(No Model.) 2 Sheets—Sheet 1.

R. H. THORPE.

APPARATUS FOR PURIFYING AND STORING WATER.

No. 568,550. Patented Sept. 29, 1896.

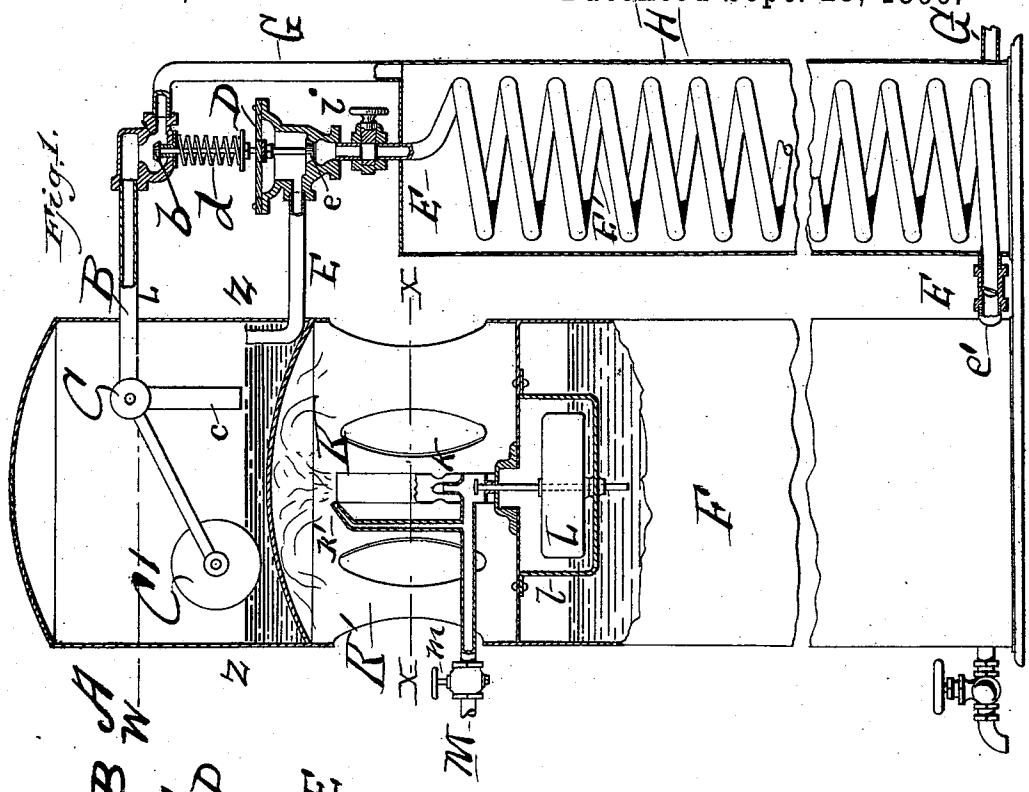

Fig. 1.

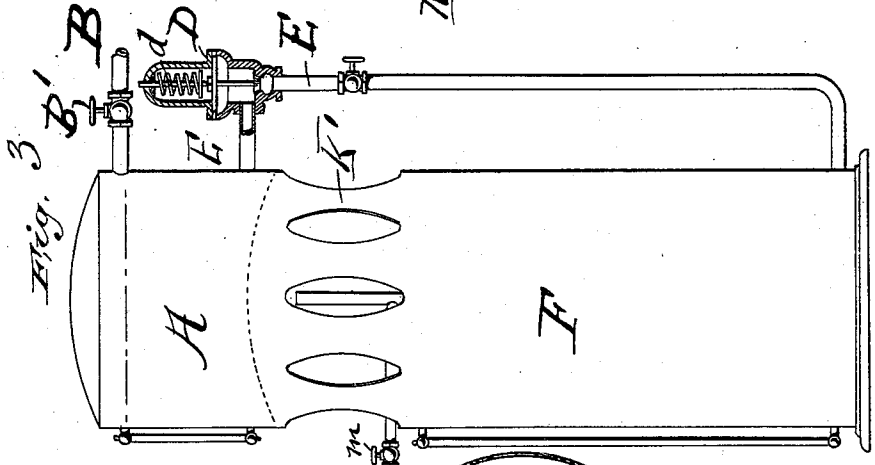

Fig. 3.

