3 Sheets—Sheet 1.

# I. C. RICHARDSON.

## Apparatus for Raising Water.

**No. 227,993.** **Patented May 25, 1880.**

Fig. 2.

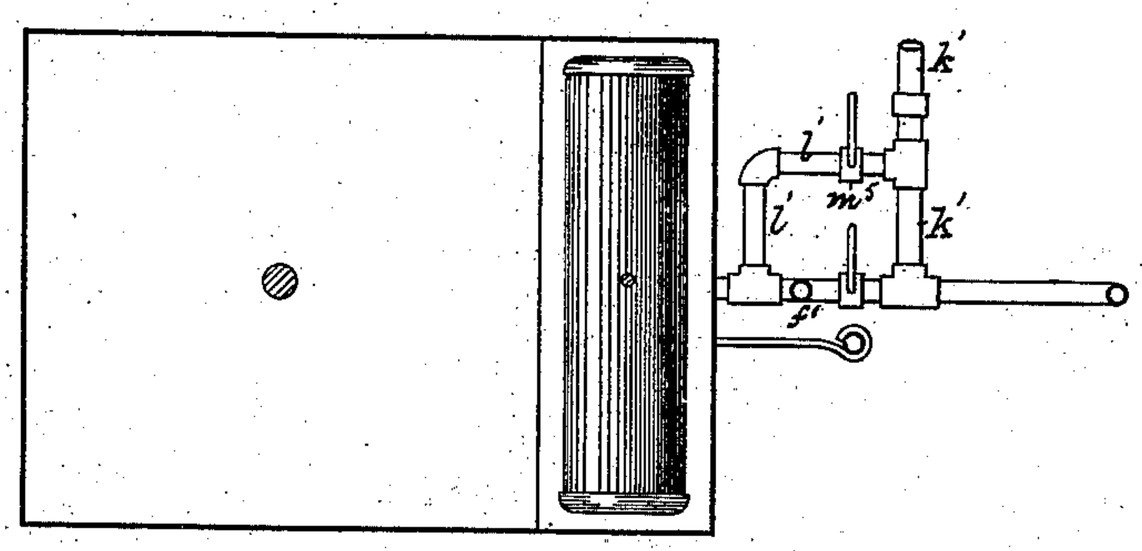
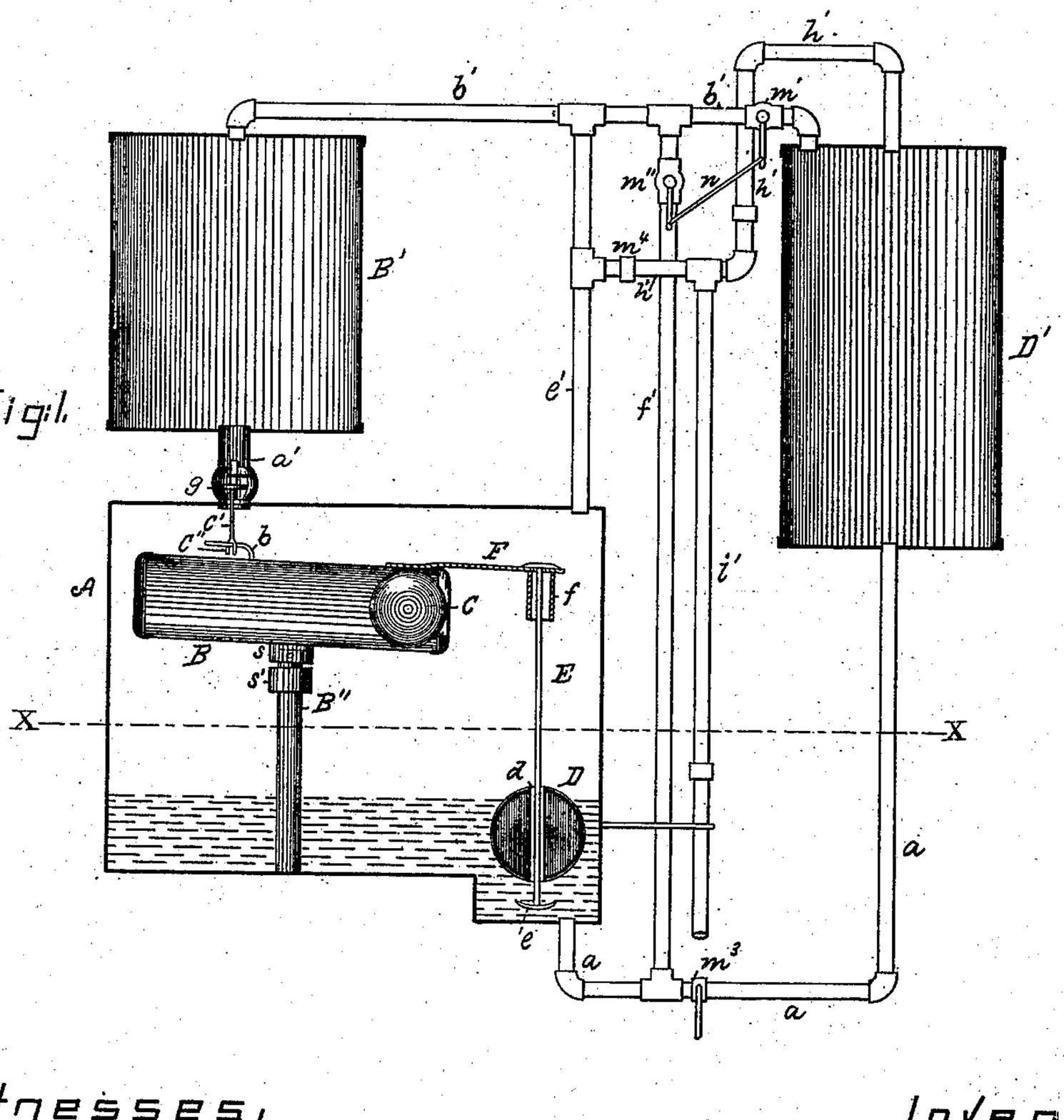



