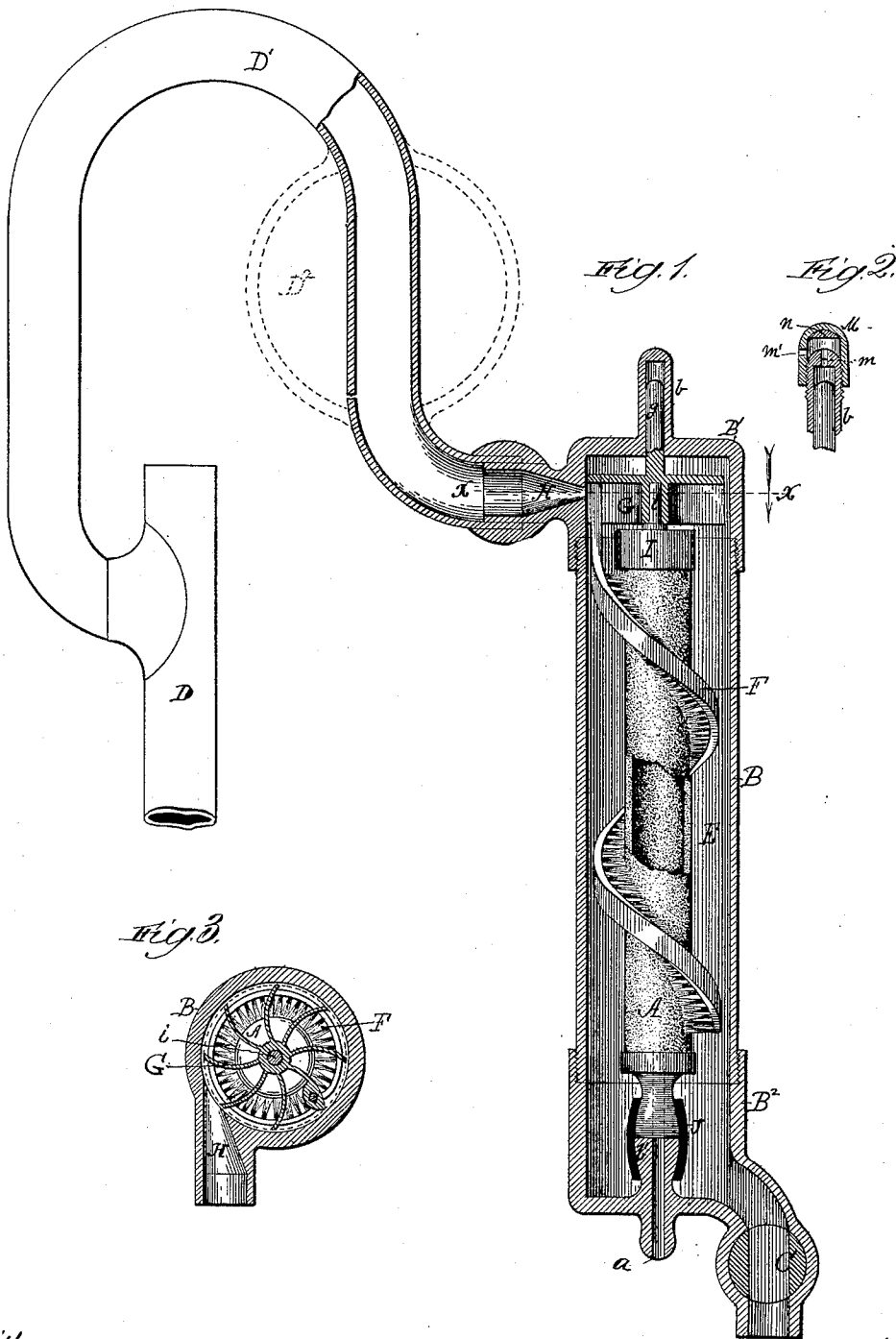


(No Model.)

T. S. E. DIXON.
FILTER.

No. 431,448.

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FILTER.

SPECIFICATION forming part of Letters Patent No. 431,448, dated July 1, 1890.

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To all whom it may concern:

Be it known that I, THERON S. E. DIXON, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Filters, of which the following is a specification.

Referring to the accompanying drawings, in which similar reference-letters indicate the same parts, Figure 1 is a vertical section of the improved apparatus; Fig. 2, a vertical section of the air-valve; and Fig. 3, a horizontal section taken in line X X of Fig. 1, looking downward.

