No. 644,711. Patented Mar. 6, 1900.

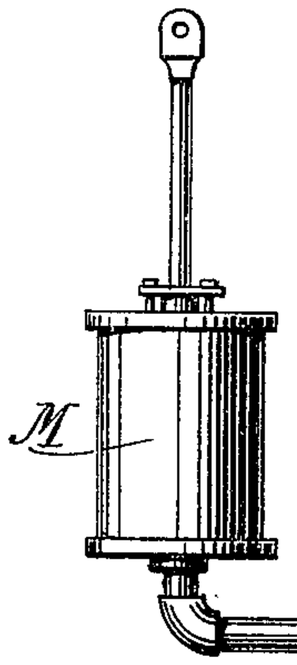
F. E. KINSMAN.

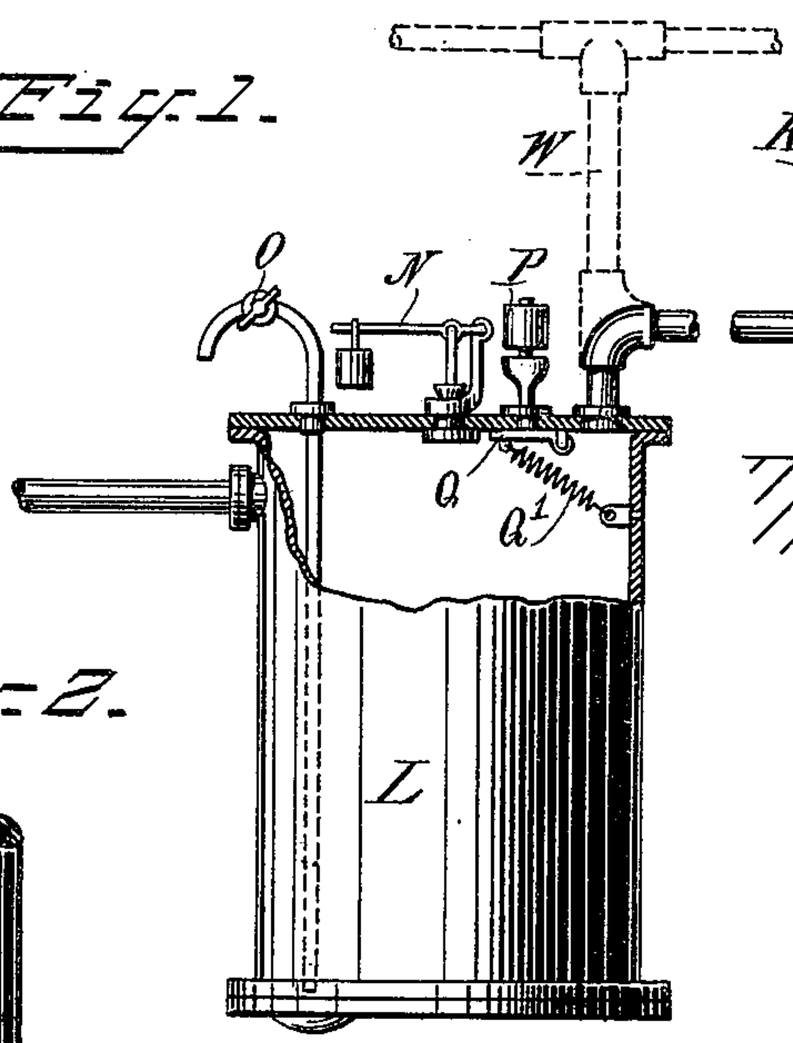
PNEUMATIC WATER SUPPLY SYSTEM.

(Application filed June 17, 1895.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.





