July 20, 1943. B. D. RICHMOND 2,324,878

CISTERN CONSTRUCTION

Filed Feb. 19, 1942 2 Sheets-Sheet 1

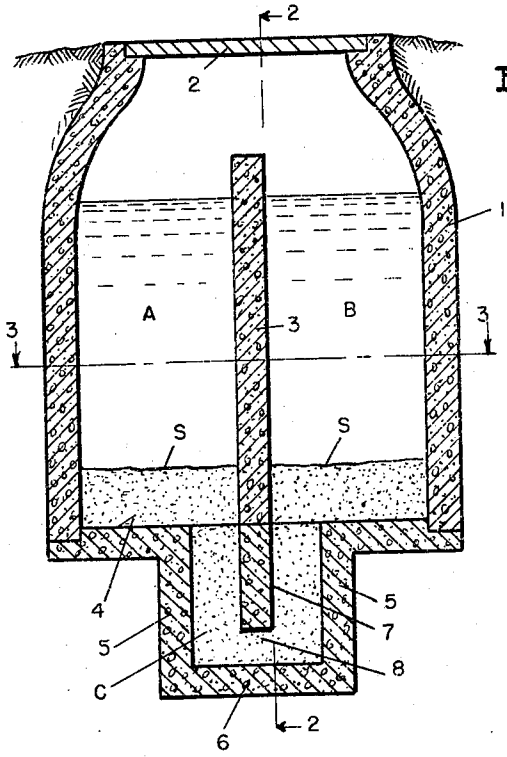


FIG. 1

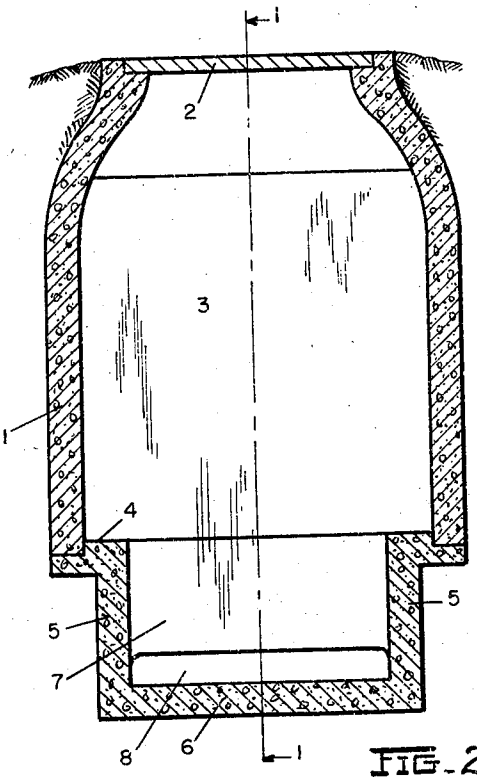


FIG. 2

