(No Model.)

2 Sheets—Sheet 1.

H. C. STIFEL.

WATER FILTER.

No. 582,405. Patented May 11, 1897.

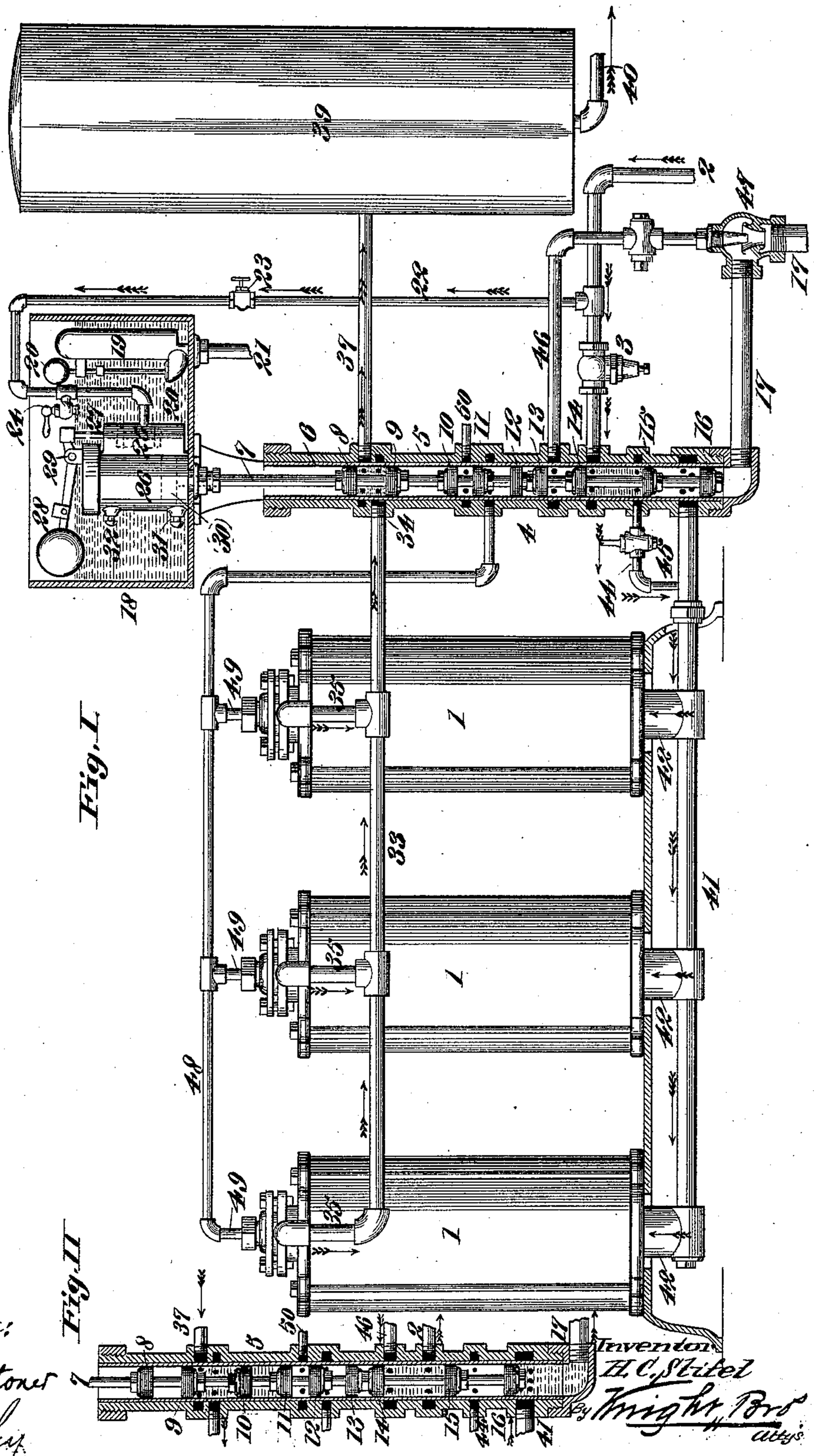

Fig. 1.

Attest:

Stanley Stoner

H. Finley.

Inventor:

H. C. Stifel

By Knight Bros

Attys.

(No Model.) 2 Sheets—Sheet 2.

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Fig. II.

