No. 740,904.

PATENTED OCT. 6, 1903.

T. O. ORGAN.

FEED WATER PURIFIER.

APPLICATION FILED NOV. 12, 1902.

NO MODEL.

Fig. 3.

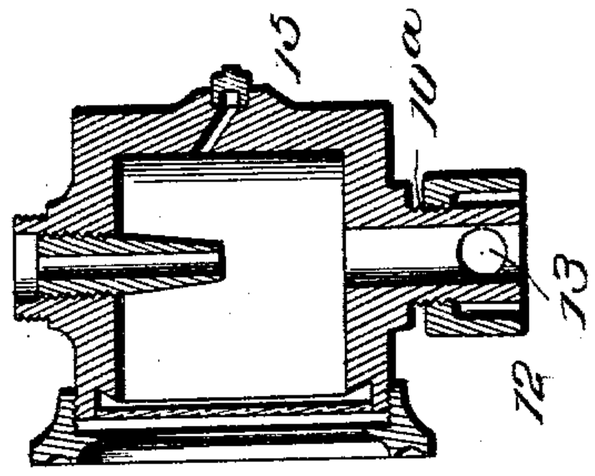


Fig. 2.

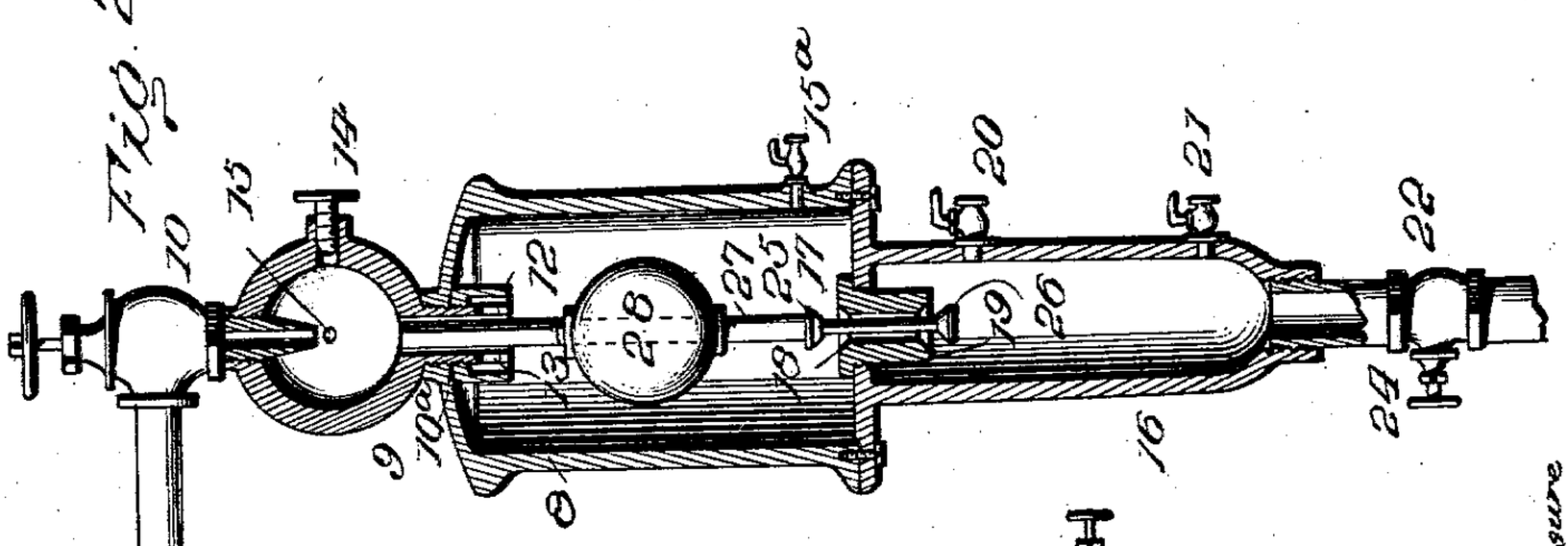
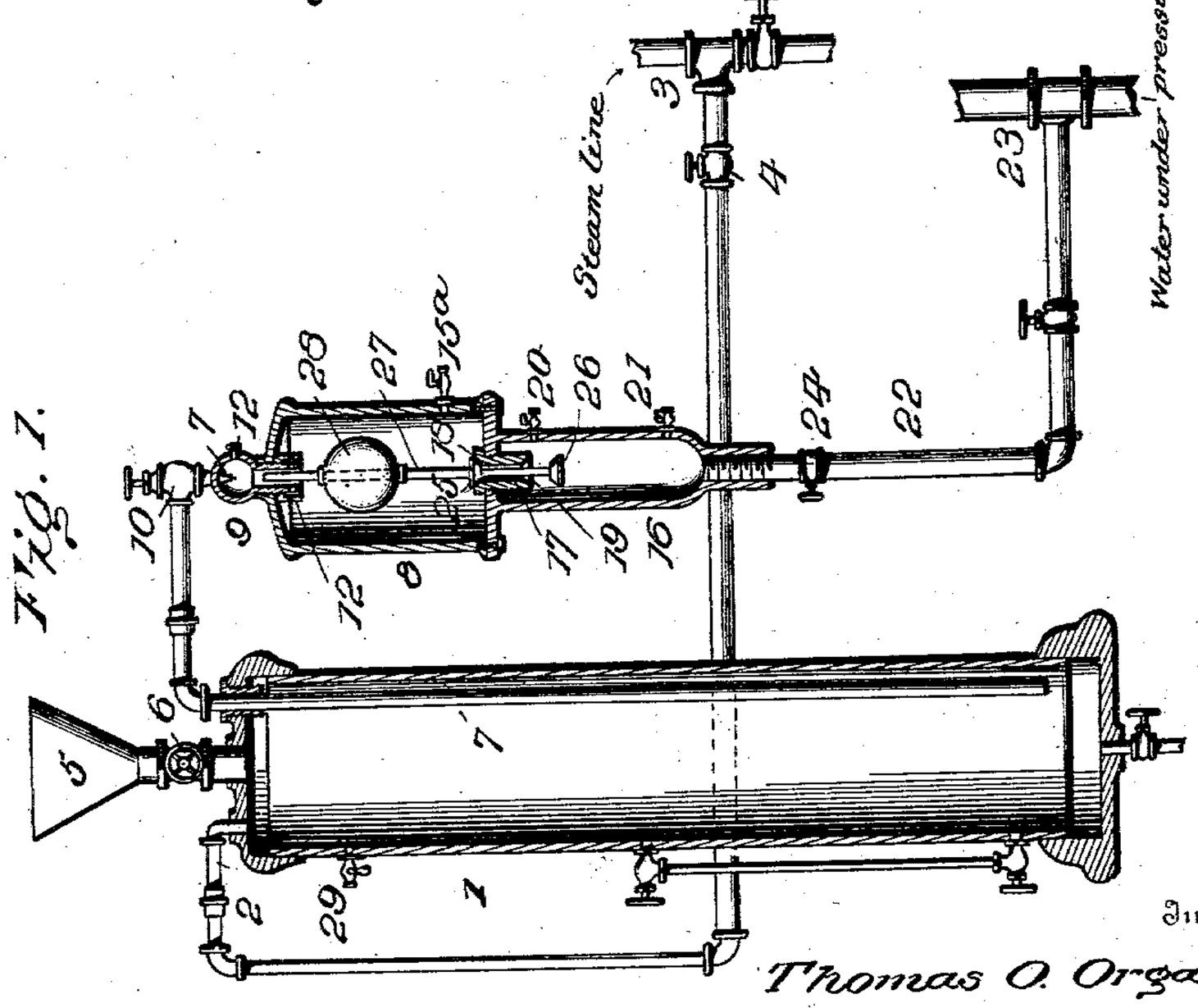


Fig. 1.



Witnesses

Inventor

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By

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No. 740,904. Patented October 6, 1903.

UNITED STATES PATENT OFFICE.

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FEED-WATER PURIFIER.

