(No Model.) 2 Sheets—Sheet 1.

J. MOHRING.

METHOD OF AND MEANS FOR CLEANING FILTERING SURFACES.

No. 591,103. Patented Oct. 5, 1897.

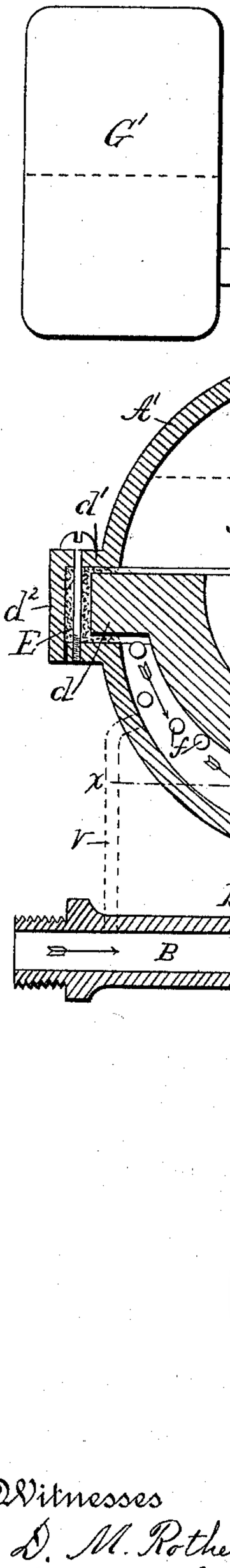

Fig. 1.

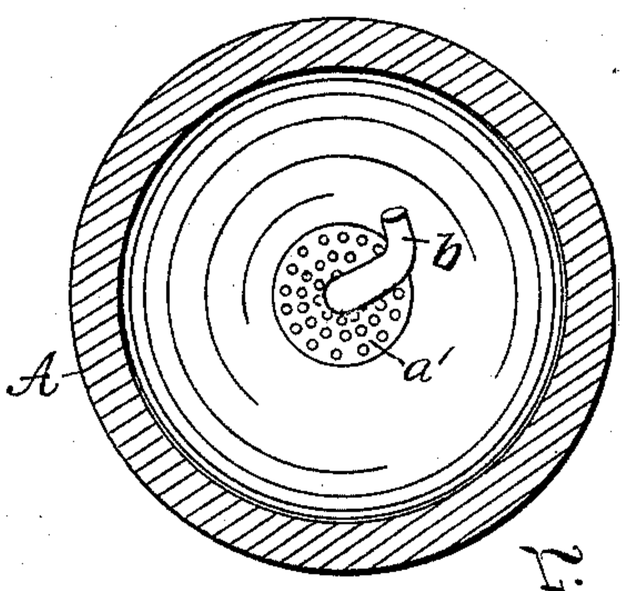

Fig. 3.

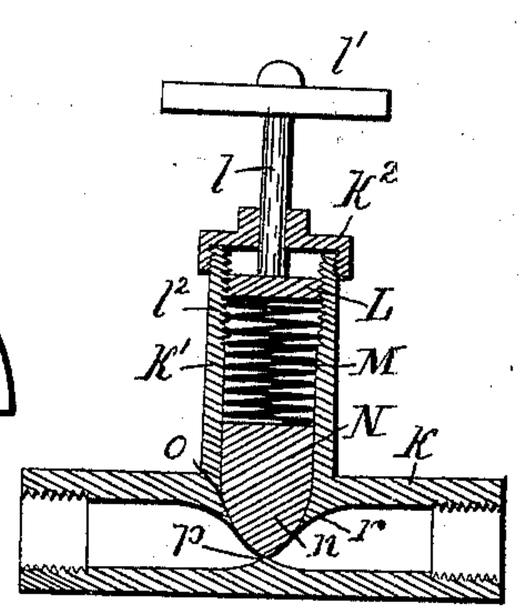

Fig. 8.

