

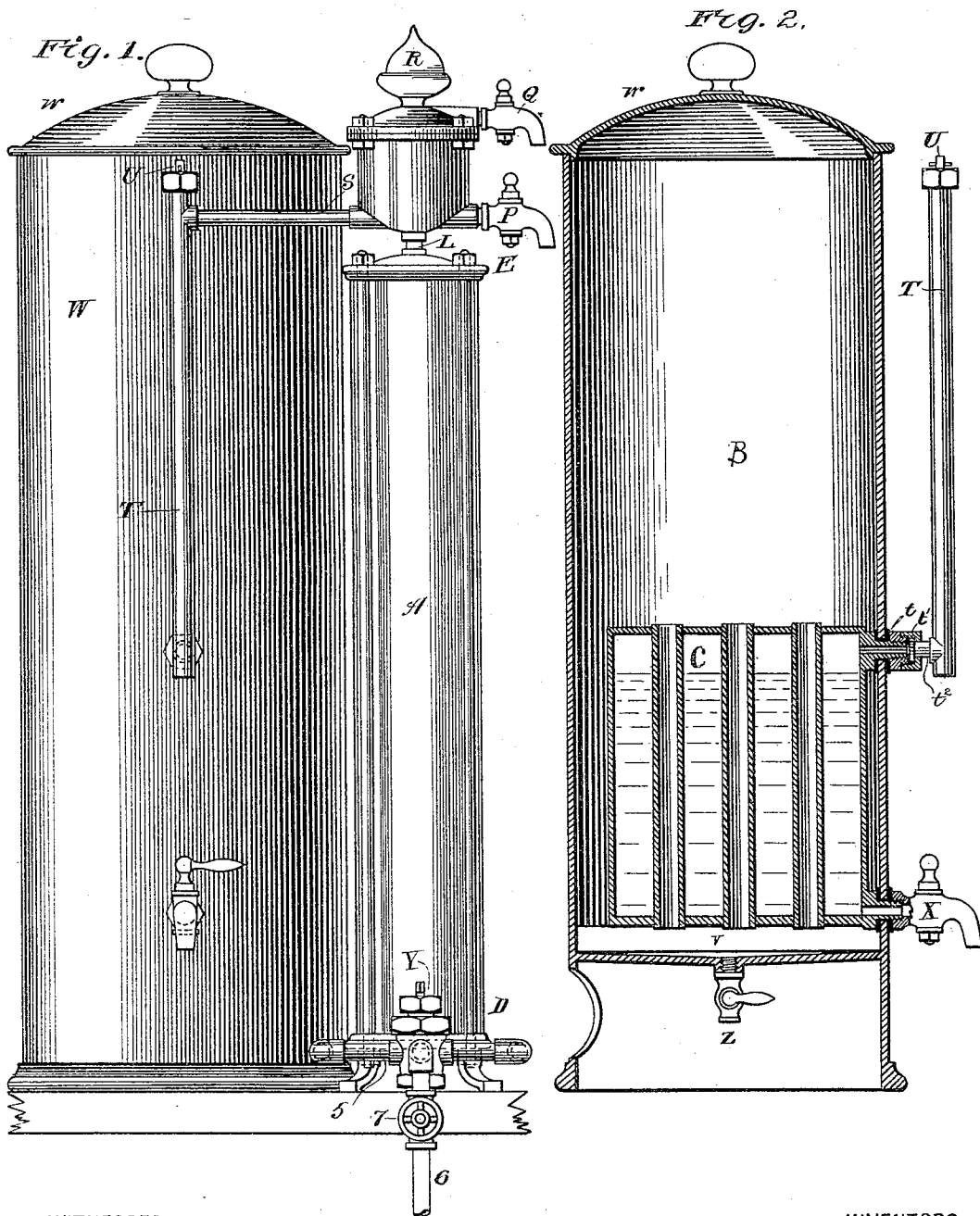
(No Model.)

2 Sheets—Sheet 1.

D. C. & J. E. WILLIAMSON.
FILTER.

No. 529,470.

Patented Nov. 20, 1894.



WITNESSES:

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Fig. 3.