SPECIFICATION forming part of Letters Patent No. 740,904, dated October 6, 1903.

Application filed November 12, 1902. Serial No. 131,032. (No model.)

To all whom it may concern:

Be it known that I, THOMAS O. ORGAN, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Feed-Water Purifiers; 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.

The object of this invention is to provide improved means for supplying feed-water purifying chemicals to closed feed-water heaters or tanks or pumps by the pressure of steam constantly exerted on the chemical compound, which latter is supplied directly to the suction or supply pipe of the pump, tank, or heater.

A further object is to provide means for automatically preventing steam from passing to the supply or suction pipe in the event of the exhaustion of the chemical compound and also to prevent backflow through the apparatus should a vacuum be created in the chemical-tank by reason of the condensation of steam therein.

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

In the accompanying drawings, Figure 1 is a vertical longitudinal sectional view showing my apparatus connected with steam and pump lines. Fig. 2 is an enlarged vertical sectional view through the controlling-valves and air-chamber. Fig. 3 is a similar view of the sight-feed.

Referring to the drawings, 1 designates a chemical-tank, into the top of which opens a steam-pipe 2, leading from steam-line 3, such pipe having a valve 4 therein. Also opening through the top of this tank is a supply-funnel 5, having a valve 6. A discharge-pipe 7 extends upwardly through tank 1 from a point near the bottom thereof and out through the top, leading to what I term an "air-tank" 8, a sight-feed tube 9 and a needle-regulating valve 10 being interposed between the tank and the end of pipe 7. This sight-feed tube is preferably screwed into the top of tank 8, and upon its threaded boss 10^a is a nut 12, into the chambered portion of which the chemicals passing downwardly through the boss are discharged through horizontal ports 13 and thence into tank 8. In one side of the sight-feed tube is an air-valve 14 and in its back is a plug 15. In the side of tank 8 is a drain-valve 15^a.

16 is an air-supply chamber secured to the lower end of tank 8 and communicating therewith through a centrally-bored plug 17, the ends of such bore forming upper and lower valve-seats 18 and 19. This chamber is equipped with an air-valve 20 and a drain-valve 21 and is connected at its lower end by a pipe 22 to a suction or supply pipe 23, a valve 24 being placed in said pipe 22. This pipe 23, which is connected to the suction side of a pump or to a tank or closed feed-water heater, leads from the city-supply service or from a storage-tank or other source of water-supply, water passing therethrough under pressure.

25 and 26 designate two valves designed, respectively, to be seated against seats 18 and 19, but under normal conditions are held in balance away from their seats. These valves are mounted on a stem 27, extended centrally into the bore connecting the sight-feed tube with the tank 8. On this stem is a float 28. When the two valves are thrown in balance, they are held by the float in the position shown in Fig. 2, and when in this position the upper end of the valve-stem is in line with the upper end of the bore leading from the sight-tube and is visible to the operator.

29 is an air-valve located in tank 1 at what should be the highest limit of the chemicals contained in such tank.

In practice valves 4 and 10 are closed and the chemical compound is supplied through funnel 5, valve 6 being unseated. When the chemicals rise in tank 1 up to valve 29, which latter is open during the filling operation, further supply is cut off and the valve 29 is closed. Steam is then admitted through pipe 2 by the opening of valve 4 and exerts a downward pressure upon the body of chemicals, tending to force the latter upwardly and outwardly through discharge-pipe 7; but before admitting steam-pressure to tank 1, or at least before opening valve 10, it is neces-

