one end within the mouth of the port 12 of the receiver to form a water tight joint therewith. Its opposite end is herein shown as similarly inserted and secured within a bracket 19 on the base plate, into which bracket the connection leading to the inlet and outlet pipes 14 and 15 is also tapped.

Admission of steam to the receiver through the hollow trunnion 2 is controlled by an oscillatory valve V located within a valve chest 20 into which the trunnion enters through a stuffing box 21. This valve comprises a valve plate 22 secured to and turning with the trunnion, and an opposing valve seat 23 carried upon the inner face of the head 24 of the valve chest and through which steam inlet and outlet ports or passages 25 and 26 lead out respectively to steam and vent pipes 27 and 28. The inner end of the steam port 25 is located at some distance from the axis of the trunnion, and that portion 29 of the valve seat surrounding said port is finished off to a plane surface at an angle to said axis. The opposing portion 30 of the valve plate is correspondingly finished off to a plane surface at the

same angle to the axis, and when brought into contact by the oscillation of the trunnion, these two surfaces will exactly coincide and close the steam port. Similarly the inner end of the vent port 26 is located at some distance from the axis of the trunnion and the surface 31 of the valve seat 23 surrounding said vent port is finished off on plane at an angle to the axis of the trunnion but at a reverse angle from that of the surface 29 surrounding the steam port, while the opposing surface 32 of the valve plate 20 is finished off on a plane at the same reverse angle to the axis, and as the trunnion is oscillated back to bring these surfaces in contact they will in turn exactly coincide and close the vent port. The movement of the valve which thus closes the steam port will open the vent port, and vice versa, the valve movement which closes the vent port will open the steam port, these movements correspond respectively with the rising and falling movements of the receiver 1. When the receiver is raised and the vent port is open and the steam port closed, the water of condensation draining from the connected system of piping will enter the receiver through the inlet pipe 14, past the check valve 16 and gradually collect therein, and eventually the weight of this collected water will become sufficient to overcome the preponderating gravity of the weight 5 and the frictional resistance on the trunnion. When this point is reached, the receiver will swing down and thus oscillate the valve plate 22 so as to close the vent and open the steam port, and the entering steam will then exert its pressure on the surface of the collected water in the receiver and force it out through the outlet pipe 15 past the check valve 17. This discharge of its contents will in turn lighten the receiver until its weight, together with the frictional resistance on the trunnion becomes less than the gravity of the weight 5, whereupon the latter will descend, thus raising the receiver and closing the steam and opening the vent port. The opening and closing movements of the valve do not, however, exactly coincide with the rising and falling movements of the receiver since, in order to render the valve travel and time of movement as short as possible, and to permit the moving parts to acquire a considerable momentum before any very great resistance is offered to their movement, a certain amount of lost motion is allowed between the valve plate and trunnion. This is provided for, as hereby shown, by mounting the valve plate upon the end of the trunnion in such manner as to permit of its having a limited oscillatory movement thereon, such movement being herein shown as determined and limited by stops in the form of set-screws 33, the inner ends of which extend into and alternately engage the ends of a circumferential slot 34 on the trunnion. No motion will thus be transmitted to the valve plate until the unbalanced weight has overcome the friction on the trunnion and the receiver has started well along on its rising or falling movement. Then the end of the slot 34 will strike the one or the other of the stop-screws 33 and suddenly and rapidly throw the valve over to close the open and open the closed port and admit or exhaust the steam accordingly.

As herein shown, the valve plate 22 is, as a matter of convenience in construction and for the sake of easy removal and repair, made with a separable hub section 35 to which the valve seat is rigidly secured by bolts 36, these bolts dropping into slots 37 in the hub section so that it is only necessary to loosen them slightly in order to lift the valve plate free from the hub. To the same end the valve seat 23 is herein shown as made separate from the head 24 of the valve chest and detachably secured thereto by bolts 37, a key 38 being applied between the contacting surfaces of the seat and head to insure thè exact positioning of the alinement of the seat. A removable cover plate 38 secured over the chest by bolts 39 and forming the top of said chest, insures ready access to those ports of the inclosed valve beneath.