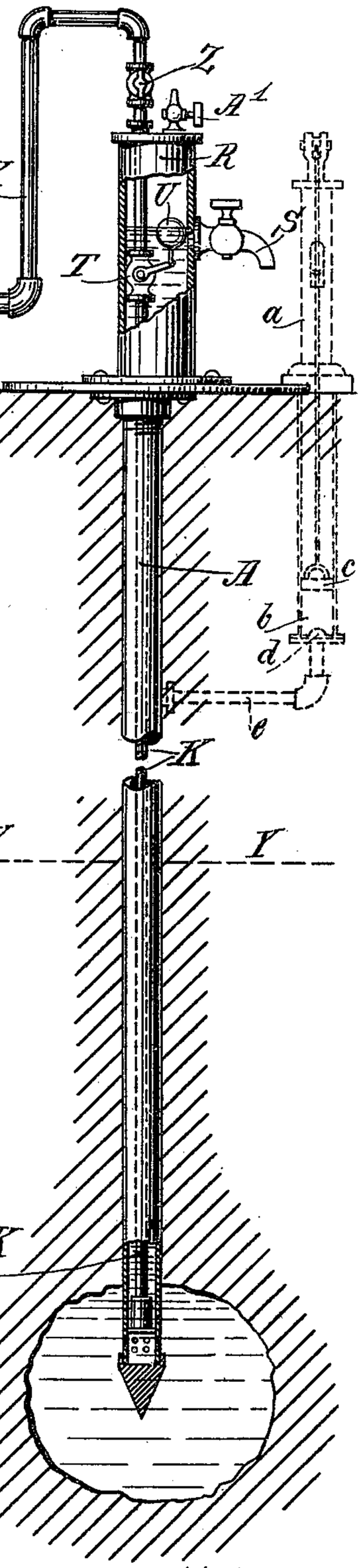


Fig. 2.

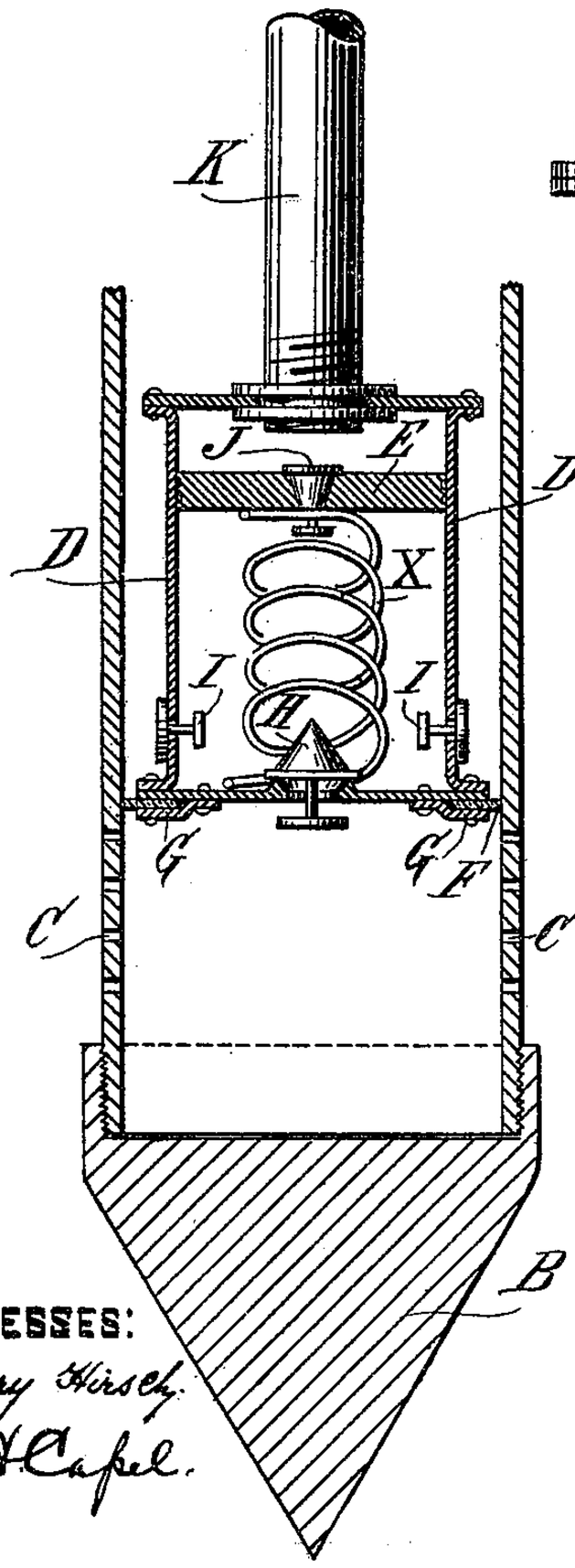
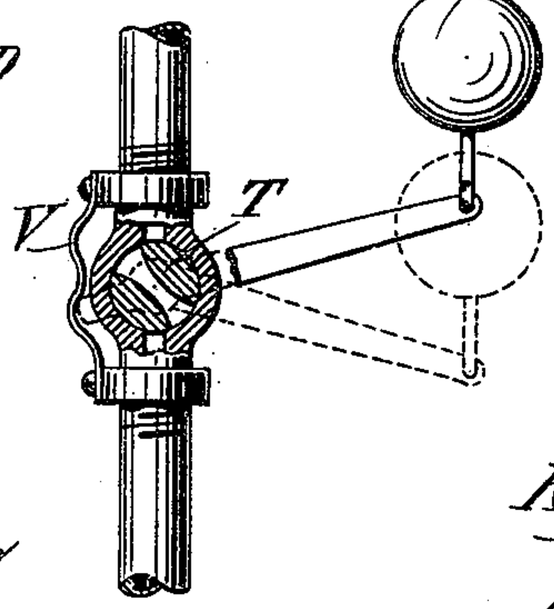