sary to throw the valves 25 and 26 into balance with air and a column of water in tank 8 and water in chamber 16. When the valves 25 and 26 are balanced, the float is about one-half submerged in the water, its stem being thus coincident with the top of boss 10^a. Assuming that the apparatus has been previously employed for this purpose, to charge the tank 8 with the proper quantity of air and water valve 24 is closed and valves 20 and 21 of the air-supply chamber are opened, the latter valve admitting of drainage, and after this is completed these two valves 20 and 21 are reclosed and valve 24 is opened, permitting the pressure in pipe 22 to force the air from chamber 16 into tank 8 and up into the sight-feed tube. If there be not sufficient air compressed at the first operation just described—that is, if there be not the proper quantitity of air and water within tank 8 to make the upper end of the valve-stem aline with the upper end of boss 10^a—the described steps are repeated. In thus again opening the valves of the air-supply chamber 16 water therein is allowed to flow outwardly, the escape from the tank 8 being cut off, however, by the seating of valve 25. The reopening of valve 24 after valves 20 and 21 have been reclosed will, as before, force the air from chamber 16 into tank 8. If there is too little water or an overpressure of air in tank 8, the valve-stem will not be visible through the sight-feed tube, and if too much water and an insufficient quantity of air are present the stem will rise too high, and hence keep valve 26 closed. When there is any overpressure of air, escape is permitted through the valve 14. After the float-valves are properly adjusted the pressure of the column of air equals that of the water, so that every drop of liquid chemicals under the steam-pressure from the main steam-line must pass through the column of air and into the water-supply pipe, and in so passing through the air is visible to the operator. Now that the valves 25 and 26 are thrown into balance the needle-valve 10 may be opened, it being understood that steam-pressure is already present in tank 1. Thus the liquid chemicals will flow through the sight-feed tube through the column of air and into a liquid of lower pressure than the pressure on the chemicals, the latter passing from tank 8 into chamber 16, and thence through pipe 22 into the suction or supply pipe 23, by which it is conveyed to the tank, closed feed-water heater, or pump.

Should the supply of chemicals in tank 1 become exhausted and steam pass outwardly through pipe 7, immediately upon entering tank 8 the valve 25 would be seated, thus preventing the passage of the steam to the suction or supply pipe. In the event of the steam-supply to the chemical-tank being cut off the steam contained in such tank upon being condensed creates a vacuum therein, having a tendency to cause the water to rise through the air-chamber 16; but it is prevented from passing beyond such chamber and also beyond tank 8 by the immediate seating of valve 26. Hence it will be seen that the chemical compound is not only automatically fed to the suction or supply pipe, but all danger consequent upon the supply of chemicals being exhausted or the creation of a vacuum in the chemical-tank is successfully avoided.

The advantages of my invention are apparent to those skilled in the art. It will be especially observed that in accordance therewith I am enabled to pass a column of liquid chemicals under high pressure through a column of air into a liquid of lower pressure and that the quantity of the chemicals so passed may be regulated by the adjustment of valve 10, and the amount supplied is always in view of the operator through the sight-feed tube. By my improvement I am enabled to prevent the ejection of large quantities of chemicals into the boiler feed-water, thereby avoiding the danger consequent upon the creation of foam in the boiler, the quantity of chemicals supplied being sufficient to effect precipitation in the tanks or closed feed-water heater. By maintaining a regular feed-supply of the precipitating chemicals better results are obtained than if the precipitants were periodically injected direct into the boiler.

I claim as my invention—

1. In a feed-water purifier, a chemical-containing tank, means for forcing the chemicals therefrom under steam-pressure, and an apparatus intermediate such tank and a suction or supply pipe of a closed feed-water heater, tank or pump, such apparatus containing a column of compressed air equal to the pressure in the suction or supply pipe, and through which column of air the chemicals pass to the said suction or supply pipe, as set forth.

2. In a feed-water purifier, a chemical-containing tank, means for forcing the chemicals therefrom under steam-pressure, an apparatus intermediate said tank and a suction or supply pipe having means for storing a column of air therein of pressure equal to the pressure of water in said pipe, and means for controlling the passage of the chemicals, under the action of the steam, from said tank to said apparatus, as set forth.

3. In a feed-water purifier, a chemical-containing tank, means for forcing the chemicals therefrom under steam-pressure, an air-tank intermediate said former tank and the supply or suction pipe of a tank, feed-water heater, or pump, said air-tank being designed to contain a column of air of pressure equal to that in the said supply-pipe, and means for automatically cutting off communication between the air-tank and the said suction or supply pipe in the event of the column of air being destroyed by the exhaustion of the supply of chemicals or the creation of a vacuum in the chemical-tank, as set forth.