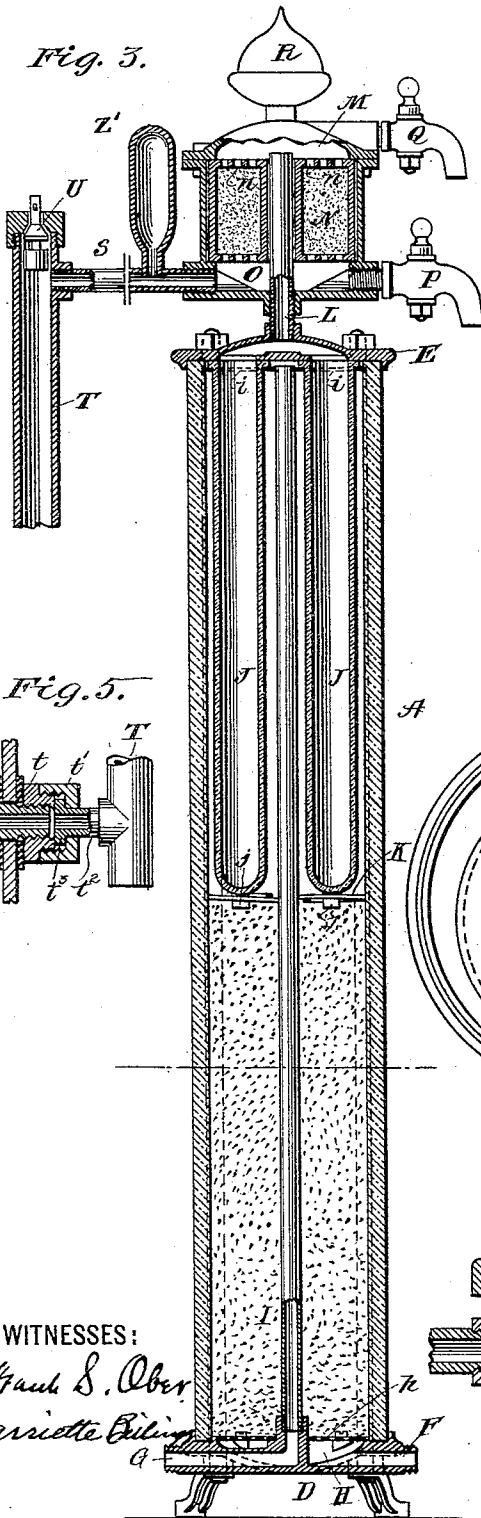


Fig. 6.

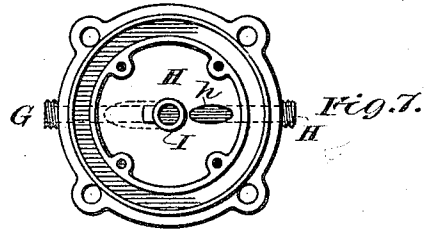
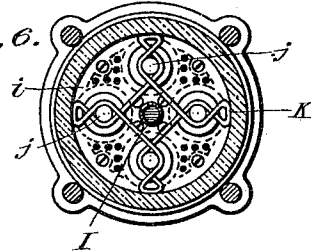


Fig. 8.

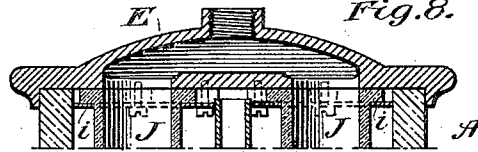


Fig. 5.

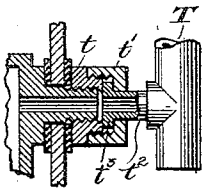


Fig. 4.

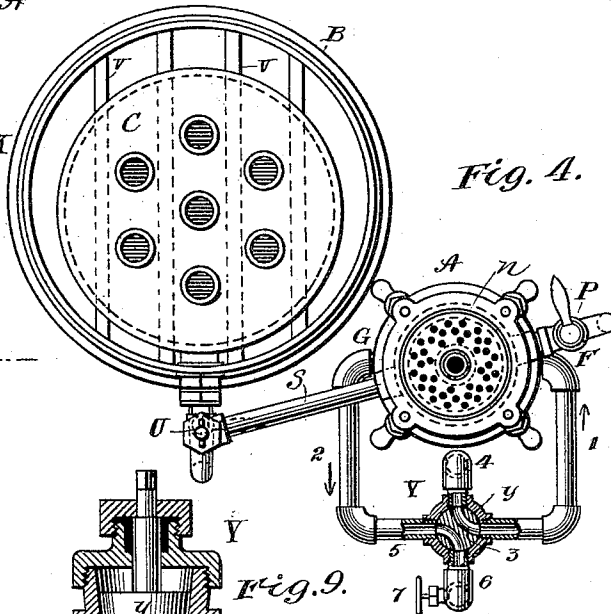
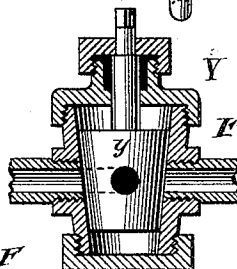


Fig. 9.