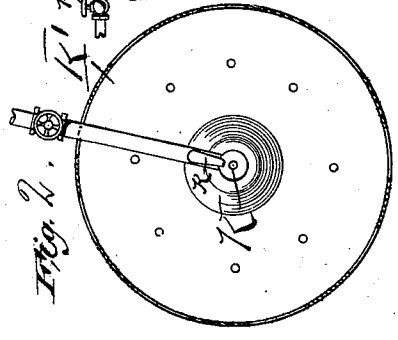

Fig. 2.

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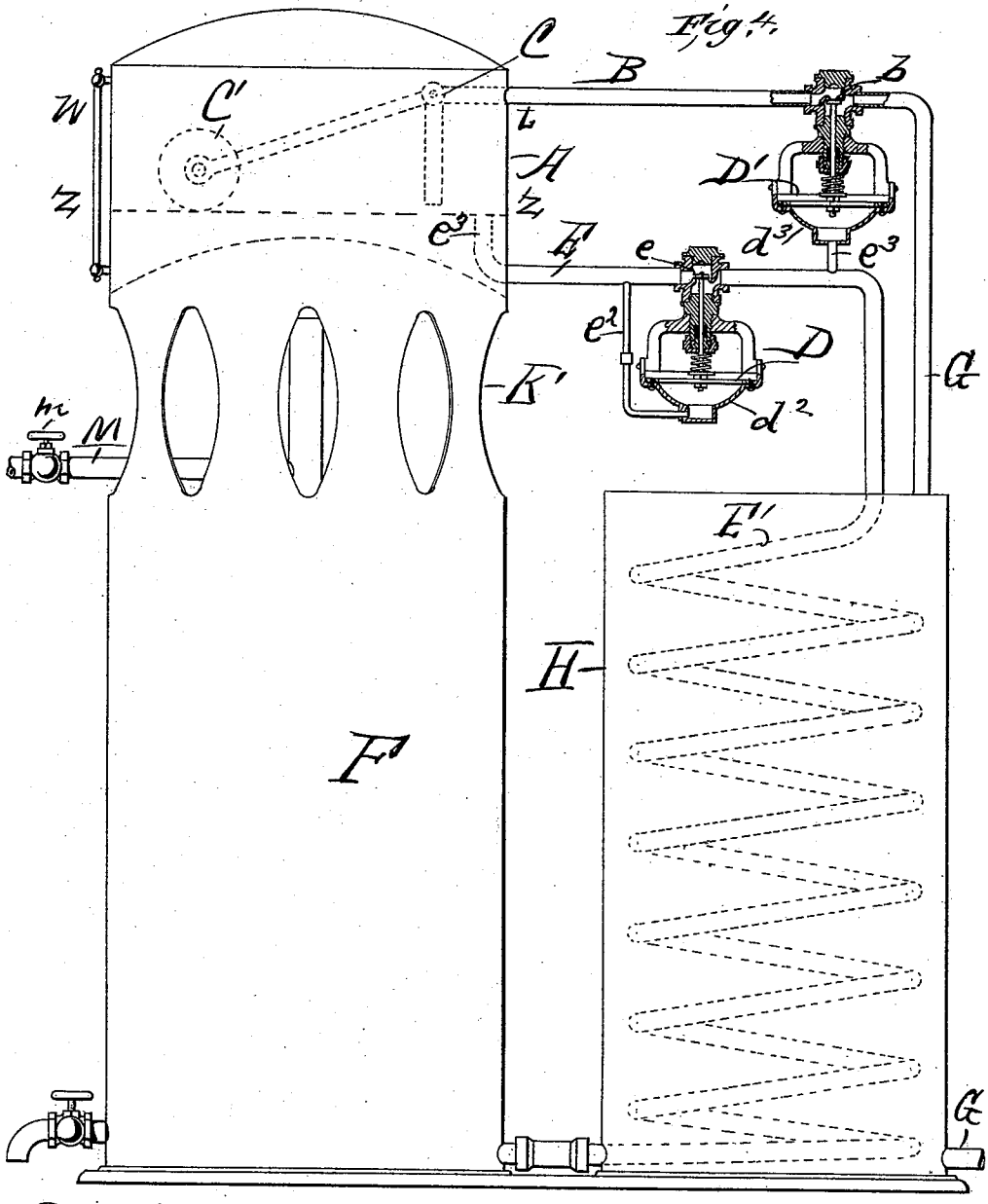
Fig. 4.



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P. A. Fray

Inventor:
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UNITED STATES PATENT OFFICE.

ROBERT H. THORPE, OF NEW YORK, N. Y.

APPARATUS FOR PURIFYING AND STORING WATER.