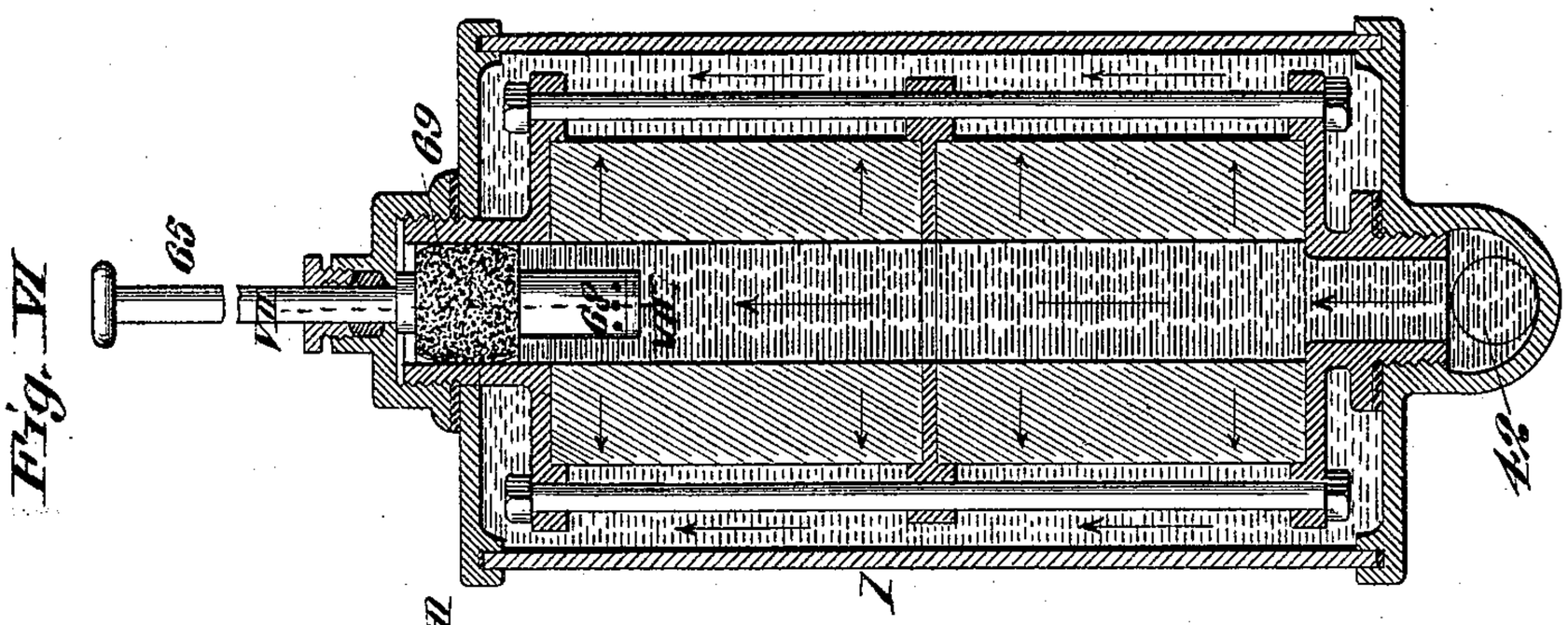


Fig. IV.