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UNITED STATES PATENT OFFICE.

DAVID C. WILLIAMSON AND JAMES E. WILLIAMSON, OF BRIDGEPORT,
CONNECTICUT.

FILTER.

SPECIFICATION forming part of Letters Patent No. 529,470, dated November 20, 1894.

Application filed April 24, 1893. Serial No. 471,690. (No model.)

To all whom it may concern:

Be it known that we, DAVID C. WILLIAMSON and JAMES E. WILLIAMSON, citizens of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Filters; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In the class of filters to which our invention belongs, it is common to employ one or more porous tubes, through which the water passes. These tubes naturally become more or less clogged with fibrous animal or vegetable matter, like threads or filaments, which matter, under ordinary conditions, is not easily detached in the process of cleansing. As a matter of fact, the tube or tubes are generally removed from their support within the cylinder which forms the main body of the filter, and are scrubbed with a brush, or other rough instrument, to make them clean. This process of cleansing involves much labor and inconvenience.

We have devised an invention by virtue of which the porous tube or tubes can be cleansed without removing them from the cylinder, and we utilize for this purpose either the water of filtration alone, or the said water in combination with a back flow resulting from the release of air pressure, either in the reservoir, which is generally combined with the filter, or in a special air-chamber outside the reservoir. In case the back pressure is utilized in this way, it serves to loosen, or, as it were, levitate, the threads or filaments of foul matter, while, at the same time, the exterior of the tubes is subjected to a rubbing, scraping, or washing process, as will be clearly described hereinafter.

The second part of our invention relates to the reservoir into which the water is usually forced under pressure. The object of this part of our improvement is to make the reservoir very strong, in order to resist the said pressure, and also to make the said reservoir detachable, so that both it and the cooler, in which it is often inclosed, can be readily cleansed.

The porous tube or tubes already mentioned are commonly inclosed in a cylinder forming the main body of the filter. We have provided means for maintaining the said tube or tubes in position within the cylinder, and that also constitutes a part of our invention.

Other details of our invention will be described in the specification which follows, and set forth in the claims forming a part thereof.

In order to enable those skilled in the art to make and use our invention, we have caused to be made a set of drawings, to which reference is hereinafter made.

In the drawings, Figure 1, is an elevation of our filter and cooler combined. Fig. 2, is a vertical section of the cooler and reservoir. Fig. 3, is a similar section of the filter. Fig. 4, is a horizontal section of the filter and cooler; and Fig. 5 is an enlarged section of the devices connecting the reservoir, the cooler, and the pipe running to the latter. Fig. 6 is a horizontal section of the filter just below the tubes, looking upward. Fig. 7 is a top view of the base into which the cylinder of the filter is set. Fig. 8 is an enlarged vertical section of the top of the filter cylinder, including the cap; and Fig. 9 is a vertical section of the controlling valve.

Referring to the drawings by letter, A, is our filter, and B, the cooler connected therewith. Inside the cooler, at C, is shown the reservoir, into which the water passes after being filtered. The filter itself, or the lower portion thereof, has a cylindrical body set into a base, D, the details of which are shown in Figs. 3 and 7, and having a cap, E, illustrated in detail in Figs. 3 and 8. Referring to the details of the base, F, constitutes an inlet thereto, and G, an exit therefrom, the former communicating with a chamber, H, and the latter with a tube, I, which extends up through the center of the cylinder, A, and has an opening just above a perforated sheet of metal, *i*, as shown in Figs. 1 and 8. The chamber, H, is closed at the top by a similar perforated strip *h*, above which rests granular material, such as sand, or charcoal finely divided, to serve as filtering material. Above the top of the said filtering material porous tubes, J, J, are inserted, the same being held between the cap, E, and a frame, K, located near the cen-

ter of the cylinder, A. The porous tubes in the present instance are four in number, and each tube is provided with a nipple or teat, *j*, around which the frame, K, is fastened, in the manner clearly illustrated in Fig. 6. It is evident from this last named figure that the frame, K, fits more or less closely within the walls of the cylinder, thus holding the tubes at the proper distances apart, and preventing their displacement during the process of washing or of transportation from place to place. The frame K, may be made of a spring which presses against the wall of the cylinder.

