(No Model.)

H. C. STIFEL.

WATER FILTER.

No. 582,404. Patented May 11, 1897.

Fig. I.

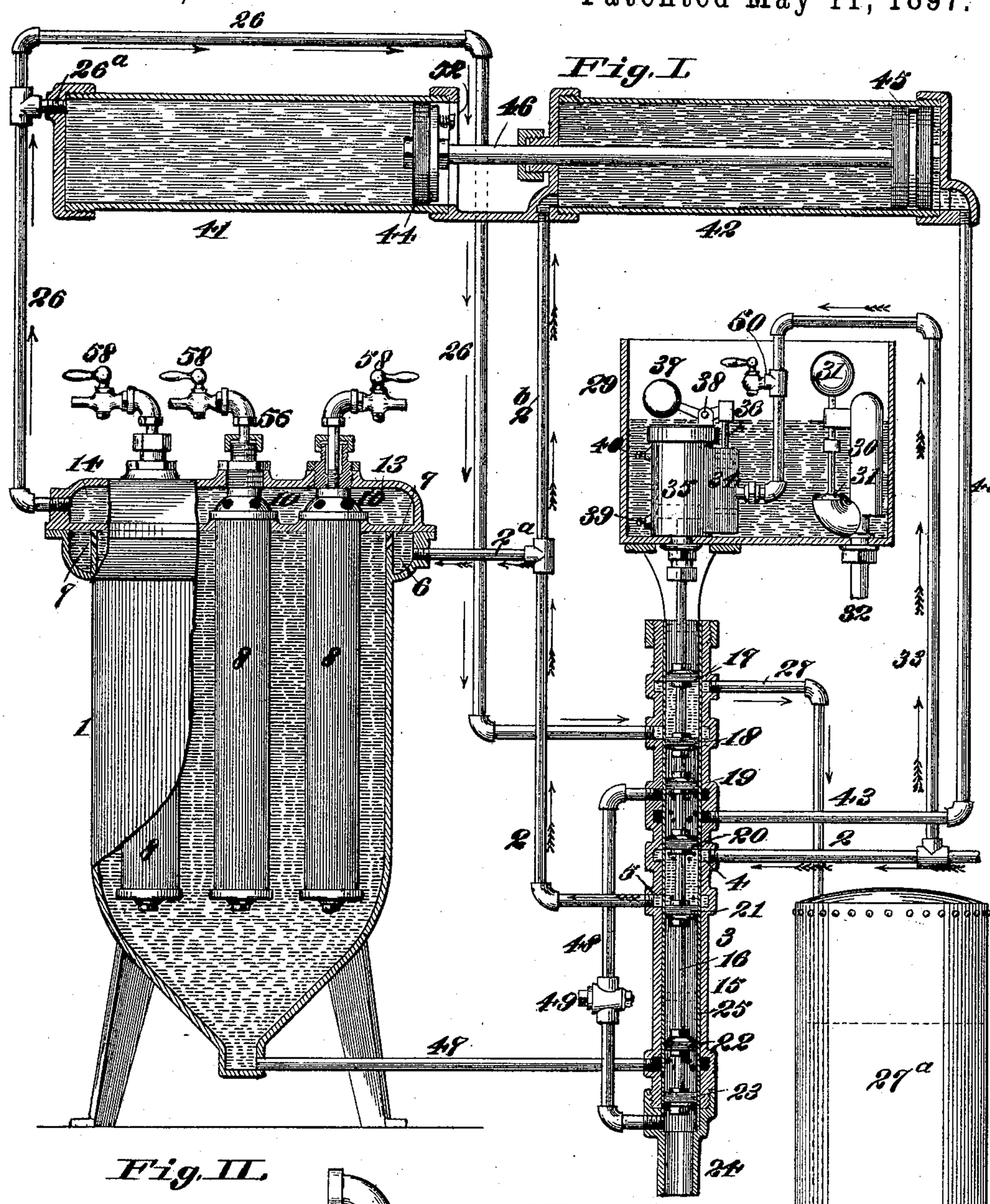

Fig. II.