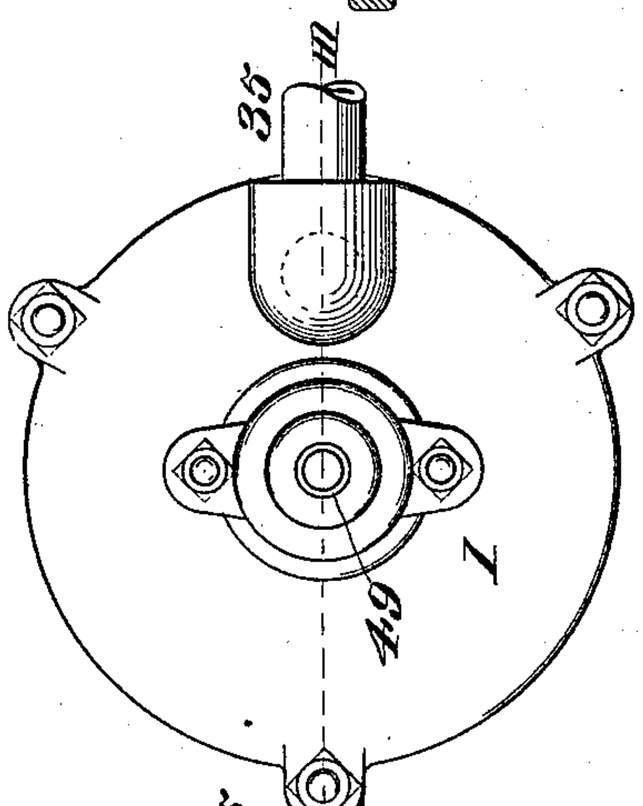


Fig. V.

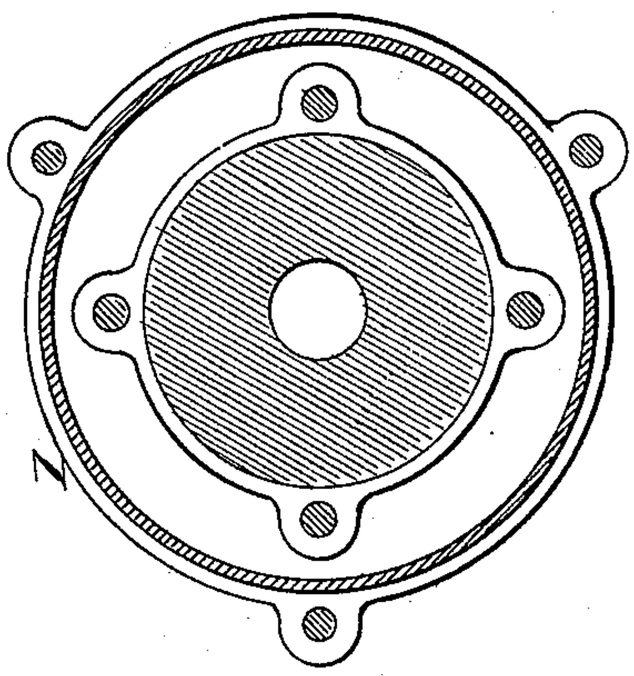


Fig. III.