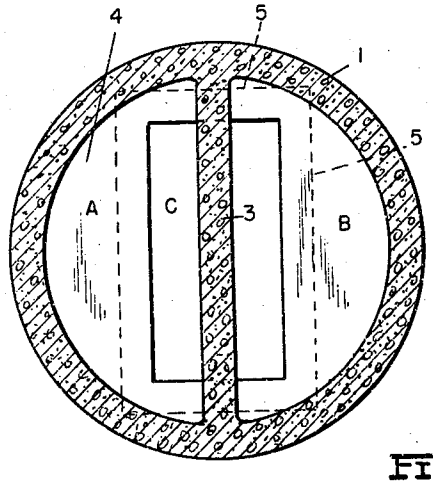


FIG. 3

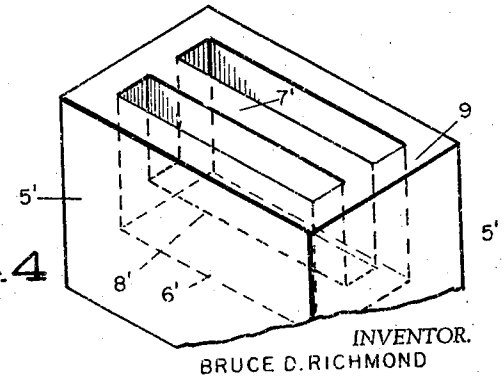


FIG. 4

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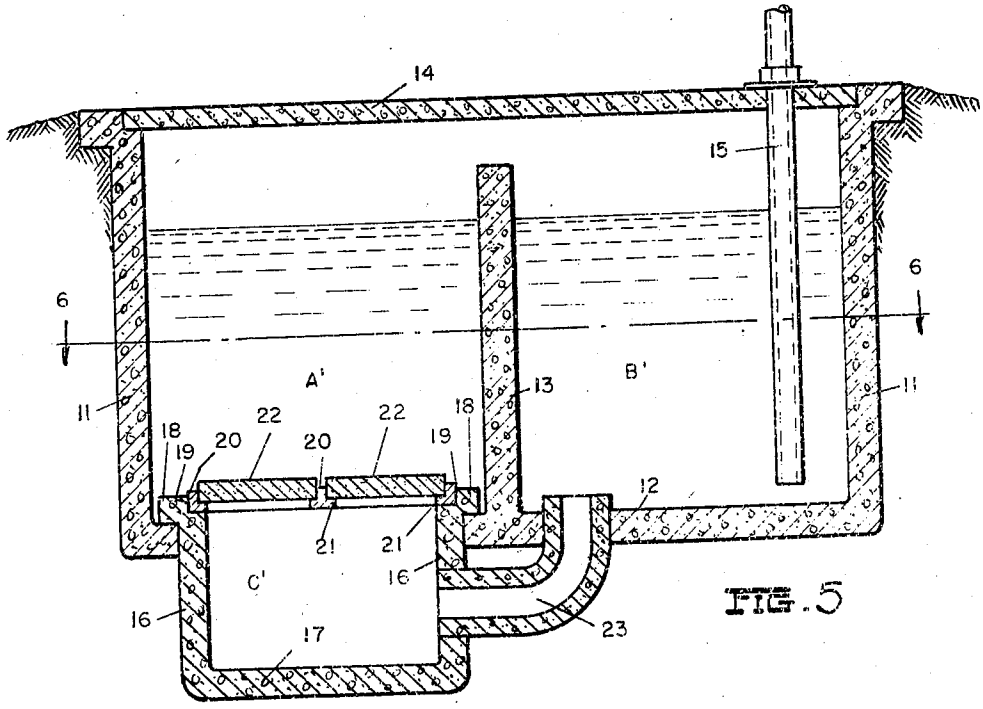