Fig. 1.




Witnesses,

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I. C. RICHARDSON.

Apparatus for Raising Water.

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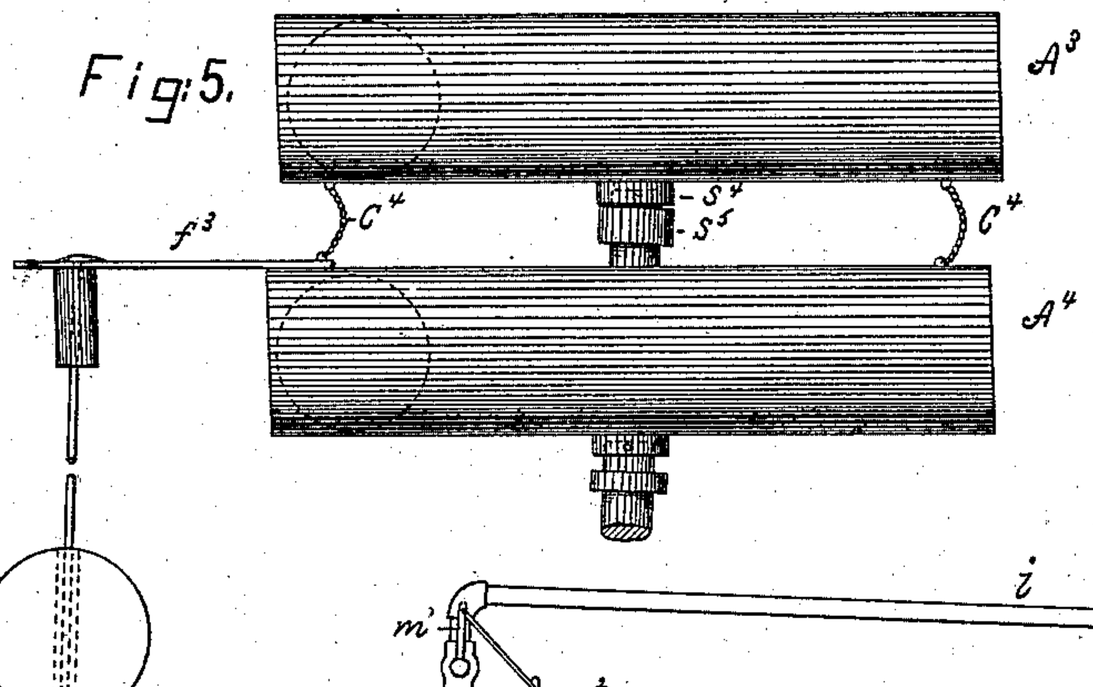
Fig: 5.



