May 17, 1927. E. ROBERTSON 1,629,085

FILTER

Filed Sept. 21, 1923

Fig. 1.

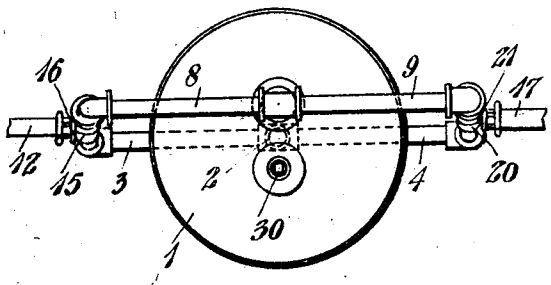


Fig. 4.

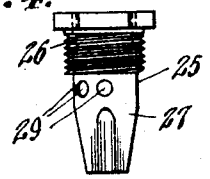


Fig. 5.

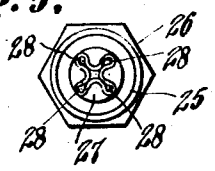


Fig. 2.

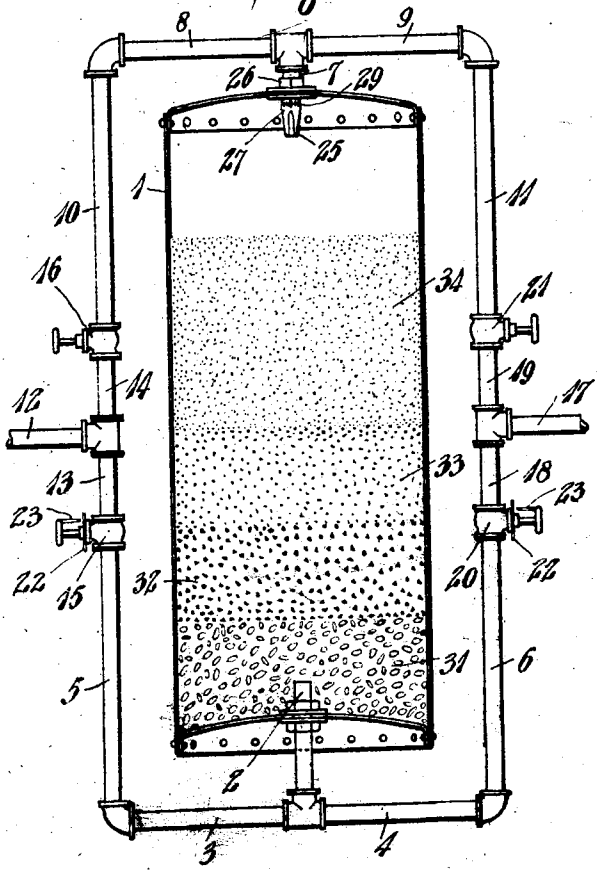
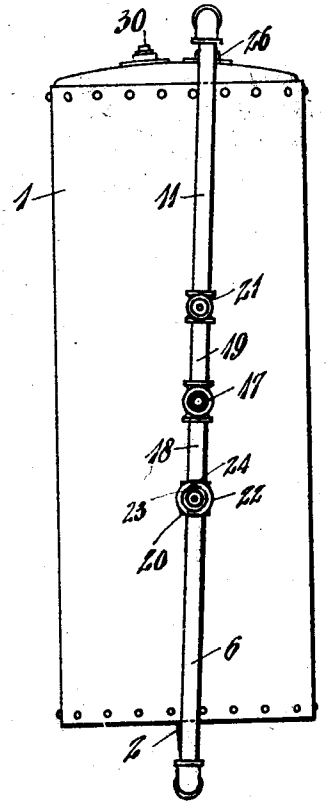


Fig. 3.



Inventor
Edmond Robertson
By Clarence Pardew
Attorney.

Patented May 17, 1927. 1,629,085

UNITED STATES PATENT OFFICE.

EDMOND ROBERTSON, OF NEWPORT, KENTUCKY.

FILTER.

Application filed September 21, 1923. Serial No. 664,055.

My invention relates to filters, and more especially to those for filtering water for household use. Its object is to provide an efficient device of this character, of ample capacity for serving a household or other similar number of individuals, which will be simple and economical in construction, easy to install, and readily kept in operative condition by relatively unskilled persons, thus reducing the first cost and cost of upkeep of the device to an extent which will permit of its use in a larger number of places. Other objects will appear in the course of the ensuing description.

I attain these objects by the device illustrated, for example, in the accompanying drawings, in which—

Figure 1 is a plan view;

Fig. 2 is a front elevation with the tank or enclosure in vertical cross section, revealing the interior details;

Fig. 3 is a side elevation;

Fig. 4 is a detail side elevation of the nozzle; and

Fig. 5 is a bottom plan view of the nozzle.