In the tank trap shown in Figs. 13—16, inclusive, the construction is generally the same as in the return trap hereinbefore described except that the receiver 1 is inverted, while the oscillatory valve V within the steam chest is provided with but a single port 40 which leads to a discharge pipe 41, the steam connection being omitted entirely. The flexible tubing 13 enters the receiver in this case near its top, instead of near its bottom, and the pipe or passage 11 which connects with the interior of the hollow trunnion 2 leads downwardly within the receiver to a point near the bottom thereof instead of upwardly toward the top as before. The flexible tubing serves solely as an inlet for the entering water of condensation, and is connected through pipe 14 and strainer 18 with the system to be drained, but is devoid of any outlet connection or check valves, these being unnecessary. The entering water gradually fills the receiver until its weight overcomes the preponderating gravity of the weight 5 together with the friction of the stuffing box and bearings. When this occurs the receiver descends and so moves the valve V as to open the outlet port 40 and permit the water accumulated in the receiver to pass out through the pipe 11, hollow trunnion 2, valve chest 20, and outlet port 40 under the pressure existing in the system with which the trap is connected. Then just before the water has been forced out to such an extent as to uncover the lower end of the pipe 11, the preponderating gravity of the weight 5 will in turn overcome the weight of the receiver and the friction of the stuffing box and bearings and again oscillate the valve so as to close the outlet port, thus preventing the steam from blowing through, and permitting the condensation to again collect in the receiver.

My improved traps are particularly advantageous in that they require the use of but a single stuffing box which also serves as a means of adjusting the friction on the trunnion to the exact amount required for the proper operation of the device. The improved form of valve set forth is exceedingly simple in its nature and is not likely to get out of order, and owing to its peculiar construction, its opposing surfaces constantly tend to wedge themselves more closely and to thus render the valve increasingly tight and less liable to leakage. Various changes, may, however, be made in the details of the construction shown without departure from the broad spirit of the invention claimed.

I claim as my invention:—

1. A steam trap or drainer comprising a counterweighted receiving chamber mounted upon a hollow trunnion, a valve chest into which the trunnion enters and with which the receiving chamber communicates through the hollow trunnion, a port in the valve chest, and a valve plate for controlling said port mounted within the valve chest upon the hollow trunnion and turning therewith

but having a lost motion thereon, substantially as described.

2. A steam trap or drainer comprising a counter-weighted receiving chamber mounted upon a hollow trunnion, a valve chest into which the trunnion enters and with which the receiving chamber communicates through the hollow trunnion, steam and exhaust ports in the valve chest, and a valve mounted within the valve chest and turning therein to control said ports, the opposing surfaces of the valve plate and seat of each port extending obliquely to the axis of the trunnion, substantially as described.

3. A steam trap or drainer comprising a counter-weighted receiving chamber mounted upon a hollow trunnion, a valve chest into which the trunnion enters and with which the receiving chamber communicates through the hollow trunnion, steam and exhaust ports in the valve chest, and a valve plate mounted within the valve chest upon the hollow trunnion and turning therewith to control said ports and having a limited oscillatory lost motion upon the trunnion, the opposing surfaces of the valve plate and seat of each port extending obliquely to the axis of the trunnion, substantially as described.

4. A steam trap or drainer comprising a counter-weighted receiving chamber mounted upon a hollow trunnion, a valve chest into which the trunnion enters through a stuffing box and with which the receiving chamber communicates through the hollow trunnion, steam and exhaust ports in the valve chest, and a valve plate mounted within the valve chest upon the hollow trunnion and turning therewith to control said ports, the opposing surfaces of the valve plate and seat of one port extending obliquely to the axis of the trunnion and the opposing surfaces of the valve plate and seat of the other port also extending obliquely to the axis of the trunnion but at a reverse angle from the surfaces of the first port, substantially as described.

5. A steam trap or drainer comprising a counter-weighted receiving chamber mounted upon a hollow trunnion, a valve chest into which the trunnion enters through a stuffing box and with which the receiving chamber communicates through the hollow trunnion, steam and exhaust ports in the valve chest, and a valve plate mounted within the valve chest upon the hollow trunnion and turning therewith to control said ports and having a limited oscillatory lost motion upon the trunnion, the opposing surfaces of the valve plate and seat of one port extending obliquely to the axis of the trunnion and the opposing surfaces of the valve plate and seat of the other port also extending obliquely to the axis of the trunnion but at a reverse angle from the surfaces of the first port, substantially as described.

6. A steam trap or drainer comprising a receiving chamber mounted upon a hollow trunnion and communicating therewith, a weight mounted upon the hollow trunnion opposite the receiving chamber to counter-balance the latter, a flexible pipe connected with the chamber at a distance from the trunnion, a valve chest into which the trunnion enters through a stuffing box and with which the receiving chamber communicates through the hollow trunnion, steam and exhaust ports in the valve chest, and a valve plate mounted within the valve chest upon the hollow trunnion and turning therewith to control said ports, the opposing surfaces of the valve plate and seat of each port extending obliquely to the axis of the trunnion, substantially as described.

7. A steam trap or drainer comprising a receiving chamber mounted upon a hollow trunnion and communicating therewith, a weight mounted upon the trunnion opposite the receiving chamber to counter-balance the latter, a flexible pipe connected with the chamber at a distance from the trunnion, a valve chest into which the trunnion enters through a stuffing box and with which the receiving chamber communicates through the hollow trunnion, steam and exhaust ports in the valve chest, and a valve plate mounted within the valve chest upon the hollow trunnion and turning therewith to control said ports, the opposing surfaces of the valve plate and seat of one port extending obliquely to the axis of the trunnion and the opposing surfaces of the valve plate and seat of the other port also extending obliquely to the axis of the trunnion but at a reverse angle from the surface of the first port, substantially as described.