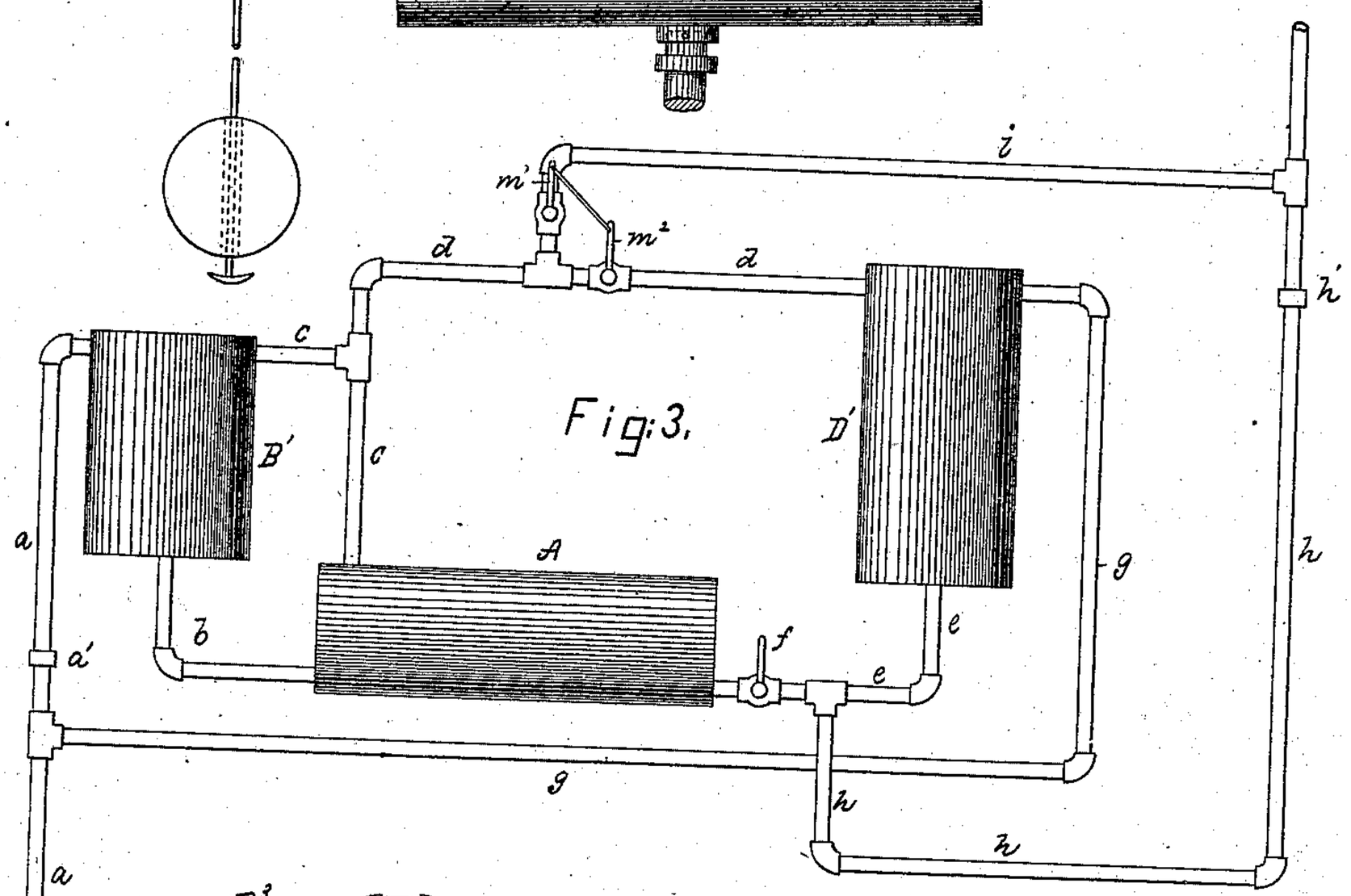




Fig: 3.

