2 Sheets—Sheet 1.

A. H. KNAPP.

Pneumatic Pressure Water-Elevator.

No. 220,293. Patented Oct. 7, 1879.

Fig. 1.

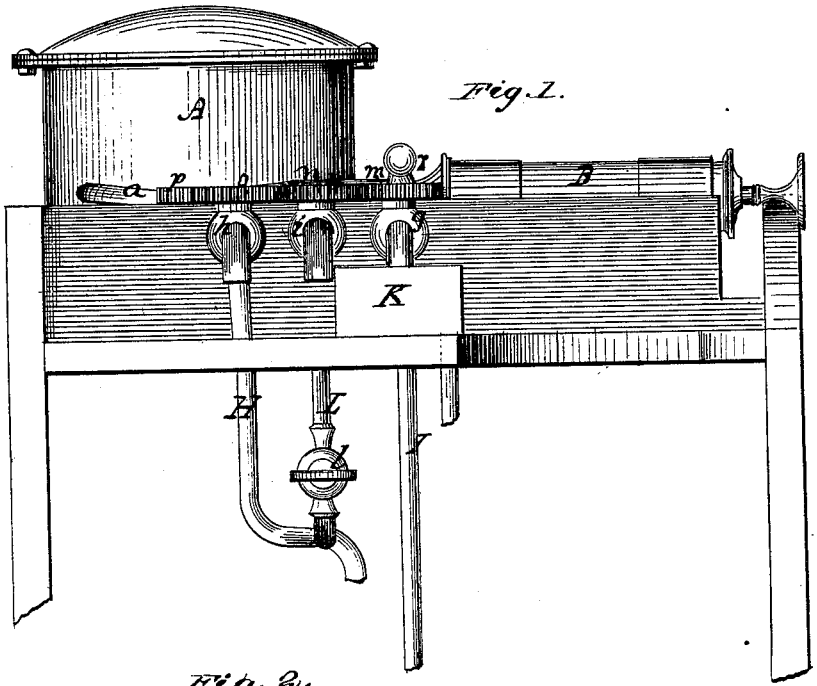
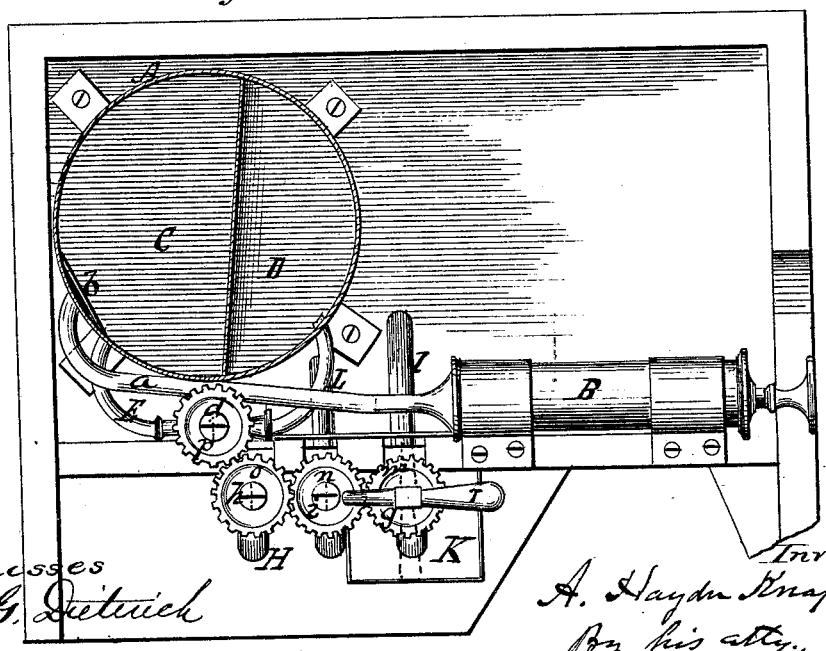


Fig. 2.



Witnesses
Ed. G. Dieterich
George Binkenburg

Inventor
A. Hayden Knapp,
By his atty.
J. S. Brown.