The filtering of water by forcing it under more or less pressure through a porous earthen plate or wall has long been known, and in the form of apparatus known as the "Pasteur filter" has recently come into extensive use. In all filters of this class the flow of water to and through the pores of the filtering-wall causes the finer impurities to soon coat the outer surface of said wall and obstruct or prevent the access of the water thereto, thus rendering the apparatus partially or wholly inoperative until it shall have been cleaned. To clean it, it has been necessary, unless some special provision is made, to take the filter apart and wipe off the accumulated dirt—an operation which involves considerable labor and care, which must be frequently repeated, and which is liable to result in breaking the frangible material of the wall, and thus necessitating the delay and expense of procuring and substituting a new one. These filters are generally connected to the water-supply pipes of the building in which they are used, so that the pressure of the water under the head of pressure from the city mains or other source of supply will be sufficient to give them effective operation when clean and in condition for service.

My invention relates to filters of the class above referred to. Its object is to enable them to be cleaned or kept clean and in completely effective operation without manual labor and without the necessity of taking them apart and the consequent liability to breakage. Its principle of operation consists in employing the fluid-pressure, which forces the filtering to also force the mechanical cleaning of the filtering-surfaces.

The generic invention consists in combining the filtering-surface with a mechanical wiper operated by the fluid-pressure of the water-supply system to wipe and clean said surface. Improvements thereon consist, respectively, first, in causing a current of water to flow in contact with the filtering-surface in a restricted space while the wiper is in operation for the purpose of cleansing the wiper and carrying away the dirt, which it removes from the filtering-surface; secondly, in actuating the wiper by said current of water; thirdly, in arranging the filtering-surface, the wiper, and the water-motor, by whose movement the wiping is effected, all within the case of the filter, so that no projecting shaft and consequent packing of joints is necessary; fourthly, in combining the filtering-surface with a revolving wiper adapted to operate in the water surrounding said surface; fifthly, in so arranging or constructing the wiper that the movement of the water through the chamber in which it is placed tends to operate it independently of any separate motor; sixthly, in giving the wiper a helical form to prevent the resistance of water from blocking its movement and to render its action more effective; seventhly, in so arranging the several parts that the act of drawing off water for use will operate the wiping apparatus and automatically clean the filtering-surface, and, eighthly, in the several details of construction and arrangement additional to the above-named features and specifically referred to in the claims.

The broad invention is not limited to the employment of any specific material for the filtering wall or plate or for the cleaning or wiping device, nor to any particular form or arrangement of the mechanism whereby the wiping is effected.

Having thus stated the general principles of the invention, the preferred form of apparatus in which they are embodied may be described as follows:

Referring to the drawings, A is the filtering material, preferably in the form of a cylindrical hollow vessel or tube of unglazed porous porcelain or earthenware, arranged within a suitable case B, which is provided with a cock C and is supplied with water under pressure from the source of supply through

a pipe D. The case B is so arranged as to leave a restricted space or chamber E surrounding the tube A, through which space water from the source of supply flows in a current when the cock is open. Whether the water be flowing or still a portion of it percolates into the interior of the vessel A and is discharged therefrom by a suitable vent *a* thoroughly purified by its passage through the porous wall of the vessel.

F is a mechanical wiper of any suitable form and material, so arranged and adapted as to be capable of sweeping the exterior surface of the vessel A and wiping off any disease germs, dirt, or other impurities that may lodge thereon. To this end either the wiper or the vessel, or both, must be given such a movement as will effect the mechanical wiping action upon the walls of the vessel. For convenience and simplicity of construction I prefer to give this movement to the wiper and to confine the vessel A rigidly in place, and accordingly this is the form of construction herein shown. The wiper being selected as the movable element, it may be given any form of motion preferred—for example, a reciprocating motion longitudinally of the vessel or around the same, or a rotary motion against or around said vessel, the latter form of motion being preferred and herein illustrated—and one or more wipers may be used for each filtering-tube. The wipers should act in the water surrounding the vessel A in order that the water may carry off the impurities removed from the walls of the vessel, and that the water may also aid the wipers in their action and may wash them clear of dirt.

One of the most important parts of my invention consists in giving the wipers their desired movement by the action of the water itself under its pressure from the source of supply, thereby dispensing with the necessity of hand labor in effecting the wiping operation, and thus rendering it practically automatic. This may be accomplished in a variety of ways; but I prefer to employ for the purpose the force of the current of water passing through the apparatus when the cock C is open, and such is the construction herein shown. This enables all the operating parts to be arranged within the case, thus dispensing with the necessity of a shaft projecting through the wall of the case and a consequent packing-box, and it also enables me to so arrange the parts that they will be automatically set in operation and the surface of the filtering-wall cleaned whenever the cock is opened to draw unfiltered water for use.