Fig: 4.

Witnesses,

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3 Sheets—Sheet 3.

# I. C. RICHARDSON.

## Apparatus for Raising Water.

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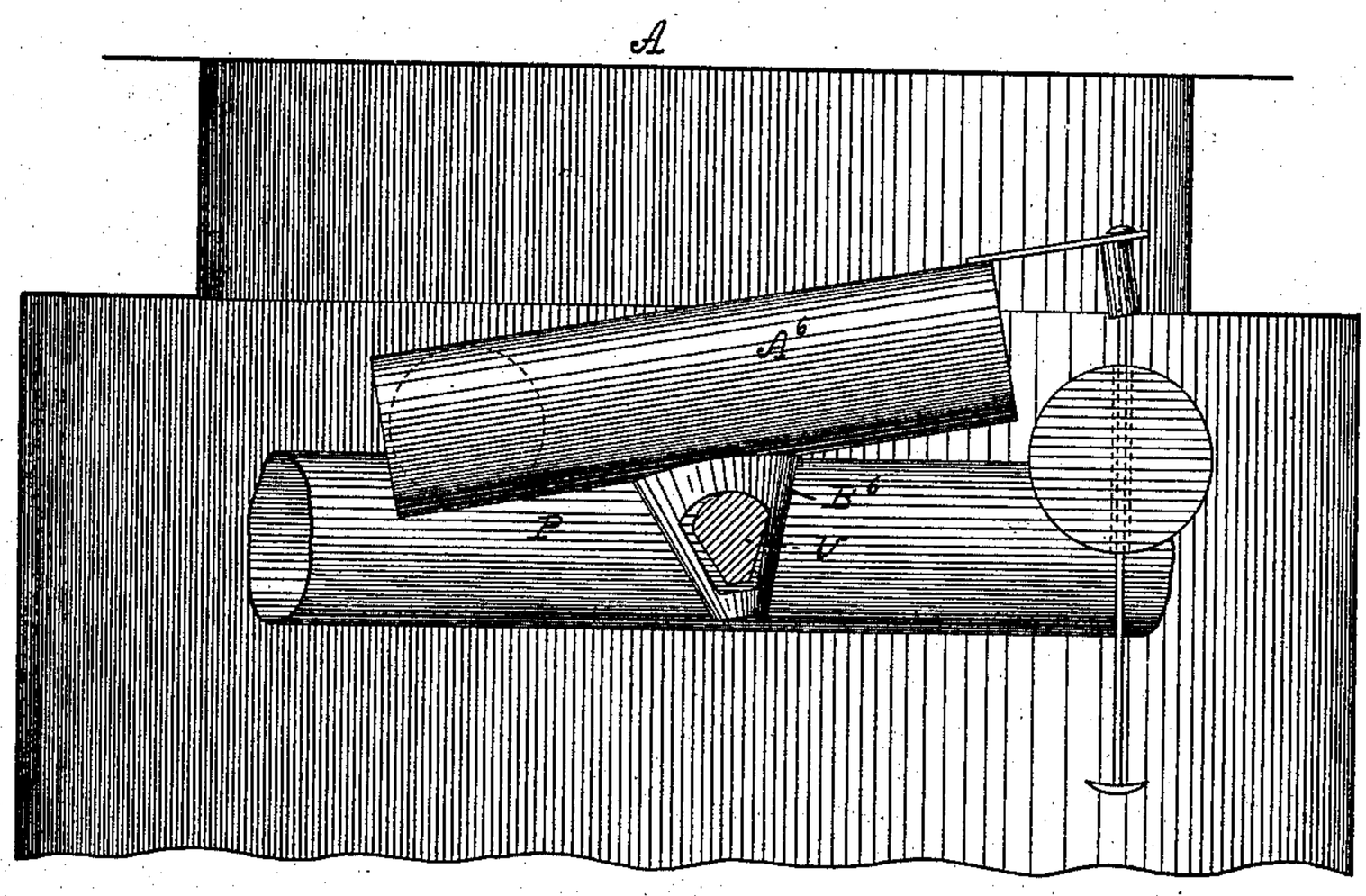


Fig: 6.

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# UNITED STATES PATENT OFFICE.

ISAAC C. RICHARDSON, OF NASHUA, NEW HAMPSHIRE.