SPECIFICATION forming part of Letters Patent No. 568,550, dated September 29, 1896.

Application filed February 23, 1894. Serial No. 501,095. (No model.)

To all whom it may concern:

Be it known that I, ROBERT H. THORPE, a subject of the Queen of Great Britain and Ireland, and a resident of New York, in the county of New York, State of New York, have invented a certain new and useful Improvement in Apparatus for Purifying and Storing Water, of which the following is a specification.

My invention relates to improvements in apparatus for purifying and storing water. Especially it relates to apparatus which operates automatically through such a cycle that in the first place the water is fed into a boiler, where it is heated above the boiling-point for the purpose, first, of destroying any deleterious germs and rendering any organic matter which the water contains innocuous; second, of generating pressure to operate the other steps of the cycle; and that in the second place by the action of the said pressure the boiled water is removed from the boiler to a storage-reservoir, the supply to the boiler being arrested while the boiled water is being discharged, so that by no possibility can any water mix with the discharge without being boiled; and in the third place, by the reduction of pressure due to the discharge of the boiled water, the supply to the boiler may be automatically resumed and the discharge from the boiler automatically arrested, so as to prevent at this step of the cycle also the passage of any water that has not been boiled into the storage-reservoir.

While I am aware that the boiling of water to destroy germs is old, I am not aware that prior to my invention a cycle consisting of the automatic supply of water to a boiler, automatic discharge of the water therefrom to a storage-reservoir, and the automatic arresting of the supply or the discharge, so that only either the supply or the discharge proceeds at a time, has ever been applied to the boiling and storage of water, and the process consisting of such a cycle as my invention.

My invention also relates to the apparatus by which the process is operated, and which is illustrated in the drawings which accompany this specification, whereof—

Figure 1 is a vertical section of one form of the apparatus. Fig. 2 is a horizontal section on the line X X of Fig. 1. Fig. 3 is a sectional elevation of a modification of the apparatus. Fig. 4 is an elevation, partly sectioned, of a modified apparatus wherein the valves in the boiler supply and discharge are operated by separate means.

A boiler A, which may be provided, if desired, with safety valve and gage, has a feed-pipe B, preferably equipped with ball-cock C and float C′, the discharge *c* descending nearly to the bottom of the boiler A. The feed-pipe B is controlled by a valve *b*, actuated by the diaphragm D, which in its turn is operated by the pressure of the water in the discharge-pipe E, which pipe ultimately leads to the storage-reservoir F and is provided with a check-valve *e*′, arranged to open toward the said reservoir F. Said diaphragm D also actuates a valve *e* in the course of the discharge-pipe E, which valve *e* is arranged to close as the valve *b* opens, and vice versa. Said diaphragm D being arranged to close the valve *b* and open valve *e*, a spring *d* is provided to actuate both said valves oppositely when the pressure on the diaphragm decreases to a desired limit.

G is the main supply-pipe, connected in any suitable manner with the boiler feed-pipe B. In the drawings a condenser H is shown interposed in the course of said supply-pipe G, within which condenser H is a coil E′, arranged in the course of the discharge-pipe E. A valve *i* may be placed between said coil E′ and the boiler A. The said boiler A may be heated in any desired manner, and the drawings show a Bunsen burner K, the needle-jet of which is controlled by a valve *k*, actuated by a float L, guided in a yoke *l* and rising and falling with the water-level in the reservoir F. The supply-pipe M to said burner K is controlled by the cock *m*, and I prefer to employ an auxiliary burner *k*′, with a small flame to ignite the gas at the burner K, as will be hereinafter described. Said burner K is preferably inclosed in a shield K′, which may be utilized to support the boiler A and is perforated, as shown.

The operation is as follows: Water enters the boiler A through the pipe B, the valves *b e* being now respectively open and closed until the ball C′, rising to some assigned level, closes the cock C. The water is then boiled by the heat of the burner K and steam gen-

erated, which finally attains sufficient pressure to lift the diaphragm D through the water in discharge-pipe E, closing valve *b* and opening valve *e*, and the diaphragm D will effect these movements in the well-known manner with great suddenness. Thus the first step of the cycle is completed. Then the boiled water is discharged by gravity and the pressure of steam in the boiler A through the condensing-coil E′ into the bottom of the reservoir F, the valve *b* remaining closed until the water in boiler A has descended to the level Z Z, so that no water can reach the discharge-pipe E except such as has been boiled. This completes the second step of the cycle. Next, the level of the water in the boiler A having descended to the level Z Z, the temperature and the pressure of the steam therein fall, so that the spring *d* opens the valve *b* and closes the valve *e*, permitting another supply of water to enter the boiler A, but preventing any water from passing therefrom to the reservoir F until the water has been raised to a temperature sufficiently high to destroy the germs and render the organic matter innocuous. This completes the third step of the cycle, and thereafter the process proceeds in that manner through a cycle composed of steps, each of which succeed each other automatically under the influence of the rise and fall of the temperature to which the water is subjected.