FIG. 5

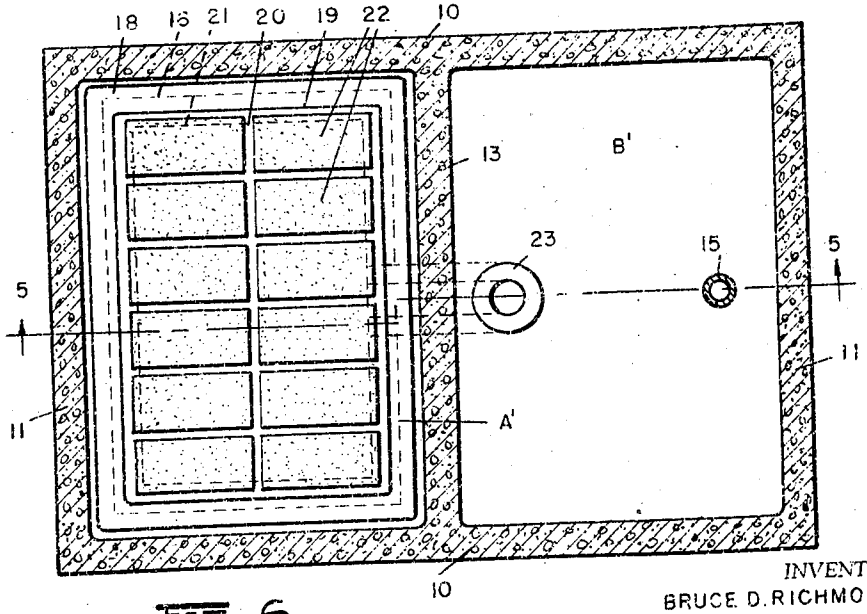


FIG. 6

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2,324,878

CISTERN CONSTRUCTION

Bruce D. Richmond, Steubenville, Ohio

Application February 19, 1942, Serial No. 431,563

6 Claims. (Cl. 72—9)

The present invention relates to a novel construction for a cistern, viz., a water supply reservoir usually located just beneath the ground surface for retaining rain water and surface water for domestic use. The inclusion of foreign particles or substances, dirt and soil in water derived from such a source is usually encountered. Hence, in order to assure a clean water supply, it is desirable that such substances be removed from the cistern water before use.

It is the general object and nature of my present invention to provide means (which not only may be incorporated into cisterns already built and in use, but also employed in new constructions), for effecting a combined filtering and settling action upon the water received in the cistern, and before withdrawal of the water for use. One of the advantages of the construction embodying my invention is that there is provided a maximum filtering and settling area, over which the water cleaning action takes place uniformly, thus eliminating the formation of any locally congested spot or area where the foreign particles or substances might tend to become concentrated and hence either clog the water supply at its point of withdrawal, or seriously affect the efficiency of the cleaning and filtering action. A further object and advantage of my invention is to provide a cistern construction wherein the operation of periodic "cleaning out" or removal of collected foreign material is facilitated.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawings:

Fig. 1 is a vertical sectional view taken through a cistern having a construction embodying the principle of my invention;

Fig. 2 is a vertical sectional view taken upon a view normal to that of Fig. 1 and substantially along line 2—2 thereof;

Fig. 3 is a horizontal sectional view taken substantially along line 3—3 of Fig. 1;

Fig. 4 is a perspective view of the separate unit which may be installed in a previously constructed cistern in order to impart the advantages and operating principles of my invention;

Fig. 5 is a vertical sectional view of a modified form of cistern construction embodying the principle of my invention, and in which the combined settling and filtering unit has been installed in a cistern of the rectangular type, taken substantially along the line 5—5 of Fig. 6; and

Fig. 6 is a horizontal sectional view taken substantially along the line 6—6 of Fig. 5.

Now referring more particularly to Figs. 1–3 of the drawings, the cistern shown therein consists of the vertical and substantially cylindrically shaped side wall portion having a reduced upper end or mouth closed by the customary cover 2. A central partition 3 extends across the cylindrical interior of the side wall 1 and divides the cistern into two compartments A and B, one for receiving the supply of rain water or the like and the other for withdrawing water, such as by the intake pipe of a pump (not shown). The bottom wall 4 of the cistern includes an auxiliary U-shaped chamber C which is formed by the rectangularly shaped sub-compartment having the vertical side walls 5 and the bottom wall 6. A partition 7, forming a continuation of the dividing wall 3, joins opposite end walls 5 and terminates short of the bottom wall 6, leaving an opening 8.

A body of filtering medium, such as clean sand or the like, as indicated at S, fills the chamber C and the chambers A and B up to a point just above the bottom wall 4 of the cistern.

As water is introduced to the chamber A, it will travel down through the body of sand S, beneath the bottom end of the partition 7, through the opening 8 and up through the remaining portion of the body of sand in the bottom of the chamber B. As long as water is supplied to the chamber A and withdrawn from the chamber B (i. e., whenever the water level in chamber B is lower than that in the chamber A), this flow will continue. The water in the chamber A has an opportunity to settle throughout the extent thereof, and the filtering action through the body of sand S takes place in the chamber A, through the auxiliary chamber C, and even in the bottom of the chamber B.

It will thus be seen that there is no locally congested spot at which the foreign material removed from the water will tend to congest due to the presence of any point of concentrated water flow.

At intervals, when the foreign material removed from the water accumulates to such an extent in the cistern as to require removal, such cleaning out operation is simply performed by

shoveling out the body of sand S and occluded foreign matter and replacing it with a quantity of new sand.