## APPARATUS FOR RAISING WATER.

SPECIFICATION forming part of Letters Patent No. 227,993, dated May 25, 1880.

Application filed January 6, 1880.

*To all whom it may concern:*

Be it known that I, ISAAC C. RICHARDSON, of Nashua, in the county of Hillsborough and State of New Hampshire, have invented certain new and useful Improvements in Apparatus for Raising Water, of which the following is a specification.

My invention relates to mechanism for automatically raising or drawing water from a well, brook, or other water-source and driving it to any distant point where a water-supply is needed; and my invention consists in a certain novel construction and combination of parts for accomplishing said result, and for furnishing an abundant supply of either cold or hot water, as may be desired, said supply being delivered at the point where it is required, either heated or cold, at the will of the operator.

Referring to the drawings, forming part of this specification, Figure 1 is a view, partly in section. Fig. 2 is a view showing the parts below the plane *x x* in Fig. 1. Figs. 3 and 4 are views showing modifications in the arrangement of parts. Fig. 5 is a detail view, showing the special construction of the valve-actuating mechanism. Fig. 6 is a view showing still another modification of the valve mechanism.

A in the drawings indicates a boiler or other suitable receptacle, wherein water may be placed and submitted to the action of heat. Within this boiler I place an automatic valve mechanism, consisting of a pivoted cylinder, B, having a heavy ball, C, rolling therein and connected at one end with a movable float, D. This float consists of a hollow metal cylinder, having a tube, *d*, passing through it at the central point, and connected with the pivoted cylinder B by means of a wire, E, suspended from an arm, F, projecting from the cylinder B. At the lower end of the wire E is a head or flange, *e*, of a size sufficient to arrest the descent of the float, and at the other end is a tube-section, *f*, through which the wire E passes, the use of the tube being to cause the float to ride up vertically instead of swinging laterally. Upon the upper surface of the cylinder B is attached a finger, *b*, engaging with an open fork upon the end of the valve-stem *c'*.

B' is a tank or other suitable receptacle for water, connected with the boiler A by means of a pipe, *a'*, a check-valve being located in said pipe, as shown at *g* in Fig. 1.

I may here remark that the relative situations of the boiler and this tank, as well as others shown, are to be varied as circumstances may demand, since these receptacles may be placed at any desired distance from the boiler A.

D' is a third receptacle or tank, connected with the boiler A by means of a pipe, *a*, which passes from the bottom of the boiler to the bottom of the tank D'. These three chambers—to wit, the boiler, the tank B', and the tank D'—may be still further connected by a series of pipes, as shown in Fig. 1—for example, a pipe, *b'*, passing from the top of tank B' to the top of tank D', and having a branch, *e'*, passing downward to the boiler A; a second branch, *f'*, springing from the pipe *b'* between the branch *e'* and the tank D' and entering the pipe *a*. A third pipe, *h'*, springs from the pipe *e'*, passing toward the tank D', then upward, and finally over the tank, which it enters at the top. A fourth pipe, *i'*, is dropped from the pipe *h'* directly downward, and may be carried into a well, cistern, or other source of supply, the latter not being shown in the drawings.

Again, referring to the plan view in Fig. 2, a pipe, *k'*, leads from the pipe *a* at a point not far distant from the boiler, and may be carried to a barn or other building at a distant point. A short branch, *l'*, springs from the pipe *a* between the junction thereof with the pipe *f'* and the boiler, and connects with pipe *k'* in the manner shown in said Fig. 2. These pipes are furnished with common plug-valves and with ordinary check-valves, in the manner hereinafter described.

The operation is substantially as follows: The three tanks A' B' D' being filled with water, the float D is raised to the upper part of the float-spindle E, tilting the hollow cylinder B and causing the heavy ball C to roll to its end farthest from the float, thus dropping down the valve-stem *c'* and closing the check-valve *g*. Heat being now applied, steam will generate within the boiler, and its pressure may be utilized in the following manner: The pipe *b'* and the pipe *f'* are each provided with