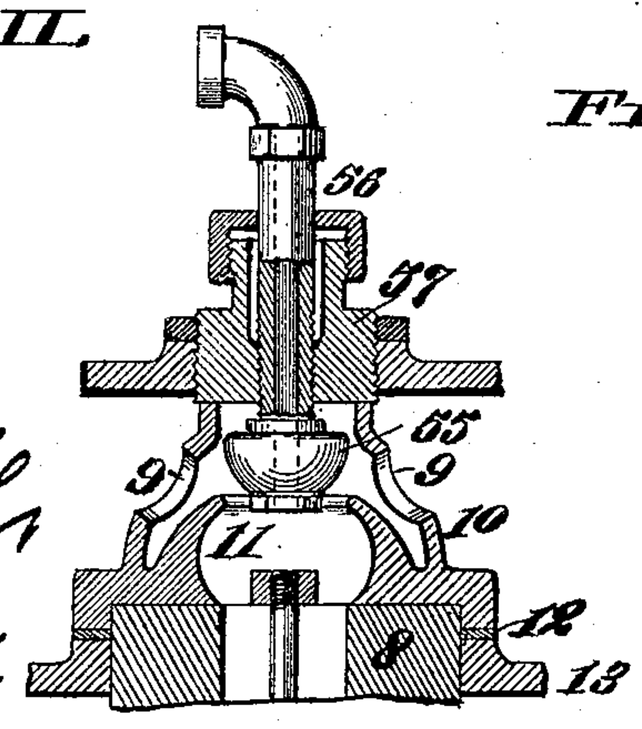

Fig. III.

Attest:
E. C. Knight
H. Finley.

Inventor:
Herman C. Stifel
By Wright Bro
Attys

UNITED STATES PATENT OFFICE.

HERMAN C. STIFEL, OF ST. LOUIS, MISSOURI, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE AMERICAN TRIPOLI COMPANY, OF CARTHAGE, MISSOURI.

WATER-FILTER.

SPECIFICATION forming part of Letters Patent No. 582,404, dated May 11, 1897.

Application filed November 13, 1894. Serial No. 528,691. (No model.)

To all whom it may concern:

Be it known that I, HERMAN C. STIFEL, of the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Water-Filters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

When water is forced into a closed tank or reservoir, so as to confine the air therein and compress it into a smaller space than it would naturally occupy, the immediate effect is to build up an elastic or reacting force by which the water thus stored will be lifted or forced through the distributing-pipes in the house whenever a faucet is opened. Experience has discovered, however, that the water still absorbs a portion of the confined air and carries this absorbed part out through the faucets, thus gradually robbing the reservoir of the element which must be relied on (where the water does not filter as fast as it runs out of the faucet) to furnish elasticity and lifting power. After a week's use it often develops that all of the air has thus been carried off and the reservoir is full of water without a cushion. In this event there is no force to assure delivery in volume. In other words, the chief purpose which the reservoir is designed to serve is defeated, as it will not deliver water at the faucets any faster than the filter would deliver it without a reservoir. In such contingency it becomes necessary to allow all the water to escape from the reservoir, so that the latter may become recharged with air, and then to again build up the pressure. This process is one of wastage and vexation, and hence there is demand for some method to prevent the depletion of the volume of air under compression, which method this invention supplies.

Further objects of my present invention is to provide for the more perfect detection of a broken or faulty stone without having to remove the stones from the filter to examine them, and to provide for the cutting off of one or more of the stones and continue the use of the remainder, and to provide for the concentration of the washing-out force upon one or more of the stones at a time.

My present invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure I is a view of my improved filter, part in vertical section and part in elevation. Fig. II is an enlarged detail vertical section showing the mechanism for shutting off one or more of the stones. Fig. III is an enlarged section of the piston of the clear-water cylinder.

Referring to the drawings, 1 represents a filtering-tank.

2 is a supply-pipe communicating with the filtering-tank through a valve device 3, the water passing from the city main or other supply into the valve device, as shown at 4, and from the valve device, as shown at 5, on through the pipe 2 into the filter, the pipe connecting through means of a branch 2^a with a chamber 6 at the upper end of the filter, the water passing through perforations 7 into the body of the filter outside of the filtering-stones 8. The water percolates through the stones to their hollow interiors and passes upwardly into hollow caps 10, provided with perforation 9 and with valve-seats 11. The lower ends of the caps 10 embrace the upper ends of the stones 8, as shown in Fig. II, and the lower edges of the caps rest upon gaskets 12, placed between the caps and the bottom 13 of a clear-water chamber 14, located over the tank and forming the top of the tank. As the water percolates through the stones it passes out through the perforation 9 in the caps 10 and enters the chamber 14.

The valve device shown (though other forms of valve devices might be employed) consists of a cylinder or tube 15, within which is a rod 16, provided with valves or pistons 17, 18, 19, 20, 21, 22, and 23. The lower end of the pipe or cylinder 15 communicates with a waste-pipe 24. I prefer to place a lining 25 within the cylinder 15 for the valves to work in, this tube being perforated between the valves, as shown in Fig. I, to permit the water to pass from one pipe to another when the valve device is in its respective positions, as hereinafter described.

26 represents a pipe leading from the clear-water chamber 14 to the valve device between the valves 17 and 18 when the apparatus is in filtering position, the water leaving the

valve device through a discharge-pipe 27, which conducts it to a storage-tank 27[a], from which leads a pipe 27[b], that conducts the water to the building.

29 represents a tank within which is a siphon 30, provided with an ordinary float and float-valve 31. The siphon communicates with a pipe 32, leading to the waste-pipe 24 or other point of discharge.