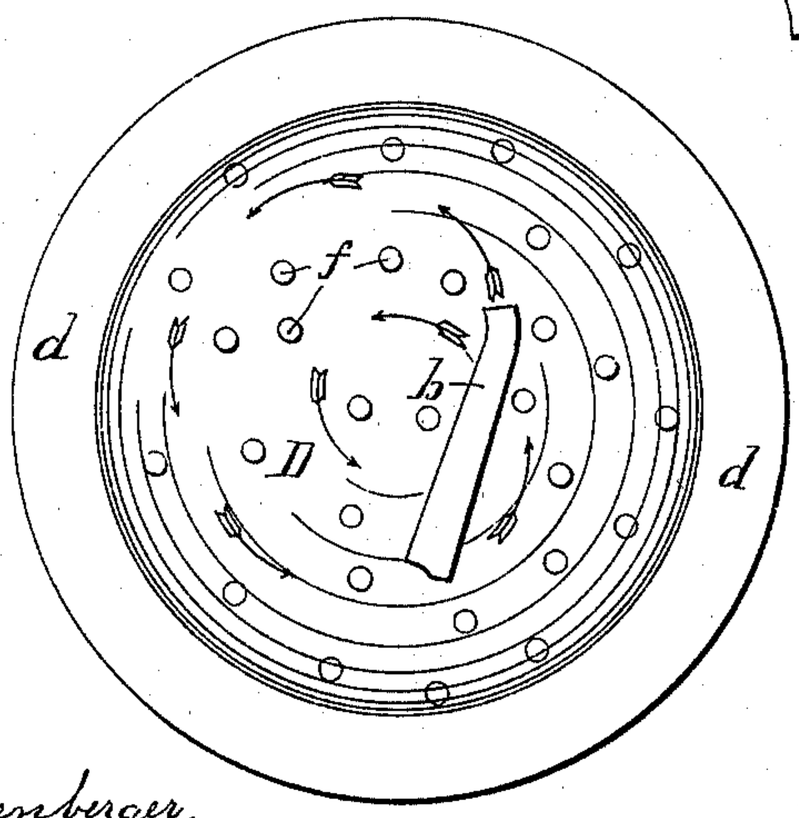

Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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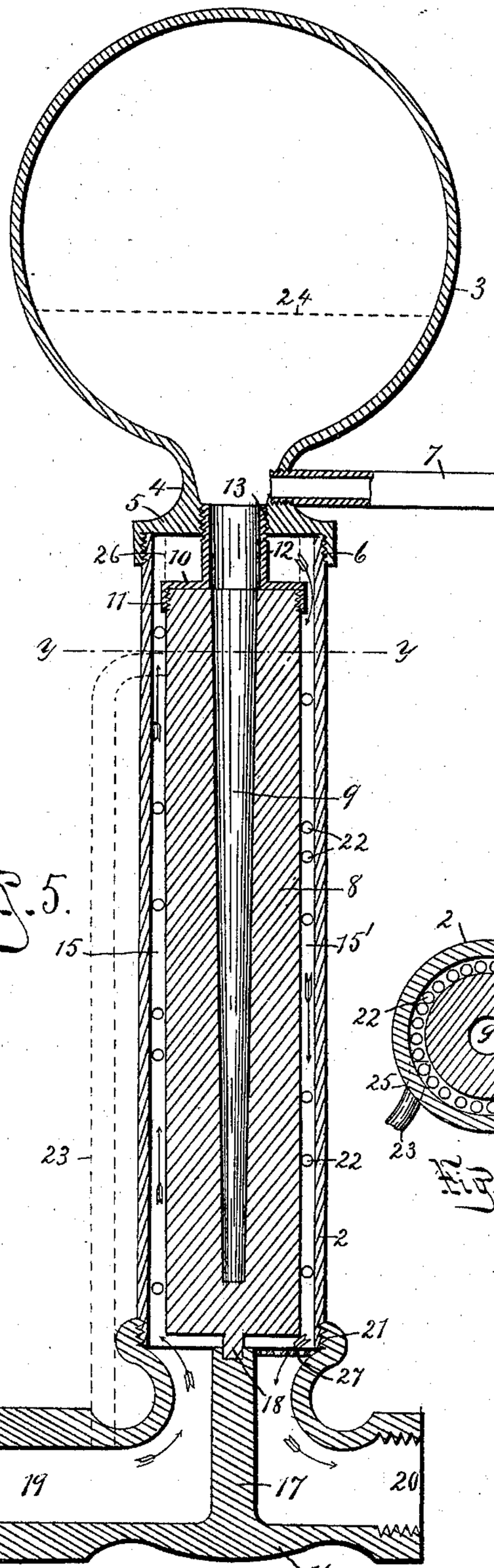

Fig. 5.

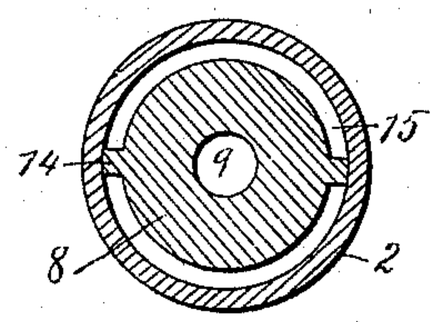

Fig. 6.

Fig. 7.