a plug-valve, $m'$ $m^2$, the handles of these valves being connected by a rigid bar, $n$, pivotally connected to the handles of the valves. A similar valve, $m^3$, is placed in the pipe $a$ between the pipes $f'$ and $k'$. By operating the two connected valves in such manner as to close the valve $m^2$ and open the valve $m'$, and also closing the valve $m^3$, the whole pressure of steam within the boiler is conveyed to the tank D′, through the pipes $e'$ and $b'$, and acts upon the surface of the water in said tank D′, driving it downward through the pipe $a$, thence into the pipe $k'$, (seen in Fig. 2,) which it is compelled to enter by reason of the closed valve $m^3$, and finally forcing it out at the distant extremity of the pipe $k'$ into a suitable receptacle placed in the barn or other building where a water-supply is needed. When the tank D′ is emptied, by closing the valve $m'$ the flow of vapor is arrested and the rapid condensation within the tank or drum D′ produces a partial vacuum, whereby a fresh supply of cold water is drawn up through the well-pipe $p'$, the check-valve $m^4$ being arranged to close against currents flowing from the boiler toward the drum D′, but permitting passage in the contrary direction. A check-valve, $v$, is also placed in the pipe $i'$, opening upward to prevent steam from the boiler flowing out.

It should be noted before going farther that the steam-pressure has free access to the drum or tank B′ through the pipes $e'$ $b'$, and in this manner there is an equal pressure on both sides of the check-valve $g$.

After the drum D′ is emptied and filled, as just described, the operation may be again repeated, and so on until the required supply of water is obtained. When, however, this is long continued the water in the boiler may become low and need replenishing. This is accomplished by automatic apparatus as follows: Above the level of the boiler, and in any convenient location, is placed a tank, B′, of smaller capacity, connected with the boiler A by a pipe, A′. In this pipe is a check-valve, $g$, which is closed by the pressure of the water above it and opened by the automatic apparatus already described. Now, when the water diminishes in the boiler and its level becomes lower, the float D gradually drops, sliding down upon the spindle E until it strikes the head $e$. Here its motion is arrested, and as the water lowers still further the whole weight of the float, at last is thrown upon the arm F. This weight is sufficient to tip the cylinder far enough to roll the ball C, and the weight of the latter, as it passes to the float end of the tube, trips the valve $g$ and admits water from the tank B′. This water is, of course, cold, or of much lower temperature than the water contained in the boiler, and its entrance condenses the body of steam and creates a partial vacuum, which draws through the pipe $i'$ leading from the well, and thence through the branch $h'$ $e'$ into the boiler. As the water in the latter rises the action of the valve-tripping mechanism is reversed, the float rising until it lifts the end of the tube and rolls the ball back. The valve $g$ then drops merely by the weight of the water above it.

The drum B′ may be filled at the same time as the boiler, since, the two being connected by the pipe $e'$ $b'$, the steam has access to the drum, and upon the opening of the valve $g$ an equal condensation takes place in both the boiler and the drum B′, causing a partial vacuum, which, as already explained, lifts the water through the well-pipe, and it is thence carried through both the pipe $e'$ into the boiler and also through the pipe $b'$ into the tank B′.

Should it be desired, however, to drive hot water to the distant barn, house, or other point, it is only necessary to close the two plug-valves $m'$ and $m^3$ and open the valve $m^5$ in the elbow-pipe $l'$. (See Fig. 2.) The pressure of the steam then drives the water in the boiler down through the pipe $a$ into the pipe $l'$, and thence into the pipe $k'$, from which it is delivered at the point desired, the pressure of the steam in the pipe $f$ resting on the water which rises in the pipe from the boiler, and stands at the same level therewith. When the water in the boiler is exhausted it is replenished by the automatic mechanism already described, and in the manner pointed out above.