Fig. 3.



WITNESSES:
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Fig. 5.

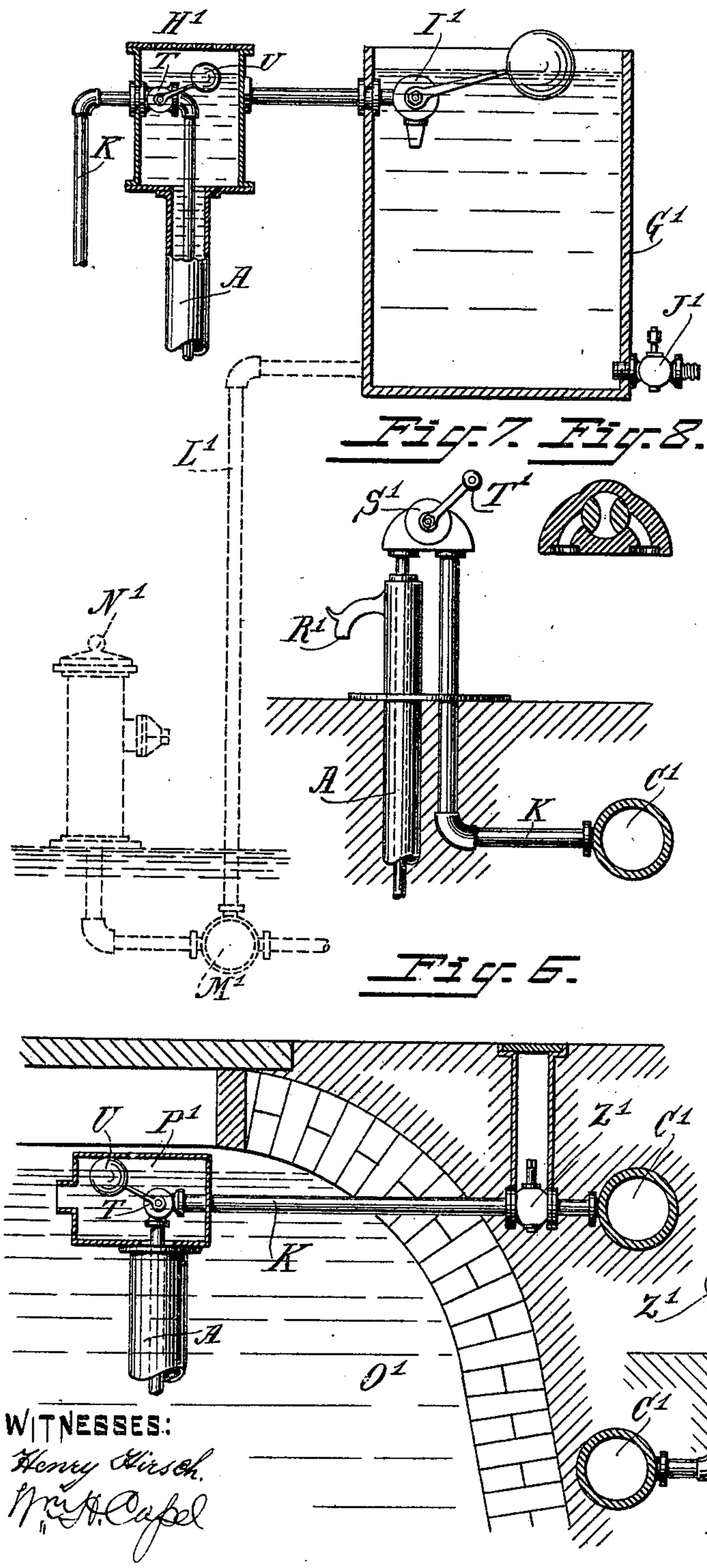

Fig. 4.

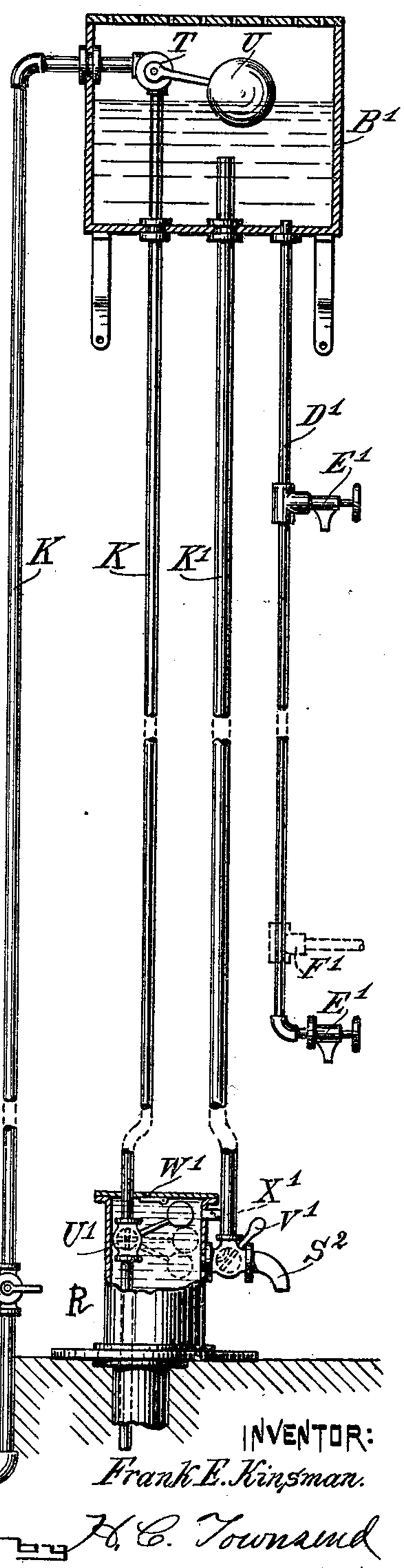

Fig. 7. Fig. 8.

Fig. 6.

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UNITED STATES PATENT OFFICE.

FRANK E. KINSMAN, OF PLAINFIELD, NEW JERSEY.

PNEUMATIC WATER-SUPPLY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 644,711, dated March 6, 1900.

Application filed June 17, 1895. Serial No. 553,073. (No model.)

To all whom it may concern:

Be it known that I, FRANK E. KINSMAN, a citizen of the United States, and a resident of Plainfield, in the county of Union and State of New Jersey, have invented a certain new and useful Pneumatic Water-Supply System, of which the following is a specification.

This invention relates to a pneumatic water-supply system, and is especially adapted for use in private houses, country seats, and villages, and, in fact, in all places where "waterworks," as they are generally known and constructed, are too expensive because of the small number of inhabitants or the distance of a suitable source of supply or because the water to be obtained from wells is below the level practical for the operation of suction-pumps.