When the level of the water in the reservoir F rises sufficiently high to lift the float L, it closes the valve *k* and shuts off the gas from the burner K, the auxiliary burner *k′* remaining ignited. When sufficient water is drawn from the reservoir F to permit the float L to fall, the valve *k* opens, turning the gas on to the burner K, which is ignited by the auxiliary burner.

In Fig. 3 I show a modification of the apparatus wherein the feed-pipe B is controlled by hand, the discharge-pipe E being controlled, as before, by the temperature and pressure of the water in the boiler A. In this case, when an attendant observes from the gage and water level that the temperature and pressure of the water in boiler A are nearing the desired limit, he closes the cock B′. Soon thereafter the diaphragm D opens the valve *e* and the boiled water is automatically discharged into the reservoir F. As soon as the gage shows that the temperature of the water in boiler A has fallen sufficiently to insure that the valve *e* is closed the attendant opens the cock B′ to admit another charge to the boiler A and institute the same cycle of operations once more.

In Figs. 1 and 2 the valves *b e* are represented as both operated by one diaphragm D, but they can of course be each operated by separate diaphragms, and one arrangement of the apparatus to effect this is illustrated in Fig. 4. The diaphragm D, controlling the valve *e*, is now arranged with its receptacle d^2 connected with the pipe E by a branch e^2, and the valve *b* is controlled by a second diaphragm D′, the receptacle d^3 of which is connected with the pipe E, beyond the diaphragm D, by a branch e^3. Other parts of the apparatus are the same as hereinbefore described.

The apparatus operates as follows: Suppose the boiler A to be filled to the line W L and the water to be boiling, the cock C being closed. Now the steam-pressure in boiler A is exerted, by way of the branch e^2, on the water in the receptacle d^2, and the diaphragm D opens the valve *e*, permitting the boiled water to flow through the coil E′ to the reservoir F. At the same time, the steam-pressure being exerted on the water in the receptacle d^3, the diaphragm D′ closes the valve *b*, so that no water can enter the boiler A, even as the ball-cock C C′ opens. Thus the steam-pressure in the boiler A discharges the contents thereof into the reservoir F until the water in the boiler A descends to the turned-up end e^3 of the pipe E. Then steam rushes into the coil E′ and is there condensed, forming a vacuum, which suddenly closes the valve *e*, if the same was not theretofore closed by the spring *d* as the pressure fell in the boiler A, and opens the valve *b*, so that another charge of water enters the boiler A. In this manner the steps of the cycle succeed each other until the reservoir F is filled with water which has been thoroughly boiled.

It will be understood that any suitable heating device can be substituted for the burner K, that the vessel H and condensing-coil E′ may be omitted, and other changes in the form and arrangement of the parts of the apparatus made without departing from my invention.

Now, having described my improvement, I claim as my invention—

1. The combination in apparatus for purifying and storing water, of a source of heat, a boiler, a supply-pipe thereto, a valve controlling the supply-pipe by the rise and fall of the level of the water in the boiler, a second valve in said supply-pipe arranged to close when the water in the boiler has reached a certain pressure, a discharge-pipe from said boiler, and a valve therein arranged to open when the water in the boiler has reached the pressure at which the said second valve in the supply-pipe closes, substantially as described.

2. In apparatus for storing and purifying water, the combination of a boiler, a supply-pipe to the boiler, a receptacle for boiled water, a connection from the boiler to the receptacle, a valve *b* in the supply-pipe to the boiler, a valve *e* in the connection between the boiler and the receptacle and a diaphragm D controlling said valves *b e*, substantially as described.

3. In apparatus for purifying and storing water, the combination with a boiler, a source of heat for the boiler, and a receptacle for boiled water, of a supply-pipe to the boiler, a connection between the boiler and the re-

ceptacle, a diaphragm adapted to be operated by the changes of pressure in the boiler and valves in said supply-pipe and connection adapted to be respectively operated in opposite directions by the said diaphragm, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 15th day of February, 1894.

ROBERT H. THORPE.

Witnesses:
BERNARD J. BECKE,
PATRICK A. FAY.