33 represents a pipe leading from the supply-pipe 2 into the valve-chest 34 of a cylinder 35. The valve of the chest 34 is provided with a stem 36, connected to a float 37, the stem of which is pivoted at 38 to the head of the cylinder 35. Within the cylinder is a piston connected to the stem or rod 16. The cylinder 35 is provided with a lower vent 39 and an upper vent 40, leading from the cylinder into the tank 29.

41 represents a clear-water cylinder with which the pipe 26 connects by a branch 26[a], the branch preferably entering the cylinder near its upper part.

42 represents a cylinder connecting at one end with the pipe 2 through means of a branch 2[b], and connecting at the other end through means of a pipe 43 with the chamber in the valve device that is between the valves 19 and 20 when the parts are in filtering position.

44 represents a piston in the cylinder 41, and 45 represents a piston in the cylinder 42. These pistons are connected together by means of a rod 46.

47 represents a pipe connecting the lower end of the filtering-tank 1 with the chamber or space of the valve device that is between the valves 22 and 23 when the parts are in filtering position, and 48 represents a pipe connecting the space between the valves 19 and 20 (when the parts are in filtering position) with the waste-pipe 24 beneath the valve 23. This pipe may be provided with a valve 49, by which the flow of water through the pipe 43 to the waste-pipe may be regulated.

The operation of the device is as follows: The parts being in the position shown at Fig. I, water will pass through the supply-pipe 2 and through the chamber between the valves 20 and 21 of the valve device and through the branch 2[a] of the pipe 2 into the upper end of the filtering-tank and, passing through the stones, enters the chamber 14 and passes through the pipe 26 and through the chamber between the valves 17 and 18 of the valve device into the discharge-pipe 27, which conducts it to the storage-tank 27[a]. A portion of the water passing through the pipe 2 passes through the branch 2[b] and enters the inner end of the cylinder 42, moving the pistons 44 and 45 to the position shown in Fig. I, and a portion of the water passing through the pipe 26 enters the cylinder 41 through the branch 26[a]. The parts remain in this position for a time, and while they do water is filtering and passing through the pipes 26 and 27 to the storage-tank until the latter has received all that it will. While the parts are in this position, water is passing through the pipe 33 and dripping therefrom into the tank 29 through the valve or vent 50. The operation continues until the water in the tank 29 reaches the float 37 and moves the valve in the chest 34, permitting water to pass from the pipe 33 beneath the piston in the cylinder 35. This raises the stem 16 and the valve or pistons connected thereto, moving the valves to the position shown by dotted lines in Fig. I, thus shutting off the pipe 2 from the tank 1 and shutting off the pipe 26 from the pipe 27 and opening a communication between the pipe 2 and the pipe 43 and also opening a communication between the tank 1 and the waste-pipe 24 through the pipe 47. As soon as this occurs the water passing through the pipe 2 and the pipe 43 forces the pistons 45 and 44 back to the other end of their cylinders, which forces the clear water from the cylinder 41 through the branch 26[a] and through the pipe 26 back through the filtering-stones, from where it passes out through the pipe 47 to the waste, and the water in the cylinder 42 passes through the branches 2[b] and 2[a] and out to the waste-pipe through the pipe 47, washing the exterior of the stones. This operation consumes a few seconds, and as soon as the water in the tank 29 rises to the float 31 the siphon 30 is opened and the water wastes from the tank 29 through the pipe 32, and the valve in the chest 34 will be sent back to its original position by the weight of the float 37, and the piston in the cylinder 35 will descend, moving the valves attached to the rod 16 back to their original positions, when the filtering process will resume, the cylinders 41 and 42 filling again with water, as described, and the pistons 44 and 45 moving back to the position shown in Fig. I, and as they thus move back the water escapes from behind the piston 45 through the pipe 43, through the chamber between the valves 19 and 20 of the valve device, and through the pipe 48 to the waste-pipe 24, the flow of this water being regulated at will by means of the valve 49.

As the pistons 44 and 45 move back to their position shown in Fig. I they do so faster than the water enters the cylinder 41, and the result of this is that the cylinder 41 is partially filled with water and partially with air when the piston 44 reaches the limit of its movement, this air entering around the cup-leather 51 of the piston 44 or through an inwardly-opening valve 52, (see Fig. III,) provided for the purpose. When the pistons reach the limit of their movement, the pressure on the inside of the cylinder 41 will close the valve 52 or the cup-leather, (the latter closing by being forced out against the walls of the cylinder,) and the air that has entered is thus prevented from escaping. As the filtering operation proceeds water continues to enter the cylinder 41 through the pipe 26 and branch 26[a], and the air which has entered the cylinder 41 passes out through the pipe 26, through

the chamber between the valves 17 and 18 of the valve device, through the pipe 27, and into the storage-tank, and thus the tank is kept supplied with a quantity of air by the automatic operation of the apparatus each time the filter is cleansed, and the highly advantageous results referred to are attained and the difficulties mentioned are avoided.