With my invention the water from driven, bored, or dug wells of any depth may be readily raised and supplied to one or more houses.

In carrying out my invention I use air under pressure, preferably from a reservoir in which it has been previously stored by compression, and so construct and arrange the apparatus that water may be supplied to any part of a house, to fire wells or cisterns, and to hydrants.

When installing my system in a village or town or when supplying a group of dwellings, the air-compressing plant may be located at any convenient place and air stored in one or more suitable reservoirs by any convenient power, as a gas-engine or a windmill. The wells from which the water is taken are preferably the private wells of the individual families supplied, though they may be at any convenient location and several families or a whole village supplied from one well or a group of wells at the compressing plant.

In supplying a country house a windmill is generally found the most available source of power; but instead of having to locate it over the well, as at present, and therefore disagreeably near the house, it may be located in any other place and the air compressed thereby conveyed to the well. Also the tank on the windmill-tower may be dispensed with, since with my system it is not needed in supplying the house.

My invention consists in the construction, combination, and arrangement of parts, as hereinafter fully described, and pointed out in the claims.

In the accompanying drawings, forming a part of this specification, Figure 1 represents my invention as applied to a system designed for a single residence. Fig. 2 represents in vertical section a detail of the water-raising portion of the apparatus. Fig. 3 represents in partial section a float-controlled valve in the air-pipe. Fig. 4 represents the manner of supplying water to several floors of a house. Fig. 5 represents a plan of general distribution. Fig. 6 represents a fire well or cistern supplied by my system. Fig. 7 represents a hand-controlled hydrant. Fig. 8 represents a vertical section through the air-valve at said hydrant.

Referring to Figs. 1 to 3, A indicates a pipe or casing forming a part of the distributing system, which may be placed in any sort of well, cistern, or other source of water-supply, but is represented in said figure as constituting the pipe or casing of a driven well. Said pipe is terminated by the usual point, (indicated at B,) above which are perforations for the admission of water, as at C. Within this pipe, below water-level, above the perforations is located a cylinder D, formed in any suitable manner, in which reciprocates a piston E, which piston is provided with any suitable packing at its periphery, preferably a water packing formed in the usual manner by grooves encircling the periphery of the piston. At the lower end of this cylinder a partition is formed by which the perforated portion of the pipe A is cut off from the upper portion thereof. This may be done in various ways; but a convenient form consists of a gasket of leather, rubber, or any suitable material F, secured to the lower end of the cylinder in any convenient manner, as by the ring G, which is bolted or riveted to the bottom of the cylinder. The partition formed in this way allows of the ready insertion and removal of the cylinder from the pipe A. Through the bottom of the cylinder an opening is formed for the admission of water thereto, which opening is controlled by any suitable form of valve, as indicated at H. As a seat for this valve I prefer to use a knife-edge ring or projecting rim arising from the bottom of the cylinder. Such a seat

insures against the lodgment of sand between it and the valve, thereby always providing for an even and firm seating of said valve. This is the inlet-valve of said cylinder. The outlet-valves may be formed and located in any desired manner, but are shown as located in the side wall of the cylinder near the bottom, as at I. In the piston E is a puppet-valve, as J, opening upwardly. All these valves have suitable stops, as cross-bars, on the inner ends of their stems to prevent them from leaving their place. The cylinder D, as will be noticed, is of sufficiently less diameter than the pipe A to provide for the ready passage of water therefrom into said pipe.

The cylinder D and its appurtenances are secured to the lower end of the air-pipe K, which leads from any suitable source for supplying air under pressure—as, for instance, the tank or reservoir L. Air may be stored in this reservoir in any convenient manner, as by operating the air-compressing pump, (indicated at M,) by a windmill, gas-engine, or any such power. The air-reservoir may be provided with a safety-valve, as indicated at N, and a blow-off for the water of condensation, as indicated at O. It may also be provided with a signal to warn the attendant when the pressure of air has dropped below a certain minimum. One convenient form of such signal is a whistle, as indicated at P, the passage to which is closed by a valve Q so long as the pressure is above the minimum. To this valve is attached a spring Q′, which acts to open it when the pressure falls below the fixed minimum.