2 Sheets—Sheet 2.

A. H. KNAPP.

Pneumatic Pressure Water-Elevator.

No. 220,293. Patented Oct. 7, 1879.

Fig. 3.

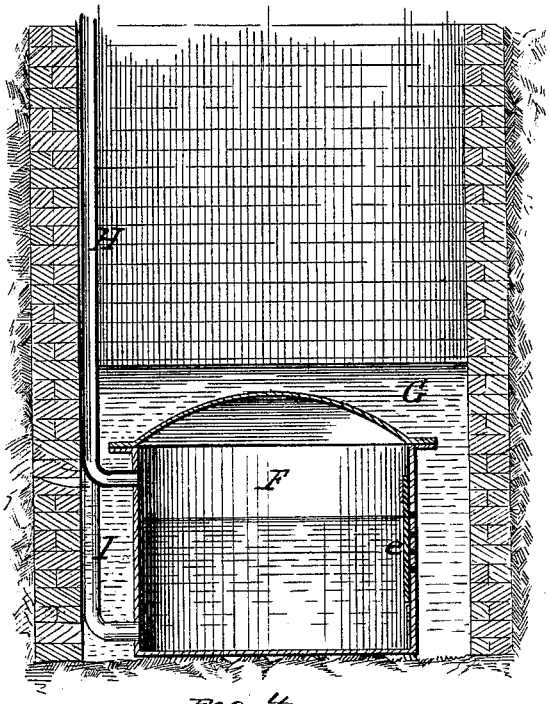
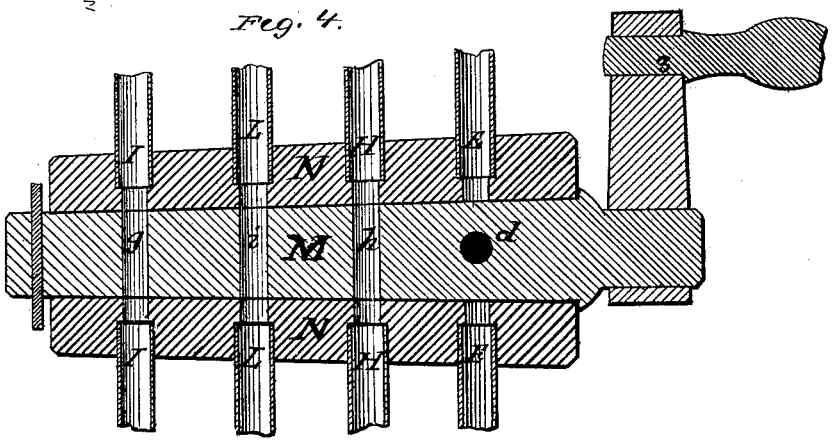


Fig. 4.



Witnesses
Ad. G. Dietterich
George. Binkenburg

Inventor,
A. Haydn Knapp.
By his atty.
J. S. Brown

UNITED STATES PATENT OFFICE.

A. HAYDN KNAPP, (F. LOUISA KNAPP, ADMINISTRATRIX,) OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN PNEUMATIC-PRESSURE WATER-ELEVATORS.

Specification forming part of Letters Patent No. **220,293**, dated October 7, 1879; application filed August 27, 1878.

To all whom it may concern:

Be it known that I, A. HAYDN KNAPP, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and Improved Pneumatic-Pressure Water-Elevator; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making part of this specification—

Figure 1 being a front view of the upper or water-drawing part of the apparatus, showing also an air-condenser and a compressed-air reservoir for producing the pneumatic pressure; Fig. 2, a top view of the same, the air-reservoir being in horizontal section; Fig. 3, a central vertical section of the lower part of a well or cistern and side elevation of the water-pressure fountain or reservoir situated therein; Fig. 4, a section showing a modified construction of the valve-operating device.

Like letters designate corresponding parts in all of the figures.