In the form of apparatus here illustrated I apply the power of the moving water to actuate the wiper or brush by means of a small water-wheel G, arranged in the line of the flowing current and suitably connected to the brush to effect the rotation of the latter around and in contact with the porous tube. The motor may be of any suitable form and is preferably arranged between the top of the

porous tube and the top of the case, in the manner shown in Fig. 1, with the brush or brushes attached to its arms, so as to rotate therewith. In such case the water is forced from the supply-pipe directly into and through the motor, setting it in rotation with considerable power. I prefer to contract the end of the supply-pipe into a nozzle H, as shown, to increase the velocity of the water against the wheel, and also because it is desirable that the cock C should be of larger capacity than the water-inlet, in order to give full clearance to the water and insure the rotation of the motor and its connected wipers. As here shown, the wheel is mounted and centered upon a spindle *i*, projecting upward from the center of the metal cap I, which is fitted over the upper end of the porous tube and is suitably packed with rubber or other elastic material between the cap and the tube. The wheel is also provided with a stem *g*, which extends up loosely into a socket *b*, formed in the top casting B' of the case B. The wheel is preferably allowed a little vertical movement, guided by the spindle *i* and socket *b*, and the water so directed against its inclined surfaces and upper flange as to tend, when entering the case with great force, to lift the wheel slightly, and thus change the position of the brush with relation to the surface which it acts upon and insure the thorough cleaning of said surface. The lower end of the porous tube rests upon a suitable internal projection *b'* of the casing B² at the bottom of the case, and is held in place by a stiff rubber tube J, inclosing both at their points of junction. The porous tube will thus be held centrally of the case and wheel and will be given a sufficient lateral elasticity to enable it to yield slightly to any irregularities in the movement or surface of the brushes. The wipers themselves may be so constructed that the force of the water passing through the case will tend to rotate them independently of the presence of any special motor for the purpose—for example, by constructing them in worm-screw form, as shown in Fig. 1. This form has several other advantages, such as increasing the brushing-surface, holding it effectively against the tube, running easily through the water, and not interfering with the flow into the exit-pipe, and for these reasons I prefer to use it even when the motor-wheel is also used.

Provision should be made for discharging any air which may collect in the upper end of the case. This may be done by connecting the pipe to the upper end of the case by means of a curved branch D', extending above the case, and thence down to its upper end, substantially as shown in Fig. 1. The bend of the pipe will then form an air-chamber in the line of the water-supply, and any air imprisoned in the upper end of the case will pass into the water-pipes and be taken care of in that way. An enlargement D² (shown in dotted lines) may be added, if preferred, to act as such air-chamber; but it should be arranged,

as shown, in the line of the water-supply, so as to act automatically in receiving and disposing of the air. If preferred, however, an air-valve may be substituted, and for this purpose a simple form is shown in Fig. 2, consisting of a vent-hole *m* in the upper end of the socket *b*, with a screw-cap *M* to cover the end of said socket, a rubber pad *n* in the screw-cap to close the vent when the cap is screwed down, and an air-vent *m'* in the cap to allow the air to escape when the cap is screwed up.

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

1. In a filter, the combination of a porous filtering-surface, through which the water slowly percolates under the pressure from the source of supply, with an outlet for filtered water and an independent outlet for unfiltered water, and a cleaning device arranged so as to be undisturbed by this percolation, but to be set in operation and actuated by said pressure when said outlet for the unfiltered water is opened, substantially as described.
2. In a filter, the combination of a porous filtering-surface arranged longitudinally in an inclosing-case, and through which the water slowly percolates under the pressure from the source of supply, with an outlet for filtered water and an independent outlet for unfiltered water, and a cleaning device arranged so as to be undisturbed by this percolation,

but to be actuated by said pressure when said outlet for the unfiltered water is opened and acting upon the porous filtering-surface within the direction of the outflow of the unfiltered water, substantially as described.

3. In a filter, the combination of a porous filtering-tube, through which the water is forced by the pressure from the source of supply, with a wiping device revolving around said tube and actuated by said pressure, substantially as described.

4. In a filter, the combination of a porous filtering-tube with a helical wiping device revolving around said tube, substantially as described.

5. In a filter, the combination of an inclosing-case *B*, provided at one end with a perforated internal projection *b'*, extending outward in the form of a nipple, and a porous vessel *A*, held upon the top of the projection *b'* by an elastic tube *J*, substantially as described.

6. In a filter, the combination of a porous tube, an inclosing-case, and a water-wheel mounted upon the tube and provided with a revoluble brush or wiper, substantially as described.

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