The discharging means for the water raised or elevated by the mechanism represented in Fig. 1 I have shown consisting of a chamber or pipe R, which forms a prolongation of the pipe A and has inserted therein a suitable cock or faucet S. In that portion of the air-pipe passing through this chamber is located the controlling-valve T, which I prefer to operate automatically, as by means of the float U, connected to the stem thereof. When the stem is elevated into the position shown in full lines, the valve T is closed, the open position being indicated in Fig. 3 by the dotted location of the float. I desire under some conditions also to provide for a quick and instantaneous movement of the float from a closed to an open position, and vice versa. As one of several ways for obtaining this snap action I extend the stem of the valve beyond the center of the plug and provide for its engagement with a curved spring-plate V, located in the path of said extension, as by connecting the ends of said plate to the flanges of the valve-casing.

The tank L may be used as a source of air-supply for more than the well illustrated, and to indicate this I have shown in dotted lines a pipe, as W, extending therefrom and branching in different directions.

The operation of my apparatus just disclosed is as follows: The water is raised in pipe A by allowing a sufficient quantity of air to descend through pipe K into cylinder D to depress the piston E against the action of any suitable spring, as X, and to force the water contained in said cylinder out through the valves I and up said pipe A, the supply of air being cut off when the piston has reached the lower portion of the cylinder, at which time the valve H, which may be provided with any suitable upward projection, as the cone indicated in Fig. 2, engages with the stem of puppet-valve J, thereby opening said valve and allowing the escape of air therethrough and through the valves I until the pressure of the air is counterbalanced by the weight of the water in pipe A, when the spring 4 acts to return the piston and allows the valve H to open and the water from the well to fill the cylinder, the head of the water in the well being indicated, for instance, by the dotted line Y. The cylinder being again filled with water, another supply of air is admitted to the upper side of the piston, when the water within said cylinder will, upon the descent of the piston, be forced up the pipe A.

The intermittent admission of air to pipe K may be effected in various ways. I prefer, however, to effect it automatically, as by the float U above described, which operates as follows: The water having been raised in the pipe A by manually admitting and cutting off the supply of air, as by means of a stop-cock, as indicated at Z, and the float U having risen to the height necessary to close the valve T, the valve Z is left in the open position, and by opening the cock S, which is normally closed, water will flow therefrom by gravity, and as soon as the float has dropped to the dotted position air will be admitted to the cylinder D, when a supply of water will be forced up the pipe A, thereby elevating the float U and cutting off the supply of air. When the water has again dropped sufficiently to allow the valve T to open, the action above described will be repeated, and water will continue to flow from the faucet S so long as it remains open. From this it will be seen that by the mere act of creating or allowing the flow or discharge of water the elevating apparatus is thrown into operation and continues to operate until thrown out of operation by stopping the discharge of water. The float also acts to keep the water up to the necessary level should it descend on account of leakage in the pipe, as it may during long intervals of disuse.

To provide for the escape of the compressed air, which rises through the pipe A at the end of each descent of piston E, should the whole of said air fail to escape through the cock S, I provide an escape-cock, as A′, which, as in the event of forcibly-discharged water by the compressed air, may be normally opened, as indicated, or which may be closed, as occasion may demand.

In supplying the several floors of a house with water by my improved system various plans may be pursued, one of which is in-

dicated in Fig. 4, wherein the water is elevated through an extension K′ of pipe A or chamber R into a tank, as B′, located on the uppermost floor that is to be supplied with water. The air-supply may be had, as indicated, from a main C′ in the street through the pipe K, which extends through the reservoir B′ down into the pipe A, as described in Fig. 1. From this tank a pipe, as D′, may be led and provided with cocks E′ at the different floors, as found necessary. From this pipe also may be led, as shown in dotted lines at F′, a branch to the hot-water boiler or elsewhere. Within the tank B′ is placed the automatic or controlling apparatus, substantially of the same form as shown in Fig. 1. In this instance, however, the float may be elevated by the force of the water issuing from the pipe K′, the float being so arranged that when it drops to a position to open the air-valve it shall rest upon the upper end of said pipe. The tank B′ may thus be kept filled to the desired level. This tank may be of any proportions desired; but whatever its proportions, as soon as the level of the water therein falls to a point such as to open the valve T the supply of water will be automatically started and kept up until the said level is again reached.