The purpose of my invention is to produce an apparatus for automatically raising water from a well or cistern by the employment of air or equivalent aeriform fluid previously compressed in a suitable reservoir, the said compressed air acting upon the surface of a limited quantity of water confined in a close reservoir or fountain in the well or cistern to elevate the water to the place of drawing, and also to so arrange this pneumatic-pressure water-elevating apparatus that whenever desired the water may be all raised fresh and cool from the well or cistern at the time.

For the compressed-air reservoir I employ a close vessel, A, of any suitable form and construction, of sheet-iron or other proper material, of sufficient strength to withstand the required pressure therein. Its size is to be sufficient for raising the quantity of water to be used, so that it shall not require to be refilled with air inconveniently often—say not oftener than once a day, or for a longer time, if preferred. It is to be located in any convenient position, considering both the filling of it with air and its proper proximity to the well or cistern, as well as the room it is to occupy.

For compressing air in this reservoir, a condensing air-pump, B, or its equivalent, is used. I have shown a hand-condenser of the simplest construction, connected by a pipe or passage, *a*, with the reservoir, there being a check-valve, *b*, in the reservoir, to provide against leakage thereby.

If it is desired to use wind or other power for pumping the air into the air-reservoir, I contemplate having the condensing-pump connected with the wind-wheel or shaft or other driving part of the power, whatever it may be, by a suitable crank and connecting-rod, or their equivalent; and it is best then to have the pump also arranged to operate by hand, or to have a separate hand-pump, if at any time the wind or other power should fail.

For the practical uses of this invention I find it generally best to provide this compressed-air reservoir with two compartments, C and D, each entirely close and distinct from the other, but having an intercommunicating pipe or passage, E, controlled by a valve or stop-cock, *d*. The main compartment C first receives the air pumped into the reservoir, and is ordinarily to be much the larger in size to contain the principal supply of air in store. The smaller compartment D is supplied from the compartment C through the said pipe E, and itself directly supplies the water-reservoir in the well or cistern.

The water-reservoir or fountain F is located in the well or cistern G, and is so situated therein as to be nearly or quite immersed in the water thereof. It is closed air-tight, but has an opening covered by an inwardly-opening valve, *e*, which, when there is no pressure of air inside, allows the water around the reservoir to flow therein, and shuts against the escape of water therefrom. The upper part of this reservoir communicates, by a pipe, H, with the compartment D of the air-reservoir, and its lower part communicates, by a discharge-pipe, I, with the water-drawing faucet *g* at the sink K or place of drawing the water.

The compressed air from the compartment D of the air-reservoir passes through the pipe H, and produces a sufficient pressure on the surface of the water in the water-reservoir to force the water therefrom up through the pipe I when the faucet *g* is opened.

For properly controlling the flow of the air and water in the apparatus, not only is a peculiar arrangement of stop-cocks and faucets provided, but an air-escape pipe, L, is employed, communicating with the air-conveying pipe H near the sink or water-drawing place, as shown in the drawings; or it may communicate directly with the water-reservoir F, though this is somewhat more expensive in construction. This surplus-air discharge-pipe is provided with a stop-cock or closing-valve, *i*, and the air-conveying pipe H is also provided with a stop-cock or closing-valve, *h*. These two valves and the valve *d*, which closes the pipe E, connecting the two compartments C D of the air-reservoir, together with the water-drawing faucet *g*, are connected together, so as to be turned simultaneously, the valves *g h i* being required to be opened and closed all at the same time, and the valve *d* to be closed when the other three are opened, and vice versa. This arrangement produces the following effects: Upon opening the faucet *g* to draw water the valve *d* is closed, thus shutting off the main compartment C and retaining therein the greater part of the compressed air, while the air in the compartment D is allowed to flow freely to the water-reservoir, the valve in the pipe H being then open, and the pressure of this air on the water raises it through the pipe I, to be discharged at the said faucet *g*. The capacity of the compartment D, with the ordinary compression of the air therein, is sufficient to raise as much water—for instance, two gallons—as ordinarily may be wanted at one time. If more is wanted at any time, the faucet *g* is simply closed, and by the same act the valve *d* is opened, thus allowing another supply of compressed air to flow from the compartment C to the compartment D, when, on again opening the faucet *g*, more water will be raised and discharged; and this may be repeated as many times as desired. But if only a small quantity of water is required at one time, and it is desired that the water-discharge pipe shall be emptied and the water all remain fresh and cool in the water-reservoir or cistern, and especially when the water-reservoir is to be replenished from the cistern, then the extra or air-discharge pipe is brought into action. Not only is this pipe provided with the valve *i*, opening and closing with the valve *h* and faucet *g*, but it has another stop-cock or valve, *l*, to be operated by hand, as the case may require. Thus, if no air is to be let off, and the full amount of water is to be drawn at any time that the air will raise, this separate valve is to be kept closed; but if only a small quantity of water is desired, and the water in the pipe is to be allowed to run back into the water-reservoir, the said separate valve is to be opened after the required quantity of water is drawn and while the faucet is still open. The air in the water-reservoir compartment D and intermediate air-pipes in excess of the atmospheric pressure outside will escape through the said extra pipe, and also enough to allow room for the water returning from the water-discharge pipe, and for refilling the water-reservoir from the well or cistern, if the valve *l* is left open long enough. This valve is then to be closed.