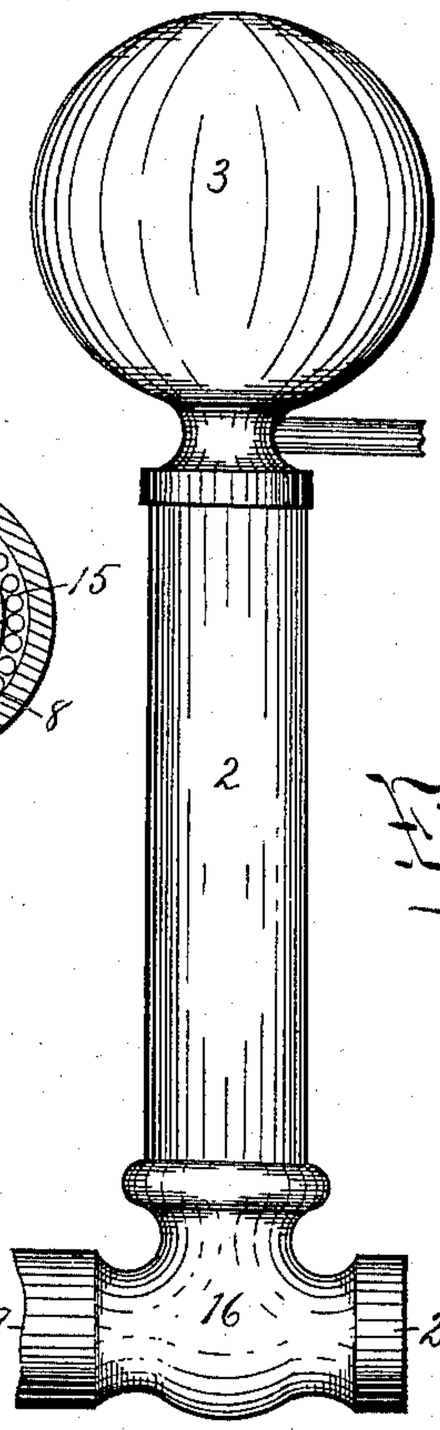

Fig. 4.

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METHOD OF AND MEANS FOR CLEANING FILTERING-SURFACES.

SPECIFICATION forming part of Letters Patent No. 591,103, dated October 5, 1897.

Application filed May 2, 1893. Serial No. 472,661. (No model.)

To all whom it may concern:

Be it known that I, JOHN MOHRING, a citizen of the United States, residing in Lancaster, in the county of Lancaster and State of Pennsylvania, have invented certain Improvements in Methods of and Means for Cleaning Filtering-Surfaces, of which the following is a specification.

This invention relates to improvements in that class of filters in which the filtering medium is cleaned by the pressure of the filtered water on the inside of said medium and by the action of movable cleaners on the outer surface of said filtering medium; and it consists in the method of cleaning the filtering medium and in the construction and combination of the various parts of the mechanism for that purpose, as hereinafter fully described and then pointed out in the claims.

In the accompanying drawings, forming a part of this specification, Figure 1 is a vertical central section of a horizontally-disposed filter embodying my improvements, a reservoir being shown in elevation above said filter. Fig. 2 is a bottom plan view of the filtering medium detached from the case. Fig. 3 is a horizontal section on the broken line $x\ x$, Fig. 1, showing the opening in the lower section of the case. Fig. 4 is a side elevation of a vertically-disposed filter, and Fig. 5 an enlarged vertical central section of the same. Fig. 6 is a horizontal section on broken line $y\ y$, Fig. 5; and Fig. 7, a horizontal section of a modified form of the vertically-disposed filter. Fig. 8 is a vertical section of the regulator-valve located in the pipe connecting the filter-case and the reservoir in Fig. 1, and Fig. 9 a view of a modified form of cleaner.

Similar letters and figures indicate like parts throughout the several views.

Referring to the details of Figs. 1, 2, 3, and 8, A indicates the bottom section of a spherical filter-case, having an annular flange a^2 projecting from its outer edge, and A′ a similar top section provided at its edge with an outwardly-extending annular flange d', having a depending lip d^2, adapted to lap the periphery of flange a^2.

D is a concavo-convex filtering medium having an annular flange d extending outward from the edge thereof. This flange is embraced between the flanges a^2 and d', being surrounded and separated from said flanges and said lip d^2 by suitable packing E. These parts are bound together by screw-bolts e, passing through flanges a^2 and d' and packing E outside of said flange d. The filtering medium is so arranged with reference to bottom section A that it is separated therefrom by a chamber F.