I may also use this system in keeping tanks filled for hot-water feeders or for various other purposes, including general distribution. An arrangement well adapted for this purpose is indicated in Fig. 5, wherein is shown a tank G′, which may be elevated to any desired height and placed on a suitable trestle or tower, as found most convenient. A chamber, as H′, corresponding to the chamber R of Fig. 1, will then be mounted at the side of or at any point on a level with the tank G′. Into this chamber the pipe A empties and through it passes the air-pipe K, said pipe being provided with the float-controlled valve T, as before. In the chamber G′ is also placed a float or any similar means for controlling the discharge-cock I′ by the height of the water in said tank. As soon as the water in the tank drops below a certain level the cock I′ will open, thereby lowering the level of the water in chamber H′, when the elevating mechanism will be set into action and will continue in action until the water in tank G′ has reached the desired level. I have shown said tank as provided with a hose-nipple, as indicated at J′, and also with a pipe for general distribution, as indicated in dotted lines at L′, leading to a main M′, from which branches may lead to houses or to hydrants, as indicated at N′.

In some towns it is usual in providing water for fire purposes to have located at convenient points fire wells or cisterns. My system is especially adapted for keeping these wells supplied, and in Fig. 6 I have indicated one way in which it may be done. In said figure, C′ indicates a main for supplying compressed air. From this main, pipe K is led into the cistern O′, then through a chamber P′, and down through a pipe A into any source of water-supply, as a driven well, over which the cistern O′ may be located. Within the chamber P′ is located the automatic air-controlling mechanism above described. In keeping up the level of the water in cistern O′ the operation of the automatic mechanism is the same as that described for Figs. 1 and 5. Suitable cut-offs may be placed in pipes K, as at Z′.

A manual means for producing an intermittent flow of air to the water-distributing pipe is indicated in Figs. 7 and 8. This is probably the cheapest form of private hydrant. It consists of the pipe A, as in Fig. 1, extended above the well-platform and provided with a suitable discharge-spout, as at R′, the air-pipe K, leading from the main C′, entering said pipe A at its upper end and being provided with a plug-cock S′. To the plug of this cock is connected a handle or crank T′. By turning said crank the supply of air will be caused to flow to the cylinder D in an intermittent manner, the speed of rotation of said crank being readily determined by the flow of water from the spout R′. Instead, however, of relying upon personal observation and judgment in the operation of the crank T′ any form of governor may be attached thereto, set to allow said crank to turn at a certain speed.

In the house-supply system shown in Fig. 4 arrangements may also be made for drawing water from the chamber R in the yard, basement, or first floor of the house, as the case may be, without emptying tank B′ or pipe K′. This will enable one to obtain cool water immediately. I may here also mention that the expansion of the compressed air in the cylinder D and its escape through the water in pipe A will materially cool the same and also thoroughly aerate it, thereby greatly improving it for drinking. The construction at chamber R for attaining the end mentioned may be as follows: A double-ported cock, as S^2, leads from said chamber, the parts being shown in dotted lines. From the top of this cock leads the pipe K′. In the normal position of cock S^2 there is free passage from R into K′, and the discharge-passage of the cock is closed. The air-pipe K leads through chamber R, as in Fig. 1, and is provided with a float-controlled valve U′. This valve has two ports at right angles to each other, as indicated in dotted lines, and it and the float are so located with respect to the top of chamber R and the cock S^2 that when said chamber is full of water the float will maintain a clear passage through said valve, so as not to interfere with drawing from the pipe D′. In drawing from cock S^2 it is turned down by means of handle V′, so as to close passage from K′ and open outlet of said cock. Water will then flow from R, air being admitted through the inwardly-opening valve W′. When the level of water in R drops sufficiently to allow the valve U′ to open, air will be admitted to cylinder D and more wa-

