

(No Model.)

M. McDONALD.

FILTER.

No. 381,406.

Patented Apr. 17, 1888.

Fig. 1.

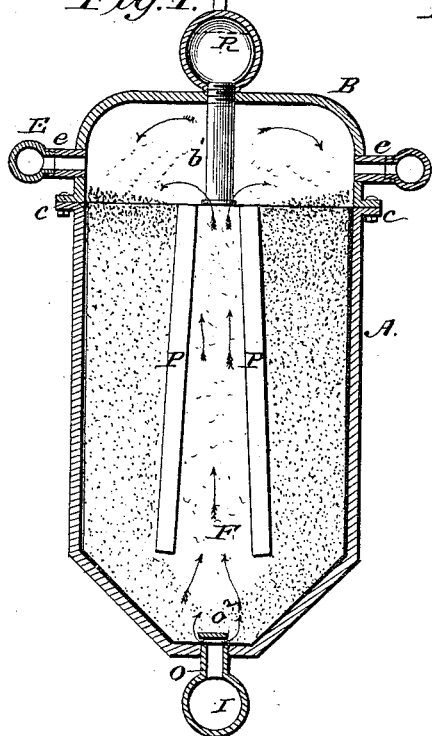


Fig. 2.

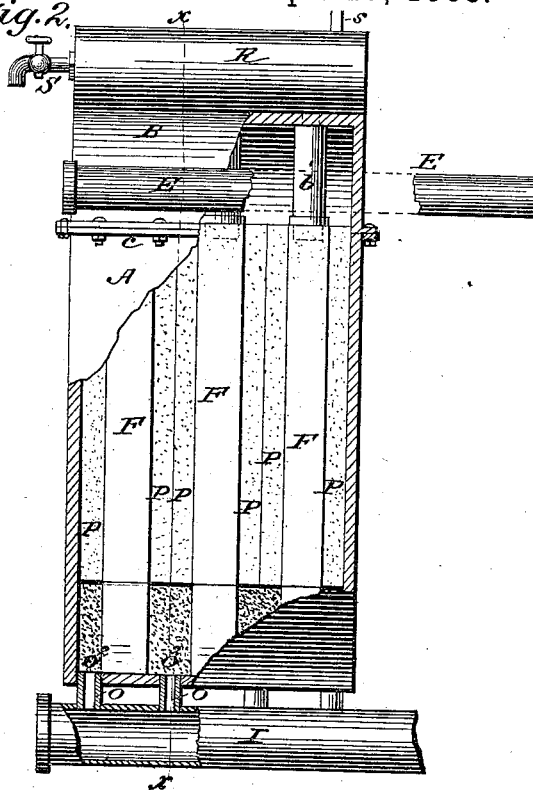


Fig. 3.

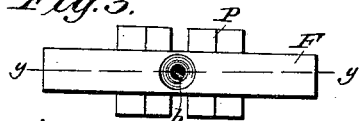


Fig. 4.

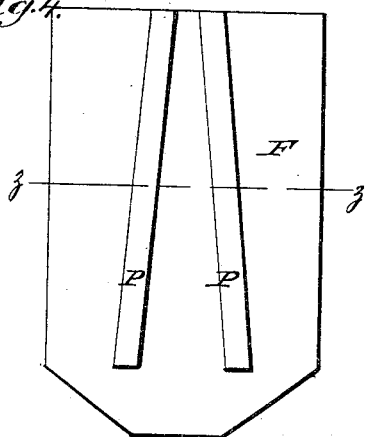
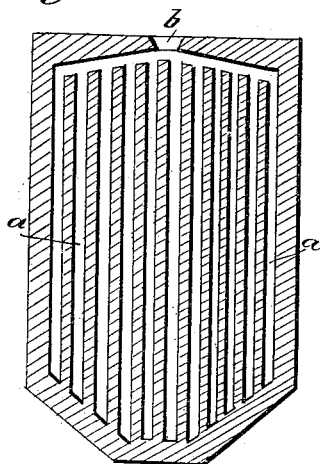


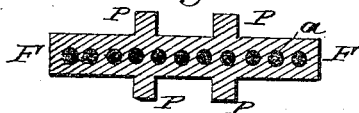
Fig. 5.



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Fig. 6.



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# UNITED STATES PATENT OFFICE.

MARSHALL McDONALD, OF WASHINGTON, DISTRICT OF COLUMBIA.

## FILTER.

SPECIFICATION forming part of Letters Patent No. 381,406, dated April 17, 1888.

Application filed November 2, 1887. Serial No. 254,089. (No model.)

*To all whom it may concern:*

Be it known that I, MARSHALL McDONALD, of Washington city, in the District of Columbia, have invented a new and useful Improvement in Filters, of which the following is a specification.

The object of my invention is to provide a filter for household and general use, which shall perfectly eliminate from a portion of the water all sedimentary matter and microbes held in suspension, and which shall automatically clean itself, so as to require no attention nor adjustment.

My filter does not proceed upon the plan of filtering all the water that enters its case, but only a portion of it, the balance being used, in connection with a body of sand, for scouring or cleansing the filtering-surface, in a manner heretofore employed.

My invention consists in the peculiar construction and arrangement of the filter, which I will now proceed to describe with reference to the drawings, in which—

Figure 1 is a vertical transverse section through line *xx* of Fig. 2. Fig. 2 is a side elevation, partly broken away. Figs. 3 and 4 are respectively a top and side view of one of the filtering-plates. Fig. 5 is a longitudinal section of the filtering-plate through line *yy* of Fig. 3, and Fig. 6 is a transverse section through line *zz* of Fig. 4.

Referring to Figs. 1 and 2, A B represent the outer case, which may be of cast-iron, made in two flanged sections bolted together at *c*.