On the bottom of section A is formed a hollow externally-threaded boss a, engaged by a similar internally-threaded boss B′, formed on the feed and escape pipes B and B^2. Between pipes B and B^2 and below the opening in bosses a and B′ is a transverse partition b^4, and into a threaded opening in the wall of pipe B and adjacent to partition b^4 is screwed a nozzle b, as shown at b', Fig. 1. This nozzle passes up through the openings in said bosses and into the chamber F, and it is so curved as to discharge the water passing through it against the convex surface of filtering medium D at an angle, so as to cause the water to move in a current around and against the bottom of said filtering medium, as shown by the arrows in Fig. 2.

In the top of pipe B^2, adjoining partition b^4, is an aperture b^2, connecting the bore of said pipe and the openings in the bosses, and into the end of pipe B^2 is screwed a faucet C, as shown at b^3, Fig. 1. In space F are a number of small solid bodies of the size of marbles or thereabout made of wood or of other material of less specific gravity than water. These bodies may be spherical in shape, as shown at f, Fig. 1, or angular, as shown in Fig. 9, but I prefer to use those of angular shape.

H represents a discharge-pipe screwed into an opening in one side of top section A′ and having the inner end h curved down to near the bottom of the filtering medium, a faucet h' being affixed to its outer end. Another pipe G is screwed into an opening through the top of section A′, which pipe G extends down to the same depth as pipe H. Above the filter is located a reservoir G′, connected with the upper end of pipe G by a pipe g, in which there may be placed any ordinary stop-cock, as g', Fig. 1.

In filling the filter water is fed through pipe B and passes into chamber F through nozzle b, whence it percolates through the filtering medium into chamber A^2. As the water passes

from nozzle *b* it strikes the bottom of the filtering medium, as described, and circles around the same, carrying with it the cleaners *f*, which, rubbing against said bottom, remove any sediment collected thereon and keep the pores of the filtering medium open. As the water rises in chamber A^2 the air is compressed in the top thereof, as shown by broken line V', Fig. 1. To open and clean the pores through the body of the filtering medium, faucet C is opened, when the expansion of the compressed air in chamber A' forces the strained water therein back through the filtering medium into chamber F, whence it passes out through aperture b^2. Across the opening in the bottom of chamber F is secured a concavo-convex screen *a'*, which prevents the escape of the cleaners *f* when the water is drawn from the filter.

If preferable, water can be fed into chamber F through the side of bottom section A by a pipe V, (illustrated by broken lines in Fig. 1,) the discharge end of said pipe being curved in the same manner as is the corresponding end of pipe *b* to produce a current about the bottom of the filtering medium. In this construction the opening in pipe B in which nozzle *b* is inserted is closed.

A regulator-valve may be inserted in pipe *g*, connecting the top of the filter-case and the reservoir G'. Any such valve suitable for the purpose may be employed. One which may be used is shown in Fig. 8. In the pipe K of this valve is formed a seat *p* for the inner end *n* of a valve N, located in stem K' of pipe K. This valve has a conical-shaped inner end, the sides whereof are seated in a depression in an annular lip *r*, formed around the opening in the wall of pipe K, through which the valve passes, as shown at O.

A cap K^2 is screwed on the outer end of stem K', and through it passes a rod *l*, having a handle *l'* on its outer end and a head L on its inner end. The periphery of head L is provided with a thread which engages a corresponding thread l^2 in stem K'. Between head L and valve N is located a coiled spring M, having its ends bearing respectively against said head and the valve N.

In filling chamber A^2 with water the air is compressed in the top thereof, and when the air-pressure becomes sufficiently great to overcome the pressure of spring M valve N is raised and the passage into reservoir G' is opened. By thus opening valve N a continuous air-cushion is formed in chamber A^2 and reservoir G', which is of greater height above the water in chamber A^2 than before the opening of said valve, thus increasing the space in chamber A^2, into which filtered water can be forced. Valve N will remain open so long as the pressure in chamber A^2 is greater than the pressure in said reservoir and the tension exerted by spring M. As chamber A^2 is emptied and the air-pressure therein becomes less than the combined air-pressure in the reservoir and the tension of spring M valve N will close the passage between said reservoir and the chamber A^2.

The closing of the passage between chamber A^2 and the reservoir G' lessens the height of the air-cushion to be compressed in said chamber and allows a greater amount of pressure to be developed for a small amount of water in said chamber than would be the case were the passage between the two open, as the ratio of the height of the air-space to the depth of the water is less than it would be were the passage open between said chamber and the reservoir, and the unnecessary increase of pressure in chamber A^2 automatically opens the valve between it and the reservoir and enlarges the space in said chamber, which can be occupied by the water. It is not intended that the water shall be forced higher than the top of chamber A^2, so that all the filtered water can be withdrawn through faucet *h'*.