ter raised and the elevation of the water continued, as described for Fig. 1, until the cock S^2 is returned to normal position. As the water rises in chamber R as the cock S^2 is closed the confined air may escape into pipe K′ through a by-pass containing a suitable check-valve X′, which prevents the flow of water from K′ into chamber R. It is also advisable in providing against the possibility of a failure of air or a break in the distributing system to combine with the well apparatus described an ordinary lift-pump. Such a combination is indicated in dotted lines in Fig. 1, wherein *a* indicates an ordinary pump; *b*, the valve-chamber thereof; *c*, the plunger-valve; *d*, the check-valve, and *e* the connecting-pipe between the pipe A and the valve-chamber. The lift-pump may be connected to the pipe A at any level or to the chamber in R, in accordance with the style of pump used.

Obviously the air-reservoirs L may be multiplied and connected in series or gangs to the supply-mains in any well-known manner employed in compressed-air systems, and the usual check-valves and cocks may be inserted in the mains and supply-pipes where found convenient.

Many ways may be devised for combining and operating the elements of the compressed-air system and water-supply system other than those set forth, which have been presented simply as means for illustrating the purpose and application of my invention.

What I claim as my invention is—

1. The combination with the source of water-supply, of a distributing-pipe extending below the level of the water, a water-chamber at the upper end of said pipe, an independently-operating cock closing the exit from said chamber, an air-pipe extending into the distributing-pipe for the purpose described, a cock in the air-pipe, a float in the water-chamber controlling the air-cock, and a snap-action device operating on said float and air-valve whereby the air-valve is quickly opened and closed at predetermined levels of the water, as and for the purpose set forth.

2. The combination with the air-cock, of the float controlling the same, a projection extending from the stem of the air-valve, and a curved plate-spring engaged by said projection to give a snap action to the valve, substantially as and for the purpose set forth.

3. In a system of water distribution, the combination with several independent wells or springs of a discharge-pipe leading from each and having a cock standing normally closed, a common source of compressed air, pipes leading air therefrom simultaneously to each of said wells or springs for elevating and discharging the water, and means at each of said wells or springs for automatically controlling the supply of air thereto and producing a flow of water through the discharge-pipe when the cock therein is opened, substantially as set forth.

4. The combination with a well, of a pipe therein, a chamber at the upper end of the pipe, a pipe conveying compressed air passing through said chamber and down into the water-pipe, a valve in said air-pipe, a float in the chamber controlling said valve, an elevated tank through which said air-pipe also passes, a water-pipe connecting said chamber and tank, a float in the tank controlling a cock in the air-pipe, and means for cutting off communication between the chamber and the tank when drawing water from the former, substantially as set forth.

5. In a system of water distribution, the combination with a pipe leading from the source of water-supply, of a pipe leading from a compressed-air reservoir into the water-pipe, a cylinder with a piston connected to the lower end of the air-pipe and sealed in the water-pipe above the inlets thereof, and inlet and outlet valves in said cylinder for the purpose set forth.

6. The combination with the water-pipe extending into a well below the level of the water, a cylinder located and sealed therein above the inlet, inlet and outlet valves at the lower end of said cylinder, a spring-returned piston in said cylinder, and an air-pipe connected to said cylinder for leading air thereto, as and for the purpose set forth.

7. The combination with a source of compressed air, of a number of wells or springs each provided with a discharge-pipe, a cock in each discharge-pipe for controlling the flow of water therefrom, a tank or water-chamber at each well supplied with water from the discharge-pipe, each well having a pipe leading thereto from the source of compressed air, a valve in the air-pipe at the well, and a float in said tank or water-chamber connected to and controlling said valve and itself controlled by the opening and closing of the cock in the discharge-pipe.

Signed at New York, in the county of New York and State of New York, this 14th day of June, A. D. 1895.

FRANK E. KINSMAN.

Witnesses:
WM. H. CAPEL,
HENRY T. HIRSCH.