We do not limit ourselves to the number of porous tubes shown in the drawings.

The perforated piece of metal, *i*, has four larger openings corresponding in size to the openings in the tubes, J, J, and smaller openings forming a means of communication between the space in the cylinder, A, outside the tubes, I and J, J,—between this space and the chamber of the cap, E. The chamber last mentioned communicates by a tube, L, with a chamber, M, which latter chamber communicates with an annular chamber, N, by means of openings, *n, n*, in the top thereof. The annular chamber, N, has other openings in its bottom, thereby communicating with a chamber, O, in the wall of which the cock, P, is inserted. We may add here that a cock, Q, also communicates with the chamber, M. The acorn-shaped structure above the chamber, M, is an air-chamber, which we designate herein by the letter R.

At the left in Fig. 3, is shown a pipe, S, communicating with the chamber, O, and also with a vertical pipe, T, in the top of which is a vent adapted to be closed under certain conditions by an automatic valve, U. The pipe, T, is shown in Fig. 2, communicating with the reservoir, C, inside the cooler, W. It will be observed that the cooler has two openings which receive screw-threaded hollow extensions, or nipples, running from the reservoir, and that suitable packing is provided to prevent leakage at this point. The connection between the upper nipple and the pipe or tube, T, is made by means of a screw-threaded sleeve, *t*, and a coupling, *t'*, the latter being loose upon a branch, *t²*, running from the pipe, T, and screwing upon the said sleeve, *t*, or upon an intermediate piece of packing, the structure being such that the branch, *t²*, cannot be withdrawn after the coupling has been made, owing to the presence upon its outer end of a ring or flange, *t³*, larger than the opening in the coupling, *t'*. The lower nipple upon the reservoir has a cock, X, attached to it by a screw with intermediate packing.

The reservoir, C, is held within the cooler, B, upon supports, *v, v*. Attention is called to the fact that the reservoir is cylindrical in shape, and that its two flat heads are supported by a series of tubes, seven in number, which are expanded into the heads and strengthen the whole structure. The necessity for great

strength in reservoirs of this kind has already been alluded to.

It remains now to describe the four-way cock shown in Figs. 4 and 9, after which the operation of the parts described will be given in detail. The structure of the cock, which we will designate by the letter Y, is clearly illustrated in the two figures referred to, and its exterior is shown in Fig. 1, also. The body of the cock communicates in one direction by a pipe, 1, with the inlet, F, and in the other direction by a pipe, 2, with the exit, G. In the usual position of the parts, the arrangement is that shown in Fig. 4, where the valve, *y*, inside the main body of the cock, has one of its passages shown at 3, communicating both with the pipe 1, running to the inlet, F, and a pipe, 4, which proceeds from the source of pressure, while the other passage of the said valve, shown at 5, communicates both with the pipe, 2, and with a waste pipe, 6, in which is a valve, or cock, 7.

We are now prepared to describe the operation of the whole apparatus, which we now proceed to do. The valve now being turned, so as to assume the position illustrated in Fig. 4, the water to be filtered passes in at the pipe, 4, through the passage, 3, and the pipe, 1, into the inlet, F. There it enters the chamber, H, in the base, D, and passes up through the perforated sheet, *h*, and through the granular material forming the filtering substance. Having passed through the granular filtering material, it is slowly forced through the tubes, J, J, and into the chamber of the cap, E, whence it proceeds by way of the pipe, L, chambers M, N, and O, to the pipes, S, and T, and the reservoir, V. We have omitted to state that the chamber, N, is filled preferably with charcoal, or some other clarifying substance, though we may use a straining material, such as felt, asbestos cloth, or the like. The progress of the water, owing to the resistance afforded by the porous tubes, is so slow that there is no injurious stirring of the granular material in the bottom of the cylinder, A, and it remains practically undisturbed. In traversing this part of the filter, the grosser portions of the foul matter in the water are retained, and it is a considerable time before any deposit appears upon the exterior of the porous tubes. The passage through the tubes filters out most of the finer foreign matter in the water, and the traversing of the clarifying or straining material in the chamber, N, makes the water perfectly pure, or as nearly so as possible; so that this process of filtration is adapted to places where the very highest degree of purification is desired or required.