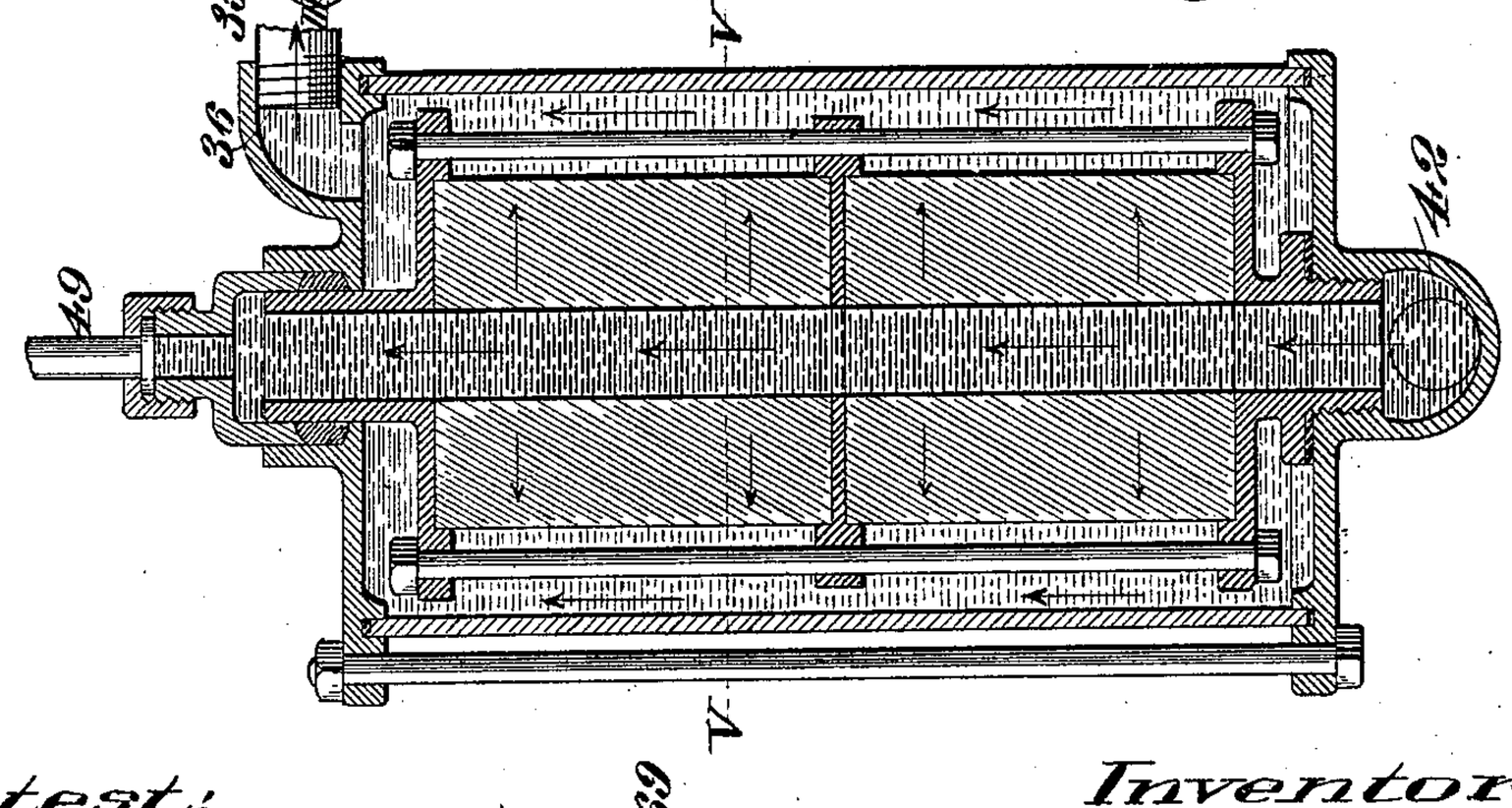
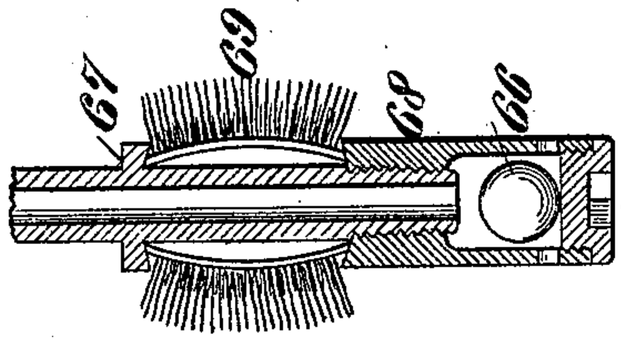


Fig. VII.



Attest:

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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. 582,405, dated May 11, 1897.

Application filed February 8, 1895. Serial No. 537,704. (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.

My present invention relates to an improvement in filters, and with my present construction the arrangement is such that the water filters from the inside of the stones or other filtering-body outwardly, and in washing out or cleaning the filter the clear water passes through the filtering-body in a direction opposite to that taken in filtering—that is, from the outside to the inside of the filtering-body—the result being that the sediment accumulates on comparatively a small amount of surface from which it has to be cleaned.

My present construction further provides for a discharge of the main portion of the sediment and dirty water in advance of the reverse flow of clear water, so that no water stands against the muddy surface of the filtering-body to offer a resistance to the reverse flow when it seeks to remove the mud.

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

Figure I is a side elevation of my improved filter, showing the valve device in section and showing also the force-ejector in section. Fig. II is a sectional view of the valve device, showing the pistons or valves in the opposite position to that shown in Fig. I. Fig. III is an enlarged vertical section of one of the filtering-cylinders. This section is taken on line III III, Fig. IV. Fig. IV is a top view of one of the filtering-cylinders. Fig. V is a transverse section taken on line V V, Fig. III. Fig. VI is a vertical section of the filtering-cylinder provided with a modified means for providing a fresh supply of air, which serves, first, to enable the water to fall quickly from the interior of the tube, which it would not do were there no air to replace it, and, second, to replenish the air-supply in the clear-water reservoir, which is constantly being depleted as water is drawn off for house use. Fig. VII is an enlarged vertical section taken on line VII VII, Fig. VI.

Referring to the drawings, 1 represents the filtering-cylinders. I have shown three, each provided with a single tube; but it is evident that one or more may be used and provided with any desired number of stones.