The enclosure or tank 1 is of upright cylindrical shape, preferably being constructed of rather heavy metal plate, such as range boilers are made of. In fact, a range boiler may be used for this. Up through the bottom of this enclosure 1 leads a pipe 2, connected at its lower end by a T to pipes 3 and 4 leading to the left and right, respectively, where they connect by elbows with upright pipes 5 and 6 at opposite sides of the enclosure 1.

In a similar manner, a nipple 7 leads up from the top of the enclosure 1, connecting by a T with left and right hand pipes 8 and 9, which connect by elbows with upright pipes 10 and 11, respectively, leading down along opposite sides of the enclosure 1.

About midway of the height of the apparatus, a supply or inlet pipe 12 leads horizontally and connects by a T with short pipes 13 and 14 leading down and up, respectively, to valves 15 and 16 which connect, respectively, with the upright pipes 5 and 10 at the left of the device.

Similarly, at the right, a horizontal outlet or escape pipe 17 connects by a T with short upright pipes 18 and 19, connecting with valves 20 and 21, which connect, respectively, with the lower and upper upright pipes 6 and 11.

Each lower valve 15 or 20 is provided with indicating means to indicate to the user, by aid of a fixed mark, the correct degree of opening of the valve for correct operation of the filter, for washing the interior of the filter, or filtering, respectively. As shown, all four of the valves 15, 16, 20 and 21 are the well known globe valves; and the indicating device of each lower valve comprises a round plate or dial 22 fixed on the valve body around the stem and a pointer 23 fixed on the hand wheel of the valve; the dial 22 having a mark 24 at such position relative to the valve parts that when the pointer 23 is at this mark the valve will be open to the right degree for the purpose.

Leading down from the nipple 7, inside the enclosure 1, is the nozzle 25, which, as herein illustrated, comprises a bushing 26 (Fig. 4) having fixed in its end a tube 27; the bushing being screwed into an opening in the top of the tank or enclosure 1 and the nipple 7 being screwed into the upper end of the bushing. The tube 27 has its lower end part pressed inward in the shape of four corrugations so that its lower end is closed except for four small openings 28 (Fig. 5) and radially through the wall of the tube, up next to its junction with the bushing 26, are a number of openings 29, which thus open laterally outward into the upper interior part of the enclosure, away from the pipe 2 at the bottom of the apparatus.

The opening in the top of the tank 1 which receives the bushing 26 and connections just described, is spaced back from the center of the tank; and spaced forward from the center is an additional opening through the top of the tank, closed by a plug 30, which may be removed for insertion of substance into the filter for treatment of the water while being filtered, which may be any of the substances approved for such purposes, for clarifying or sterilizing the water. These locations of the two openings in the top of the tank are those usually found in the water heater or range boiler tanks before mentioned; and the opening in the bottom being central, the pipes lean backward, as seen in Fig. 3. These arrangements, of course, are merely incidental to the use of the tanks to be had ready made, and may be subject to variation in different tanks. By using a ready made tank, I am enabled to produce the filter at less expense on a relatively

small scale of production, since such heater tanks are made in relatively large quantities with attendant economy of manufacture. Should the tanks be made specially for my filter, the upper nipple 7 and connections may be located centrally of the top of the tank, with the pipes extending vertically from top to bottom.

On account of the offset location of the nozzle 25, I do not provide it with the openings 29 at its rear, which is close to the rear wall of the tank; but were it located centrally, it might have these openings arranged entirely around it. With such central arrangement, the opening with the plug 30 might be located nearer to the front, or it will be understood that this opening may be dispensed with, if it is not specially desired to be able to insert substance into the tank conveniently.

With the apparatus thus constructed, filtering material is filled into the tank around the lower passage of the pipe 2, up to within a short distance of the top of the tank, leaving an empty space around the upper passage of the nipple 7 and nozzle 25. Preferably, this material is of coarser structure at the bottom than at the top; being, as here shown, made up of a layer of coarse gravel 31 at the bottom, then over this a layer of fine gravel 32, and over the fine gravel a layer of coarse sand 33, and finally, on top of the coarse sand a layer of fine sand 34. Preferably, the first three layers 31, 32 and 33 are about equal in depth, but the top layer of fine sand 34 is about twice as deep as any of the lower layers.