8. A steam trap or drainer comprising a receiving chamber mounted upon a hollow trunnion and communicating therewith, a weight mounted upon the trunnion to counterbalance the latter, a flexible pipe connected with the chamber at a distance from the trunnion, a valve chest into which the trunnion enters and with which the receiving chamber communicates through the hollow trunnion, steam and exhaust ports in the valve chest, and a valve plate mounted within the valve chest upon the hollow trunnion and turning therewith to control said ports, and having a limited oscillatory motion upon the trunnion, the opposing surfaces of the valve seat of each port extending obliquely to the axis of the trunnion, substantially as described.

9. A steam trap or drainer comprising a receiving chamber mounted upon a hollow trunnion and communicating therewith, a weight mounted upon the trunnion to counterbalance the latter, a flexible pipe connected with the chamber at a distance from the trunnion, a valve chest into which the trunnion enters and with which the receiving chamber communicates through the hollow trunnion, steam and exhaust ports in the valve chest, and a valve plate mounted within the valve chest upon the hollow trunnion and turning therewith to control said ports and having a limited oscillatory motion upon the trunnion, the opposing surfaces of the valve plate and seat of one port extending obliquely to the axis of the trunnion and the opposing surfaces and seat of the other port also extending obliquely to the axis of the trunnion but at a reverse angle from the surface of the first port, substantially as described.

10. A steam trap or drainer comprising a counter-weighted receiving chamber mounted upon a hollow trunnion, a valve chest into which the trunnion enters and with which the receiving chamber communicates through the hollow trunnion, a flexible pipe connected with the chamber at a distance from the trunnion, steam and exhaust ports in the valve chest, and a valve plate mounted upon the trunnion within the valve chest and turning therewith to control said ports, substantially as described.

11. A steam trap or drainer comprising a receiving chamber mounted upon a hollow trunnion and communicating therewith, a weight mounted upon the trunnion opposite the receiving chamber to counter-balance the latter, a flexible pipe connected with the chamber at a distance from the trunnion, a valve chest into which the trunnion enters and with which the receiving chamber communicates through the hollow trunnion, steam and exhaust ports in the valve chest, a valve plate mounted upon the trunnion within the valve chest and turning therewith to control said ports, substantially as described.

12. A steam trap or drainer comprising a receiving chamber mounted upon a hollow trunnion and communicating therewith through a pipe extending up into the chamber to a point near the top thereof, a weight mounted upon the trunnion opposite the receiving chamber to counter-balance the latter, a flexible pipe connected with the chamber near the bottom thereof, and a valve operated by the chamber movement to control the flow therein, substantially as described.

13. A steam trap or drainer comprising a receiving chamber mounted upon a hollow trunnion and communicating therewith through a pipe extending up into the chamber to a point near the top thereof, a weight mounted upon the trunnion opposite the receiving chamber to counter-balance the latter, a flexible pipe connected with the chamber near the bottom thereof, a valve chest into which the hollow trunnion projects, and a valve within said chest mounted upon and turning with the trunnion to control the flow through the receiving chamber, substantially as described.

14. A steam trap or drainer comprising a receiving chamber mounted upon a hollow trunnion and communicating therewith, a counterbalancing weight connected to the chamber, a flexible pipe connected with the chamber at a distance from the trunnion, inlet and outlet pipes connected to this flexible pipe and each being provided with a check valve, a valve chest into which the hollow trunnion

extends, a steam inlet entering the valve chest, and valve devices operatively connected to the end of the hollow trunnion within the steam chest.

15. A steam trap or drainer comprising a counter-weighted receiving chamber mounted upon a hollow trunnion, said hollow trunnion having communication with the interior of the chamber, inlet and outlet water pipes connected to the receiving chamber at a distance from the trunnion connection, valves in these pipes, a valve chest into which the hollow trunnion extends, and a two-member valve in the chest, one being operatively connected to the trunnion and the other to the chest, this latter member being provided with a steam inlet and exhaust port, substantially as described.

16. A steam trap or drainer comprising a receiving chamber gravitatingly mounted, counterbalancing means connected therewith, a rotatively mounted trunnion or pipe connected to the interior of the receiving chamber, a valve chest inclosing the inlet end of this trunnion, and valve devices within said chest operatively connected to the trunnion, substantially as described.

In testimony, that I claim the foregoing as my invention, I affix my signature in presence of two subscribing witnesses, this 27th day of November, A. D. 1901.

A. SORGE, JR.

Witnesses:
HENRY W. CARTER,
K. A. COSTELLO.