The amount of pressure necessary to raise valve N is regulated by the degree to which spring M is compressed by head L.

If desirable, pipe G and the regulator-valve may be dispensed with and chamber A^2 be filled with water, the air being compressed only in reservoir G'.

It is not necessary that the filtering medium be bowl-shaped, as herein shown and described, as it may be made flat or of any other shape suitable for the purpose, though the bowl shape is preferable.

Figs. 4, 5, 6, and 7 illustrate a modified form of filter embodying my improvement. In this construction the lower end of a vertical cylindrical case 2 is screwed into a T-joint 16, as shown at 21, Fig. 5. This T-joint has arms 19 and 20, divided by a partition 17, and with which are connected, respectively, the feed-pipe and the faucet. (Not shown.) In case 2 is located a vertical filtering-cylinder 8, having a bore 9, open at the upper end, said cylinder being so disposed as to leave a space between the periphery thereof and the wall of the case 2.

On the bottom of cylinder 8 is a rib 18, which engages a corresponding recess in partition 17, and on the outside of the wall of said cylinder 8 are vertical ribs 14, forming partitions on opposite sides thereof, which divide the space between the cylinder 8 and the wall of the case into two parts, extending from the bottom of the case to the top of the filtering-cylinder. The ribs 18 and 14 form a continuous wall around the filtering-cylinder, completely dividing the space surrounding it into two chambers 15 and 15'. On the top of the filtering-cylinder is screwed a cap 10, as shown at 11, Fig. 5, said cap having a hollow cylindrical stem 12 thereon that registers with bore 9, the upper end of the stem being screwed into a cap 5 at 13. Cap 5 is screwed onto the case at 6 and supports a reservoir 3, with which it is connected by a neck 4, having inserted therein a faucet 7.

In this filter the water passes into chamber

15 from feed-pipe 19, and then up over the top of the filtering-cylinder and around stem 12 into chamber 15′. The faucet on discharge-pipe 20 being closed, the water from chambers 15 and 15′ percolates through the walls of the filtering-cylinder into bore 9, whence it is forced into reservoir 3, in the top of which the air is compressed by the rising water, as shown by broken line 24, Fig. 5. To cleanse the pores of the filtering-cylinder, the faucet in the discharge-pipe is opened. In a modified form of this construction there is no opening from the feed-pipe into the bottom of chamber 15, and ribs 14 are omitted. Water is supplied to the filter by a pipe 23, (shown by broken lines in Fig. 5,) extending upward from the feed-pipe and entering case 2 somewhat below the top of the filtering-cylinder, the end of pipe 23 entering the case at an oblique angle with the surface of the filtering-cylinder, as shown at 25, Fig. 7, so that as the water enters the case it produces a current or eddy about said cylinder. In this construction there is a single and continuous chamber surrounding the filtering-cylinder and in it are a number of cleaners 22, similar to those before described, which are carried around the filtering-cylinder by the revolving current of water. The cleaners are of such size that one cannot pass another between it and the wall of the case or the wall of the filtering-cylinder. The chamber 15 is continued up to the top of case 2, as shown by broken lines 26, Fig. 5, or the top of the filtering-cylinder is carried up to and bears against the top of said case. There is a screen 27 placed over the opening leading into escape-pipe 20.

It will be observed that the filtered water is drawn from the bottom of the chamber containing it, so that the water therein acts as a seal to prevent the escape of compressed air above it. After this water has been drawn off in the process of cleaning the pores of the filtering medium the faucet in the discharge-pipe of that chamber should be opened to allow it to be refilled with air.

I do not limit myself to the construction and arrangement of parts shown and described, as it is obvious that many changes in the details thereof may be made without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The within-described improvement in the method of cleaning the lower side of a horizontally-disposed filtering medium, the same consisting in supporting buoyant cleaners in contact with said lower side of the filtering medium and producing friction between the same and the cleaners by agitating the liquid in which the cleaners float.

2. The within-described improvement in the method of cleaning the lower side of a horizontally-disposed filtering medium, the same consisting in supporting buoyant cleaners in contact with said lower side of the filtering medium and producing friction between the same and said cleaners by injecting a stream beneath said surface.

3. The combination, in a filter, of a filtering medium having a convex surface, floating cleaners maintained in contact therewith, and means for injecting a stream of water into the filter at an angle with said surface, for the purpose specified.

4. The combination, in a filter, of a filtering medium having a convex surface, floating cleaners maintained in contact therewith, and a nozzle for injecting a stream of water into the filter and having its discharge end curved at an angle with the filtering-surface, for the purpose specified.

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