For filtering, the upper left hand valve 16 and the lower right hand valve 20 are opened and the lower left hand valve 15 and the upper right hand valve 21 are closed. The water then flows from the supply or inlet pipe 12 up through the pipe 14, open valve 16, pipe 10 and pipe 8 and through the nipple 7 and out through the lateral openings 29 and down through the lower openings 28 of the nozzle 25 into the tank or enclosure 1, there to pass first through the fine sand 34 and successively through the coarser layers 33, 32 and 31. The water passes out through the lower pipe 2, pipes 4 and 6, open valve 22, and pipe 18, to the outlet pipe 17, from which pipe the water is taken for use. The water enters under the pressure of the hydraulic system supplying the water, and is retarded in its flow through the filtering material 34, 33, 32, 31 in accordance with the degree of opening of the lower right hand valve 20. The mark 24 being located to insure the correct degree of opening of this valve 20 when the pointer 23 is at the mark, the manufacturer of the filter may enable the less skilled user always to avoid too forceful flow of water through the material, which would disrupt and carry away part of the material, and to avoid such limited flow as would deprive the user of the full capacity of the filter.

For washing the substances out of the filtering material, which have collected therein as a result of the filtering, the lower left hand valve 15 and the upper right hand valve 21 are opened, and the upper left hand valve 16 and the lower right hand valve 20 are closed. The water then flows from the supply or inlet pipe 12 down through the pipe 13, open valve 15, pipes 5 and 3 and up through the bottom pipe 2 into the filtering material and up therethrough to pass out through the nozzle 25 and nipple 7, pipes 9 and 11, open valve 21 and pipe 19 to the outlet pipe 17 from which the water, with the sediment and filtering residues washed from the filtering material, is led to a sewer or otherwise disposed of. In this case, it is the valve 15 nearest the inlet which is adjusted accurately, by aid of its pointer 23 and the marked dial 22, which parts may be set by the manufacturer of the filter to enable the user always to set this valve so that there will be an ample stream of water up through the filtering material for removing the accumulated substances, yet not such an excessive volume as would disrupt and remove the filtering material. The outlet valve 21 is left wide open in washing, so that there is a minimum of back pressure on the water flowing through the material, with the tendency to loosen this material and better permit the dislodgment of the accumulated substances and their free escape with the washing water.

Were the upper passage from the enclosure 1, through the nipple 7, wide open and leading directly away from the inlet of washing water through the lower pipe 2, there would be a tendency for the water, in the upper space above the filtering material, to form a whirlpool, exerting a cyclonic action on the filtering material, especially upon the fine sand 34 adjacent to this space, sufficient to lift considerable quantities of this material and carry it away through the outlet pipes. This is counteracted by the simple means comprising the nipple 25, which, having only very restricted closely assembled openings 28 in its lower end, and having its larger openings 29 directed laterally away from the washing inlet pipe 22 and from the streams of water rushing up from the top of the filtering material, compels the escaping water to take numerous paths to the outlet so that the variously directed streams thus induced counteract each other in a way that is unfavorable to the setting up of the whirlpool or cyclonic action before referred to.

Although the nozzle 25 thus counteracts such tendency to violent action of the washing water, it affords ample capacity for the more moderate outflow thus compelled, with-

out clogging the passage of the impurities being washed from the filter; and when the connections are reversed, for filtering, and the nozzle 25 must form the inlet for the water, its divergent lateral openings 29 and lower openings 28 permit free inflow of the water and tend to distribute it more evenly over the top of the filtering material and thus attain a uniform use of the entire cross-section of material rather than concentrating a stream at the center thereof as would a simple downwardly directed inlet at the top of the enclosure 1. The lateral openings 29 are the principal means of inlet for filtering, and of outlet for washing; but the lower restricted openings 28 in the nozzle 25 are desirable, rather than complete closure of the lower end of the nozzle, because these openings thus afford a drainage from the nozzle, preventing accumulation of sediment in the nozzle during prolonged filtering, which sediment might reach a height where it would clog the main openings 29. Also, it will be noted that the nozzle 25 readily may be removed, should it be necessary to clean or replace it after considerable use of the filter, by simply disconnecting the pipes and unscrewing the bushing 26, and the tube 27 therewith, from the top of the enclosure 1.

Modifications other than those mentioned herein, may occur in various installations of my invention, under varying conditions, and, therefore, although I have rather specifically described certain details herein, I do not wish to be understood as being limited to such precise disclosure, but having thus fully described my invention,

What I claim as new and desire to secure by Letters Patent is:

In a filter comprising an upright cylindrical enclosure having passages respectively in its top and bottom from its interior outward, and filtering material interposed between said passages, resting on the bottom of said enclosure around the lower passage and spaced down from the upper passage said material being progressively of finer texture from bottom to top, inlet means, connections from said inlet means to the respective passages, outlet means, connections from the outlet means to the respective passages, cut-off valves in said connections between the respective passages and the inlet means and outlet means, and a combined filtering-outlet and washing-inlet nozzle in the space above the filtering material spaced away from said material but freely accessible therefrom, leading down from the upper passage and having a lower downwardly directed opening and openings in various lateral directions.

EDMOND ROBERTSON.