By providing the valve 49 the pistons 44 and 45 are permitted to move back faster or slower, as is desired, thereby regulating the amount of air that enters the cylinder 41, as it will be understood that the amount of air that enters the cylinder depends upon the relative speed with which the pistons move as compared with the speed with which the water flows into the cylinder 41.

Considerable difficulty has been experienced in detecting faulty or broken stones in water-filters, owing to the fact that the filtered water from the different stones mixes before it leaves the filtering-tank, and the dirty water of one stone mixes with the clear water of the other stones, and it is difficult, and sometimes impossible, without removing the stones to tell which one is faulty or broken. To overcome this difficulty and to provide for an inspection of each stone separately without removing it from the filtering-tank, I provide the caps 10 with the valve-seats 11, through which the water passes from the filtering-stones, and arrange over each valve-seat a valve 55 on a stem 56, tapped in a plug 57, screwed into the top of the chamber 14. The stem 56 is made hollow, and the valve has a central opening, and on the upper end of the stem is a petcock 58. It will thus be seen that by screwing the stem 56 down the valve 55 will be brought against the seat 11, and all communication between the stone 8 and the chamber 14 will be closed off, and then by opening the petcock 58 the condition of the stone will be readily detected, for if the water is not perfectly clear it will be understood that the stone is faulty, and thus one stone after another can be examined and tested without removing it from the filter. This valve arrangement also provides for the cutting off of one or more of the stones while the filtering operation continues through the other stones, and it also provides for the concentration of the washing-out force upon one or more of the stones, as by closing off part of the stones all of the water, when the cleansing operation occurs, is caused to pass through those stones that are not closed off.

I claim as my invention—

1. In a water-filter, the combination of a filtering-tank, supply and discharge pipes communicating with said filtering-tank, a storage-tank communicating with said filter, and an automatically-operating air-forcing mechanism interposed between the filtering and storage tanks, substantially as and for the purpose set forth.

2. The combination of a water-filter, the storage-tank, the connections for supplying water to the filter and for conducting the filtered water to the tank, a device interposed in the connection between the filter and storage-tank, constructed to develop air-pressure in said tank, a hydrostatic-pressure device controlling the said device for developing air-pressure, a connection between the supply-pipe and said hydrostatic-pressure device for operating the latter, and a valve device controlling the application of the water-supply pressure to the hydrostatic-pressure device substantially as explained.

3. The combination of a filter having flushing-outlet, a storage-tank, pipes for supplying water to the filter and conducting filtered water to the storage-tank, a cylinder interposed in said filtered-water pipe, a piston working in said cylinder and having means for admitting and trapping air in the cylinder, a hydrostatic-pressure piston having connections on opposite sides with the water-supply, and having controlling connection with the air-pressure piston, and a valve device constructed to control the filter-supply pipe, the filter-flushing outlet, the pipes communicating the pressure to opposite sides of the hydrostatic-pressure piston, substantially in the manner and for the purposes herein set forth.

4. In a water-filter, the combination of a filtering-tank, a supply-pipe, a discharge-pipe, a storage-tank, a cylinder provided with a piston having means for admitting air as it recedes, a pipe communicating with the filtering-tank, with said cylinder and with the valve device, and means for moving said piston, substantially as and for the purpose set forth.

5. In a water-filter, the combination of a supply-pipe, a valve device, a filtering-tank, a storage-tank, a discharge-pipe communicating with the valve device, a cylinder 41, a pipe communicating with said cylinder and with the filtering-tank and valve device, a piston in said cylinder provided with a valve 52, a second cylinder having a piston connected to the first-mentioned piston, and pipes forming a communication between the opposite ends of the last-mentioned cylinder and the valve device, substantially as and for the purpose set forth.

6. In a water-filter, the combination of a filtering-tank, a supply-pipe, a discharge-pipe, a storage-tank, a cylinder provided with a piston adapted to admit air to the cylinder as it recedes, and a pipe 26 communicating with the clear-water chamber of the filtering-tank and communicating with said cylinder and said discharge-pipe, and means for moving said piston, substantially as and for the purpose set forth.

7. In a water-filter, the combination of filtering-stones located within a tank, perforated plugs located over the stones and provided with valve-seats, pipes provided with petcocks, and perforated valves secured to said pipes and which are adapted to fit against

said seats; substantially as and for the purpose set forth.

8. In a water-filter, the combination of filtering-stones located within the tank, a clear-water chamber located over the filtering-stones and with which the stones communicate, and valves for closing communication between said stones and chamber, substantially as set forth.

HERMAN C. STIFEL.

In presence of—
GEO. H. KNIGHT,
E. S. KNIGHT.