4. The combination with the chemical-containing tank, the steam-pipe opening thereinto at one end, and the delivery-pipe leading from near the other end of such tank, of the air-tank into which said delivery-pipe discharges, the supply or suction pipe of a tank, feed-water heater, or pump, a passage-way between said tank and said latter pipe, means for storing air in said tank at a pressure equal to that in the suction or supply pipe, and means for controlling the discharge from the delivery-pipe into said air-tank, substantially as set forth.

5. The combination with the chemical-containing tank, the steam-pipe opening thereinto at one end, and the delivery-pipe leading from near the other end of such tank, of the air-tank into which said delivery-pipe discharges, the supply or suction pipe of a tank, feed-water heater, or pump, a passage-way between said tank and said latter pipe, an air-supply chamber intermediate said suction or supply pipe and said air-tank, means for admitting air to such chamber, and a valve intermediate the latter and said suction or supply pipe, said valve when opened permitting the pressure in the supply-pipe to force the air from said chamber to said tank, as set forth.

6. The combination with the chemical-containing tank, the steam-pipe opening thereinto at one end, and the delivery-pipe leading from near the other end of such tank, of the air-tank into which said delivery-pipe discharges, the supply or suction pipe of a tank, feed-water heater, or pump, a passage-way between said tank and said latter pipe, means for storing air in said tank at a pressure equal to that in the suction or supply pipe, and means for automatically cutting off communication between said air-tank and said suction or supply pipe in the event of the column of air being broken, as set forth.

7. The combination with the chemical-containing tank, the steam-pipe opening thereinto at one end, and the delivery-pipe leading from near the other end of such tank, of the air-tank into which said delivery-pipe discharges, the supply or suction pipe of a tank, feed-water heater, or pump, a passage-way between said tank and said latter pipe, an air-supply chamber intermediate said suction or supply pipe and said air-tank, means for admitting air to such chamber, a valve intermediate the latter and said suction or supply pipe, said valve when opened permitting the pressure in the supply-pipe to force the air from said chamber to said tank, and means for automatically cutting off communication between said air-tank and air-chamber in the event of the column of air being broken, as set forth.

8. The combination with the chemical-containing tank, the steam-pipe opening thereinto at one end, and the delivery-pipe leading from near the other end of the tank, of the air-tank, a sight-feed tube between said air-tank and the delivery-pipe, a valve controlling the admission to sight-feed tube, an air-chamber connected to said tank, a pipe connecting said air-chamber to the suction or supply of a tank, feed-water heater, or pump, means for forcing the air from said air-chamber into said tank, a valve-stem having two valves for cutting off communication between said tank and air-chamber, said valves being normally held away from their seats, and said valve-stem being extended into said sight-feed tube, as set forth.

9. The combination with the chemical-containing tank, the steam-pipe opening thereinto at one end, and the delivery-pipe leading from near the other end of the tank, of the air-tank, a sight-feed tube having a passage-way opening into said air-tank, a valve for controlling the discharge into said sight-feed tube, an air-chamber opening into said air-tank, valves in said air-chamber, a pipe connecting said air-chamber to the suction or supply pipe of a tank, feed-water heater, or pump, a valve in said pipe a valve-stem extended into said passage-way of the sight-feed tube, two valves on said stem for controlling communication between said air-chamber and air-tank, and a float on said stem, substantially as set forth.

10. The combination with the chemical-tank, the steam-pipe and the delivery-pipe, of the air-tank, the sight-feed tube having a passage-way opening into said air-tank, an air-chamber having a passage-way opening into said air-tank provided with upper and lower valve seats, means for admitting air to said air-chamber, a valved pipe connecting said air-chamber with the suction or supply pipe of a tank, feed-water heater, or pump, upper and lower valves designed to be seated against said seats for closing communication between the air-tank and air-chamber, a stem for said valves extended into said passage-way of the sight-feed tube, and a float on said stem, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOS. O. ORGAN.

Witnesses:
G. ALFRED KOCH,
HERMAN W. SULZER.