I is the inlet-pipe, which, by a number of short sections or thimbles, O, communicates with the bottom of the case.

E are the outlet-pipes for unfiltered water, of which there are two, one on each side, and which have short pipe-connections *e* with the top B of the filter-case in the same plane as the inlet-pipes O below.

R is a reservoir for the filtered water, which is mounted upon the top section, B, of the case. Within the lower section, A, of the case is arranged a series of filtering-plates, F. (See Figs. 3 to 6.) The outline of these plates is made to correspond with the cross-section of the case, and there may be any number of them placed in the case, according to the size of the latter. As shown in Fig. 2, there are three.

These plates (see Figs. 3 to 6) are made of porous earthenware, and are provided with a series of longitudinal channel-ways, *a*, in them, all of which communicate with an outlet, *b*, at the top. On the sides of these plates are formed wings or flanges P P, which are set at a reverse inclination to each other, so as to form a chambered space between them, large at the bottom and tapering to a smaller width at the top, and whereby a tapering chamber or space is also formed between these wings and the sides of the case, as in Fig. 1, but of a reverse taper—i. e., large at the top and small at the bottom. These wings or flanges also form abutments that hold the filtering-plates spaced the proper distance from each other, as shown in Fig. 2. The outlet *b* of each filtering-plate is connected by a short tube, *b'*, with the reservoir R for filtered water above, the tubes being closely fitted by means of elastic washers of soft rubber.

The operation of my filter is as follows: The filtering-plates all being in place in the lower section of the case, clean sharp sand is filled in around the same up to the level of the top of the filtering-plates or thereabout, as shown in Fig. 1. Water under pressure being now admitted through inlet-pipe I, it passes up through the sand in the central chambers between the wings P P, making a gradual boiling motion of the sand, which, passing up said chamber into a continually-narrowing space, produces an abrasion against the filtering-plates that scours their surfaces and dislodges therefrom all adhering matter. This sand rises above the wings P P and is gradually deposited in the hopper-shaped spaces between the wings P P and the sides of the case, where it settles and moves gradually to the bottom again, and as it descends to the bottom through the contracting side chambers it again scours and cleans the plates. The inflowing currents of water from I, it will be seen, thus produce a gradual circulation of the sand, the central column gradually rising and the side columns gradually descending from the cutting action of the currents at the base of said columns. The unfiltered water passes out through the pipes E E at the top, and to prevent the sand from being carried with it the discharge of the water is divided and distributed to the two

pipes E E, so that the water in the space above the sand is in a comparatively quiescent state that permits the sand raised from the central chambers to remain for a moment in suspension, and then quietly settles in the side chambers, down which the columns move for a repetition of the same action. As the water in the filter-case is under a pressure, it will be seen that a portion of the water will filter through the constantly cleaned and scoured surfaces of the plates F, and, finding its way to the channel-ways *a* within, is perfectly filtered and rises through the pipes *b'* into the reservoir R for filtered water, where it may be drawn from time to time. To stimulate or quicken the body of water in reservoir R in drawing the same at the stop-cock *s*, an air-cushion may be formed in the top of reservoir R, as shown in dotted lines, Fig. 1, or a stand-pipe, *s*, or elevated distributing-pipes without an air-chamber, would serve the same purpose.

This filter is designed to have its outlet-pipes E E connected with the outlet-cocks of the house, so that every time water is drawn for any purpose not requiring filtered water this action will serve to cleanse the filter. It will therefore be seen from the foregoing that this filter constantly cleanses itself without attention with a portion of the water which passes through it, and filters another portion so as to always give a supply of clean filtered water.

To prevent the sand from settling into the inlet-pipe I, a suitable cap or valve, O<sup>2</sup>, is placed above the same.

In defining my invention with greater clearness I would state that I am aware that a body of sand has been agitated in a filter against the filtering-surfaces by the force of the inflowing water; but said sand had as a body no progressive movement or circulation, but was only agitated haphazard after the manner of a sand in the bottom of a spring. My invention is distinctive in that there is a continuous progressive movement of the entire body of sand in the same direction, first rising to the top and then settling in columns from gravity. It cleans by an abrasive sliding action the filter-surface and positively and surely takes away the adhering matter and holds it until the bot-

tom of the column is reached, where the action of the current cuts the lower portion of the column, washes out the sedimentary matter, and carries it off to the top, while the clean sand is again deposited in columns to act by gravity again.

I do not confine myself to the particular construction of filter for carrying out this part of my invention, but may vary the construction without departing from this fundamental and distinctive feature.

Having thus described my invention, what I claim as new is—

1. A filter consisting of the combination of an outer case, a porous filtering medium having beside it two or more upright channels or passage-ways for water and sand communicating at the top and bottom and disconnected from each other at intermediate points, and an inlet for water arranged beneath one of said passage-ways, whereby the water and sand are made to rise in one passage-way and descend in one or more of the others with a progressive circulation in the same direction, as set forth.

2. A filter having beside its filtering-faces an upwardly-converging channel for a rising column of sand, and a downwardly-converging chamber for a descending column of sand in open communication at both top and bottom, in combination with an inlet-pipe located below the channel for the ascending column, and an outlet-pipe located above the channel for the descending column, substantially as and for the purpose described.

3. The filtering-plates F, made of porous earthenware, with channel-ways *a* in the same, and flanges P P on the sides thereof, substantially as and for the purpose described.

4. The combination of case A B, with inlet-pipe I and outlets E E, the channeled filtering-plates F, with wings P P, the reservoir R, and pipe *b'*, connecting said reservoir with the filtering-plates, substantially as and for the purpose described.

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Witnesses:

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