2 represents the supply-pipe leading from the main or other source. I have shown this pipe provided with a pressure-regulator valve 3.

4 represents a valve device with which the pipe 2 communicates. This valve device in itself forms no part of my present invention and is fully described in several applications heretofore filed by me. Briefly, it consists of a tube or cylinder 5, inclosing a perforated sleeve 6. Within the sleeve is a rod or stem 7, provided with valves or pistons 8, 9, 10, 11, 12, 13, 14, 15, and 16. The lower end of the pipe or cylinder 5 communicates with a waste-water pipe 17. The perforations in the sleeve 6 occur between the valves I have mentioned, as shown in Fig. I, and permit the water to pass from one pipe to another, as hereinafter explained.

18 represents a tank within which is a siphon 19, provided with an ordinary float and valve 20. The siphon communicates with a pipe 21, that may lead to the waste-pipe 17 or to any other place of discharge. 22 represents a pipe leading from the supply-pipe 2 to the tank 18, and this pipe may be provided with an ordinary globe-valve 23, and it is also provided with a drip-valve 24, located within the tank 18. This pipe communicates with the valve-chest 25 of a cylinder 26, located within the tank. The valve of the chest 25 is provided with a stem 27, connected to a float 28, the stem of the float being pivoted at 29 to the head of the cylinder 26. Within the cylinder 26 is a piston 30, connected to the upper end of the rod or stem 7. The cylinder 26 is provided with a lower vent 31 and an upper vent 32, which allow the water to pass from the cylinder 26 into the tank 18.

33 represents a clear-water pipe communicating with the valve device at 34 between the valves 8 and 9 when the latter are in their normal position. This pipe 33 is connected

by branches 35 with the tanks 1, the connection being preferably made at the heads of the tanks, as shown at 36, Fig. III.

37 represents a pipe connecting with the valve device between the valves 8 and 9 (when in their normal position) and which forms a communication between the valve device and a storage-tank 39. This storage-tank may be closed and located at a low elevation or it may be an open tank located at a high elevation. 40 represents a pipe leading from the tank 39 and through which the clear water is drawn for use.

41 represents a pipe communicating with the valve device between the valves 15 and 16 (when in their normal position) and which communicates with the interior of the filtering-tubes through means of branches 42, as shown in Figs. I and III. The pipe 41 also communicates with the valve device between the valves 14 and 15 (when in their normal position) through means of a branch 44, this branch being provided, if desired, with a valve 45. The water to be filtered passes through the pipe 2 to the pipe 41 through the branch 44, and I prefer to make the branch 44 of considerably smaller diameter than the pipe 41 and the pipe 2, so that while a full flow of water is permitted through these pipes 41 and 2 when the filter is being cleaned, yet a comparatively small flow of the water to be filtered is delivered to the filtering-tubes, avoiding danger of breakage and causing the water to be filtered under less pressure than is used for washing. It is evident that the branch 44 may be carried forward to each tube independent of pipe 41, if preferred.

46 represents a pipe communicating with the valve device between the valves 13 and 14 (when in their normal position) and connecting with a force-jet 47, located in the waste-pipe 17. (See Fig. I.)

48 represents an air-pipe communicating with the interior of the tubes through branches 49 (see Figs. I and III) and which connects with the valve device between the valves 11 and 12 when in their normal position.

50 represents a pipe connecting with the valve device between the valves 10 and 11 (when in their normal position) and air enters the pipe 48 through the pipe 50 when the valve device is raised.