In order to operate the valves *d g h i* simultaneously, I have represented in the main figures of the drawings a set of connecting-gear, *m n o p*, on the respective shafts or plugs thereof, so that on turning the faucet-valve *g* by its handle or stem *r*, all will be actuated at the same time therewith. The positions of the several valves are here such as to allow this connecting-gear.

In the modification shown in Fig. 4 a somewhat cheaper and more compact construction is shown, effecting the same result. A single plug or barrel, M, turns in a case or shell, N. This plug has four valve-holes, *d g h i*, the three latter all in the same direction, so as to open and close all at the same time, and the other one, *d*, being at right angles thereto, so as to open when the others close, and vice versa, the plug being turned by a handle, *s*. The shell N has openings on opposite sides communicating with the openings in the plug, and at these openings the several pipes E H I L are coupled to the shell.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a pneumatic-pressure water-raising apparatus, the combination of a compressed-air reservoir, a close water-reservoir receiving the air-pressure on the surface of the water therein, a cut-off valve in the pipe or passage between the two reservoirs, a cut-off valve in the air-escape pipe or passage leading from the water-reservoir, and a faucet at the termination of the water-discharge pipe or passage, the said faucet and cut-off valves being operated simultaneously on opening and closing the faucet, substantially as herein specified.

2. In a pneumatic-pressure water-raising apparatus, a pneumatic-pressure reservoir constructed with two compartments, one first receiving and holding the air or other aeriform fluid, and the other supplying the air direct to the water-reservoir, the two compartments being connected by a pipe or passage controlled by a valve which shuts off the first compartment when the second is supplying air to the water-reservoir, substantially as and for the purpose herein specified.

3. In a pneumatic-pressure water-elevating apparatus, an air-escape pipe or passage, L, provided with two valves, *i* and *l*, one operated simultaneously with the faucet and the other separately, substantially as and for the purpose herein specified.

4. In a pneumatic-pressure water-raising apparatus, an air-discharge pipe or passage, L, provided with a valve, *i*, operating simultaneously with the water-discharging faucet *g* and valve *h* of the air-supplying pipe H, substantially as and for the purpose herein specified.

5. In a pneumatic-pressure water-raising ap-

paratus, a series of valves or stop-cocks, *d g h i*, opening and closing the several air and water pipes or passages E H I L, arranged to be operated simultaneously, substantially as and for the purpose herein specified.

6. In a pneumatic-pressure water-raising apparatus, the combination of a compressed-air reservoir, a water-reservoir receiving the compressed air, a connecting pipe or passage, a water-elevating pipe or passage, and stop-valves in the said pipes or passages, substantially as and for the purpose herein specified.

Specification signed by me this 8th day of August, 1878.

A. H. KNAPP.

Witnesses:
F. M. KILBEY,
H. W. KITTREDGE.