Such, in general, is the process of filtration.

Before proceeding to cleanse the filter, we prefer to fill the reservoir up to a point above the inlet from the pipe, T, which, by the way, may be placed higher or lower in the reservoir at the will of the manufacturer. It is obvious, however, that when the reservoir is

so filled a compression of air takes place in the upper portion of the reservoir, the pipe, T, fills up, and the automatic valve, U, becomes closed. There is then an elastic force within the top of the reservoir acting to throw the water in a direction opposite to that in which it is forced by the normal pressure. There is also a pressure in the acorn-shaped chamber, R, having a tendency in opposition to that of the original force. Suppose, now, that the valve, 7, in the outlet pipe, 6, is suddenly opened (its normal position being a closed one). There comes then a sudden relief to the resistance to the action of the normal force, in that the water is no longer forced to pass through the porous tubes, but may pass down through the pipe, 1, and out at the exit, G. The consequence is that the granular material is suddenly thrown up and caused to rub against the outside of the porous tubes and scour them clean. At the same time, the compressed air in the top of the reservoir and in the acorn-shaped chamber throws the water backward, and tends to loosen momentarily the strands, threads or filaments, which have collected on the porous tubes. Accordingly, the exterior of the said tubes is in precisely the right condition to be most effectually acted upon by the stirring of the granular material in the cylinder, A. The result is that the tubes are cleansed in a manner which has hitherto been impossible.

The chamber, R, is really intended as an alternative to the air-chamber in the top of the reservoir, and is designed to be used when the reservoir is dispensed with. Ordinarily, in case a reservoir is employed, the acorn-shaped chamber will be done away with.

A still further step in the process of cleansing consists in leaving the valve, 7, open, and then alternately reversing the valve of the four-way cock, so as to connect the inlet, 4, alternately with the pipe, 1, in the manner already described, and with the pipe, 2, running into the inlet, G, and connecting there-through with the pipe, 1. There is thus a positive action of the granular particles in both directions, up and down, upon the exterior of the porous tubes. By repeating this process over and over again, the tubes are thoroughly cleansed.

At Z, we show a cock for drawing off the water of the melted ice.

The cooler, W, has a removable cover, w, and it is evident that the connections described between the reservoir and the attachments outside of the cooler permit of the easy removal of the reservoir also, so that the whole apparatus can be easily cleansed.

The cock, P, is present to admit of drawing off filtered water before it passes to the reservoir and cooler. The object of the cock, Q, is to admit of the cleansing of the chamber, N, apart from the operation of cleansing the main portion of the filter. This can be done by opening the cock, Q, and allowing the compressed air in the reservoir to re-act and throw the water back with a sudden movement through the chamber, N. To provide for accomplishing the same result (that is, the cleansing of the chamber, N) when the reservoir is absent, we show the air-chamber, Z', attached to the pipe, S.

We have described a series of braces for the reservoir, consisting of tubes expanded into the heads thereof. Instead of tubes so expanded, we may employ headed bolts, which run through the reservoir and are secured by nuts at the opposite end. While we prefer the cylindrical form for the reservoir, yet this is not an essential feature of it.

Having now described our invention, we claim—

1. In a filter, a cylinder forming the main body thereof, one or more porous tubes supported within the said cylinder and communicating with a reservoir, the space around the said tubes within the cylinder communicating with an outlet which is normally closed, all in combination with an air-chamber in the said reservoir, the air in which is adapted to exert a pressure in an opposite direction to the normal, and also in combination with a four-way cock which is adapted to alternately direct the incoming water through the normal inlet for filtration, and into the cylinder, and in the opposite direction into the cylinder through the normal outlet, as and for the purpose set forth.

2. In a filter, a cylinder forming the main body thereof, one or more porous tubes supported within the said cylinder, the space around the said tube or tubes within the cylinder communicating with an outlet which is normally closed, all in combination with a four-way cock adapted alternately to direct the incoming water through the normal inlet for filtration into the cylinder, and in the opposite direction into the cylinder through the normal outlet, as and for the purpose set forth.

In testimony whereof we have signed our names, in the presence of two witnesses, this 6th day of February, A. D. 1893.

DAVID C. WILLIAMSON.
JAMES E. WILLIAMSON.

Witnesses:

G. H. STOCKBRIDGE,
HARRIETTE BILLING.