The operation is as follows: When the parts are in the position shown in Fig. I, water passes through the pipe 2, through the branch 44, and through the pipe 41 into the interior of the filtering-tubes, and, percolating through the tubes in an outwardly direction, leaving its sediment on the interior surfaces of the tubes, passes through the branches 35, through the pipe 33, through the valve device between the valves 8 and 9, and through the pipe 37 to the storage-tank 39. Water at the same time is dripping from the petcock 24 into the tank 18, and when the water in the tank reaches the float 28 it moves the valve in the chest 25, permitting water to pass from the pipe 22 beneath the piston in the cylinder 26. This raises the stem 7 of the valve device, carrying the valves on the stem in an upwardly direction to the position shown in Fig. II. As the valve-stem moves upwardly the valve 15 shuts off the supply of water through the pipe 2 and the valve 16 opens a communication between the pipe 41 and the waste-pipe 17, and at the same time the valve 11 opens a communication between the pipes 50 and 48, permitting a passage of air to the filtering-tubes, and the valve 9 closes the communication between the pipe 37 and the pipe 33. The water is now passing by gravity out of the filtering-tubes through the pipe 41 and the drain-pipe 17, its place being taken by air furnished through the pipe 48. A continued upward movement of the stem causes the valve 14 to open a communication between the pipe 2 and the pipe 46 and causes the valve 9 to open a communication between the pipe 37 and the pipe 33, the air-pipe 48 now being closed by the valve 12. Water will now pass through the pipe 2 and the pipe 46 through the ejector 47, and will also pass from the storage-tank through the pipe 37 and pipe 33, causing a reverse flow of clear water through the filtering-tubes, which is carried off by the pipe 41 to the waste-pipe. The parts will remain in this position until the water in the tank 18 reaches the float 20 and the siphon 19, when the siphon will be opened and the water will waste from the tank 18 through the pipe 21, and the float 28 will shift the valve in the chest 25 again back to its original position, and water being now admitted above the piston 30 the valve device will be forced back to its original normal position. As it passes back a communication is again opened momentarily between the pipe 50 and the pipe 48, which causes the filtering-tube to be charged with a fresh supply of air, and when the valve device reaches its normal position this communication with the air is again closed and the confined air is forced by the water, when the filtering operation resumes, into the storage-tank, the storage-tank thus being kept supplied with air. When the valve device reaches its normal position again, the filtering operation resumes as described.

Instead of using the air-pipes connecting with the valve device I may employ a short air-pipe 65, projecting through the head of each tank 1, (see Fig. VI,) and locate on the inner end of each pipe a ball or other suitable form of valve 66, (see Fig. VII,) the ball dropping from its seat and permitting an influx of air during the cleaning process and closing the air-pipe when the filtering process is resumed. This arrangement of the air-pipe also provides for the use of a brush 69 to clean the interior of the tubes, if such is needed. The brush I have shown in the form of a cylinder and secured between a flange 67 on the pipe 65 and the housing 68 of the valve 66. By forcing

the pipe 65 up and down the brush is caused to rub along the interior surface of the tubes.

By providing for the opening of a communication between the pipe 41 and the waste-pipe 17, and between the pipe 50 and the air-pipe 48 in advance of opening a communication between the pipe 37 and the pipe 33 I secure a discharge of the main body of the sediment and dirty water within the tubes before or in advance of the clear water passing in a reverse direction through the tubes to clean them. This provides for a more effectual and thorough cleaning of the stones with a less amount of clear water than would otherwise be necessary.

Experience shows that as much water can be filtered from the inside to the outside of a tube as from the outside to the in. Hence neither way has any advantage so far as quantity is concerned. Filtering from in to out the mud is deposited over a smaller surface, which tends to a quicker clogging of the tubes, and this fact has led me in the past to filter from out to in, thus depositing the mud over a larger surface and keeping the stones open longer; but I have come to regard the process as not the most advantageous. The most important feature in the construction of any filter, after that of clarifying the water, is the cleaning process, and the most effective cleaning process is that which will concentrate the largest amount of force and of water in a reverse movement against the surface on which the mud is deposited. On all filters in which tubes are now used the cleaning power applicable through the smaller or inside surface, as well as the smaller amount of cleansing-water deliverable to such surface, are dissipated by radiation to the much larger exterior surface, and hence their effectiveness for removing sediment is diminished by from fifty to eighty per cent. By reversing the construction I concentrate both force and volume of water, thus increasing the effectiveness at the point of application in the same ratio as the other process decreases it.

The filtration of water does not need the application of any considerable force. Light pressure and slow flow do the best work. The cleansing does need force. Strong pressure and copious flow do the best work. Hence it is reasonable that, in the case of a tube, filtration should take place from in to out, since the resistance offered by a given area is reduced by that course, and that cleansing should take place from out to in, since the pressure on a given interior surface is increased by that course.