In Figs. 3 and 4 are shown certain modifications of this same arrangement. A in each figure is the boiler. B′ in Fig. 3 corresponds with the drum B′ in Fig. 1. The piping is different, however. The pipe $a$, Fig. 3, leads from the well and connects with the drum B′, as shown. $b$ is a pipe to convey water from said drum to the boiler, and $c$ is a steam-pipe conveying steam to the drum, corresponding to the pipes $e'$ $b'$, Fig. 1. D′ is the third drum, as shown in Fig. 1, connected with the boiler by continuation $d$ of the pipe $c$, said pipe $d$ entering the drum D′ at the top. A second pipe, $e$, having a plug-valve, $f$, passes from the bottom of the boiler to the bottom of the drum D′. From the well-pipe $a$ a single pipe, $g$, runs direct to the top of the drum D′, and finally a pipe, $h$, leads from the pipe $e$ at a point between the plug-valve $f$ and the drum D′, said pipe $h$ passing to the point where the water is to be driven. At any convenient point in this pipe $h$ may be jointed a branch, $i$, connecting it with the pipe $d$, and affording a convenient point to place the connected turn or plug valves $m'$ $m^2$. These valves are the exact counterpart in all respects of the two connected valves in Fig. 1, and no further description of them is necessary here. A check-valve, $h'$, Fig. 3, is placed in the pipe $h$, opening to admit flow from the boiler and closing against currents toward the boiler.

The operation of this modified form of apparatus is obvious. When heat is applied to the boiler A, by closing the plug-valve $f$ and opening the valve $m^2$, (closing at the same time the connected plug-valve $m'$,) steam flows into the drum D′ through the pipes $c$ $d$, and the

water in the drum is forced out through the pipes *e h* and delivered at the extremity of the pipe *h*. When the water is exhausted from the said drum, the valve $m^2$ is closed, and the condensation within the drum produces a partial vacuum which draws water through the pipe *g* from the well at the lower end of the pipe *a*. When hot water is needed it is only necessary to open the valve *f* and close the valve *m'*, when the water in the boiler A will be driven out through the pipe *e h*, the boiler being filled by an automatic valve-tripping apparatus similar to that shown in Fig. 1. It is almost unnecessary to add that the use of the pipe *c* is to admit steam to the drum in order to balance the pressure of the steam within the boiler, as otherwise the latter would lift the valve *g* (see Fig. 1) and admit the water from said drum prematurely. A check-valve, $a^2$, is placed in pipe *a* below and another above the pipe *g'*, both opening upward.

In Fig. 4 I have still another arrangement of piping, which may, under certain circumstances, be preferred, as being somewhat more simple. The boiler A is connected with a supplemental drum, $B^2$, of small capacity, by a pipe, $a^2$, the steam-pipe $b^2$ entering at the other end to equalize the pressure upon the automatic valve at the end of the pipe $a^2$, and within the boiler. $B^3$ represents a tank, stream, or other supply of water, (in distinction from a well,) with which the drum $B^2$ is joined by a pipe, $b^3$. C is a reservoir, placed at any distant point where the water-supply is needed, connected with the boiler by a pipe, $b^4$, which branches near the boiler into the pipes $b^5$ $b^6$, the former having a plug or turn valve, *v*, and entering the boiler at the bottom, while pipe $b^6$ enters at the top, or near it. The only other valves needed in this form of apparatus are a check-valve, $b^2$, in the pipe $b^3$, opening toward the drum $B^2$, and a similar check-valve, *b'*, in the delivery-pipe $b^4$, opening to currents flowing toward the reservoir C, and closing to all draft or current in the direction of the boiler.

The operation of this form of apparatus hardly needs description. When heat is applied the steam forces the water through the pipe $b^4$ to the tank C, the steam in pipe $b^6$ resting on the water in said pipe, which rises therein to the level of water in the boiler. The boiler is filled by an automatic valve apparatus exactly like that shown in Fig. 1, or the modified form shown in Fig. 6. One point, however, requires notice. The "auxiliary reservoir," as it may be called, is connected by the pipe $b^2$ with the boiler, said pipe being opened and closed by the automatic valve-operating apparatus referred to. When this valve is opened an amount of water sufficient to condense the steam in the boiler is admitted, and the vacuum thus formed draws a stream from the water-supply through the pipes $b^2$ $a^2$. The steam-pipe $b^2$, already described, is carried up above the level of the water-supply, in order to prevent the natural tendency of the water therein to seek the lowest level, which would cause it to flow down through the auxiliary reservoir, and thence through the steam-pipe into the boiler, if said steam-pipe were not carried up above the level of the water at the point $B^3$.

Beside the valve-actuating mechanism shown in Fig. 1 inside the boiler, I have devised a modification which may, in certain circumstances, be used with advantage.