Experience has also shown that when water is forced back through a tube and it finds a body of water standing against the surface of the tube on the other side, even though not under pressure, the mud which it is designed to remove is very reluctant to go. This mud has a specific gravity little greater than water. If it were exactly the same, it would not sink at all, but would remain in suspension right where it was pushed away from the pores of the stone, and part of it would not leave the stone at all, but would partially adhere, only to be forced back into the pores the moment filtration was resumed; but if all of the water is removed from the muddy side of the stone, so as to leave nothing to hold up the mud that is to be forced out of the pores, and then clear water is driven back through the pores, the accumulation drops off of the face of the stone and down into the waste-pipe like so much lead. Hence the importance of the process which removes all water from the support of the muddy deposit before bringing back pressure to dislodge said deposit. As the stone filters are now constructed this process of removing the muddy water every time the automatic device went into operation would not be economical, because the larger part of the large filter tank or shell is given to muddy water, and consequently thirty, forty, or even sixty gallons of water would have to be discharged into the waste-pipe before the reverse wash began. Under my construction this waste is obviated by reason of the fact that the filter contains no muddy water except that carried in the cavity of the tubes. Consequently only a few quarts need to be discharged before the filter is relieved and ready for the backwash.

A further advantage results from the tubes being full of air when the wash has been completed, in this, that when the muddy water is again admitted for filtration it is met by an air-cushion which prevents the pressure from coming too suddenly against the inside of the tubes, and thus affords protection against breakage.

I claim as my invention—

1. In a water-filter, the combination of a filtering-tank, a supply-pipe communicating with said tank, a drain-pipe, an air-pipe communicating with said tank, and a valve device with which said pipes connect, whereby said supply-pipe is cut off from and said air and drain pipes are opened to said filtering-tank, substantially as set forth.

2. In a water-filter, the combination of a filtering-tank, a supply-pipe communicating with said tank, a drain-pipe, an air-pipe communicating with said tank, and an automatic valve device with which said pipes connect, whereby said supply-pipe is cut off from and said air and drain pipes are opened to said filtering-tank, substantially as set forth.

3. In a water-filter, the combination of a filtering-tank, a supply-pipe communicating with said tank, a drain-pipe, an air-pipe communicating with said tank, a clear-water-discharge pipe, a storage-tank, and a valve device with which said pipes connect, whereby when said valve device is moved, the supply-pipe is cut off from, and the air and drain pipes opened to said filtering-tank, and whereby, upon the further movement of said valve device, said air-pipe is cut off from and said

storage-tank opened to said filtering-tank, substantially as set forth.

4. In a water-filter, the combination of a filtering-tank, a supply-pipe communicating with the filtering-tank, a drain-pipe, a clear-water-discharge pipe, a storage-tank with which the clear-water-discharge pipe connects, a valve device with which said pipes communicate, and an air-pipe whereby the supply-pipe may be shut off and the filter opened to said drain-pipe, and air admitted to said filtering-tank in advance of a reverse flow of clear water through the filter, substantially as set forth.

5. In a water-filter, the combination of a filtering-tank, a supply-pipe communicating with said tank, a drain-pipe, a clear-water-discharge pipe communicating with the filtering-tank, a valve device, a force-jet located in said drain-pipe, and a pipe forming a communication between said force-jet and valve device, whereby when the valve device is moved, a communication is opened between said filtering-tank and drain-pipe, and between said supply-pipe and force-jet pipe, substantially as set forth.

6. In a water-filter, the combination of a filtering-tank, a supply-pipe communicating with the filtering-tank, a drain-pipe, a storage-tank, a clear-water-discharge pipe forming a communication between said filtering-tank and storage-tank, a valve device with which said pipes communicate, a force-jet located in said drain-pipe, and a pipe forming a communication between said valve device and the force-jet, substantially as set forth.

7. In a water-filter, the combination of a filtering-tank, a supply-pipe communicating with said filtering-tank, a drain-pipe, a storage-tank, a clear-water-discharge pipe forming a communication between said filtering-tank and the storage-tank, an air-pipe, a valve device with which said pipes communicate, a force-jet located in said drain-pipe, and a pipe forming a communication between said valve device and said force-jet, whereby when the valve device is moved, the supply-pipe is closed off from the filtering-tank, and said drain-pipe and air-pipe opened to the filtering-tank, and whereby a further movement of the valve device closes said air-pipe to the filtering-tank and opens a communication between the storage-tank and the filtering-tank and between the supply-pipe and said force-jet pipe, substantially as set forth.

HERMAN C. STIFEL.

In presence of—
GEO. H. KNIGHT,
N. FINLEY.