Instead of a single tube with a heavy ball therein, I may use two pivoted cylinders, $A^3$ $A^4$. (See Fig. 5.) Both these tubes are mounted on the same post or support, one above the other, and they are connected at the ends either by a loose chain or by any other equivalent device. The upper cylinder is connected with the valve in the manner already described in connection with the single tube. Now, when the float falls with the lowering of the water in the boiler the lower tube, $A^4$, is first moved without disturbing the other, and when the proper inclination is effected the ball in said lower tube rolls and the float end is depressed to its lowest point. By this movement the chain connecting the two cylinders at that end is made taut and draws upon the end of the upper tube, depressing it, and also rolling the ball contained therein. A collar upon the post and one upon the tube limit the movement of the upper cylinder; but no such check is attached to the lower. Consequently the automatic valve is opened more suddenly, and is held open more effectually until the required amount of water enters, when the operation is reversed and the valve closed. When, however, the boiler is supplied from a pipe in which there is a head or pressure of water, it is well (and if the pressure is great it may be necessary) to use a plug or turn valve. In this case I mount the ball-cylinder upon the projecting shank of the valve, as shown in Fig. 6, and in other respects operate it in the same manner.

When the point where the water is driven by this apparatus is lower in level than the boiler, in order to prevent the water from "siphoning" over I may carry the delivery-pipe up to a level higher than the boiler, and there empty it into a suitable tank, whence it flows naturally to the desired point.

The preference as to the two forms of valve-operating devices shown in Figs. 1 and 5 is as follows: In using the single cylinder shown in Fig. 1 it is necessary to connect the boiler to a subsidiary drum, as *B'*, and also to a separate water source, as a well or cistern, the latter connection requiring a separate pipe. This form is needed for the reason that as water enters from the drum through the automatic valve it will probably tilt the tube far enough to close the valve before the vacuum in the boiler is satisfied, and the residue of water required must enter through the pipe from the well; but in cases where I pipe to a running stream, and thus obtain a low head or pressure, the double cylinder seen in Fig. 5 is indispensable, as it will hold the valve up until the

body of water required in the boiler has entered, and will thus enable me to dispense with the second pipe which is needed with the single cylinder apparatus, as described above.

The boiler may be filled by a single pipe having simply the automatic-valve apparatus whenever it is possible to connect with a water-supply having a moderate head. In this case the condensing-drum may be wholly dispensed with and a single pipe without any other than the automatic valve be used.

This invention is intended chiefly for use upon farms where there are no water-supply companies, and where also no sufficient natural head of water exists. Even with these present, however, it is often indispensable to have a supply of hot, or at least warm, water, both to feed stock with what is known as a "hot mash" and also to treat animals when sick. My invention will provide this at an extremely small cost, and is so far automatic that no special knowledge is required in order to operate it successfully.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. An automatic water-raising mechanism consisting of a boiler and an auxiliary reservoir, connected by suitable tubing to balance the pressure, and having an automatic valve mechanism placed within the boiler and operated by a float which is raised and lowered by the rise and fall of water within said boiler, as set forth.

2. The combination, with a boiler containing water, of a subsidiary reservoir, a connecting-pipe, an automatic valve in said pipe actuated by a valve closing and opening device, B, placed within the boiler and actuated by a weight or float, D, which is raised and lowered by the water in said boiler, and a delivery-pipe, substantially as described.

3. The combination, with a boiler containing water, and provided with a valve closing and opening device operated by the rise and fall of the water in said boiler, of a subsidiary tank, an intermediate tank, and piping connecting the two and leading from the intermediate tank to a well or other water-supply, whereby cold water may be drawn to the intermediate tank and thence driven to the desired point, substantially as set forth.

4. The combination, with the boiler, of a subsidiary tank, a pipe, a valve, and a valve-tripper consisting of a pivoted cylinder and a ball rolling therein, the action of said cylinder being controlled by a float rising and falling on a spindle attached to one end, substantially as and for the purpose set forth.

5. The combination of boiler A, outlet-pipe *a*, drum B′, connecting-pipe *a′*, valve *g*, and valve-opening tube B, substantially as shown and described.

6. The combination of the boiler A, drums B′ D′, piping *a′ b′ e′*, and an outlet-pipe leading from bottom to drum D′, substantially as shown and described.

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

ISAAC C. RICHARDSON.

Witnesses:

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WM. H. SAUNDERS.