Although the bottom wall 4 of the cistern and the auxiliary chamber C are shown as being of monolithic or integral construction, the chamber C may be made in the form of a separate unit as illustrated in Fig. 4, which unit may be assembled in a previously constructed cistern. Such a previously constructed cistern might consist simply of a flat bottom wall and vertical sides, or might also include a central dividing wall, such as the wall 3. This separate unit is of rectangular shape, comprising the side walls 5', the bottom wall 6' and the dividing partition 7' which also terminate short of the surface of the bottom wall 6', leaving an opening therebetween. The top face 9 of the separate unit is installed so that it coincides with the bottom of the cistern. The dividing wall 7' forms a continuation of and is placed in alignment with the previous baffle wall which might already be in the old cistern, or a baffle wall which is built up therein. After the assembly of the separate unit as shown in Fig. 4, a body of sand or similar filtering medium is placed in the unit and in the bottom of the cistern, as previously described in connection with Fig. 1.

In many cases the central dividing wall 3 is made of a porous cement, concrete, or ceramic material, so that a filtering action also takes place through it from the compartment A to the compartment B. This filtering action, of course, is in addition to the previously described filtering action through the body of sand S.

In the modified form of construction shown in Figs. 5 and 6, the cistern proper illustrated therein is of a rectangular rather than cylindrical shape and comprises the vertical side walls 10, and end walls 11 and the bottom wall 12. A central dividing wall 13 forms two compartments A' and B' for the reception and eduction of water, respectively. A cover 14 closes the top of the cistern or reservoir and the eduction pipe 15 extends therethrough to a point near the bottom of the compartment B'.

A sub-compartment is provided in the bottom of compartment A' and comprises the vertical side walls 16 and the bottom wall 17. As illustrated in the drawings, this sub-compartment C' is also in the form of a rectangularly shaped, separate unit and adapted to be mounted on the bottom wall 12 of the cistern proper and retained therein by means of the laterally extending flanges 18. A marginal shoulder 19 is provided in the top side of the vertical walls 16 and a grillwork 20 rests therein. The grillwork 20 in turn has a plurality of openings with marginal shoulders as indicated at 21 for the reception of a porous filtering element such as the porous bricks 22. A connecting conduit or passage, formed by the elbow 23, leads from the chamber C' to the compartment B'. The water thus travels from the compartment A' through the filtering bricks 22 to the compartment C', thence to the withdrawal compartment B'. Filtering action takes place substantially throughout the majority of the area of the bottom of the compartment A'. As the water enters the relatively narrow end of restricted passage 23, the foreign material has already been removed therefrom so that the opportunity of any clogging or impairing of the efficiency of the flow of the water through the cistern is obviated.

It should also be noted, that in the form of construction shown in Figs. 1–4 inclusive, that the water undergoes a reversal of direction of flow at the point where it travels through the filtering medium or body of sand S; viz., the water flows downwardly through the body of sand in the chamber A and then reverses its flow as it passes through the opening 8 and goes upwardly through the body of sand in the bottom of the chamber B. This flow reversal aids greatly in the separation of the foreign matter and enhances the filtering action of the filtering medium in the bottom of the cistern.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In a cistern construction, the combination of a water reservoir, a wall dividing said reservoir into two compartments, one for receiving water and the other for the withdrawal of water, a bottom wall forming the bottom of both of said compartments in the same horizontal plane, and filtering means located below said bottom wall of said reservoir, said filtering means communicating at each end with each of said compartments, whereby all of the water contained in said receiving compartment and passing to said withdrawing compartment passes through said filtering means.

2. In a cistern construction, the combination of a water reservoir, a wall dividing said reservoir into two compartments, one for receiving water and the other for the withdrawal of water, a bottom wall forming the bottom of both of said compartments in the same horizontal plane, filtering means located below said bottom wall of said reservoir, and forming a portion of the bottom of said receiving compartment, and a passage passing under the bottom side of said dividing wall, said passage connecting said receiving compartment and said filtering means to said withdrawing compartment.

3. In a cistern construction, the combination of a water reservoir having a central dividing wall and a bottom wall, a separate filtering unit assembled below said bottom wall, said unit comprising a chamber adapted to form a major portion of said bottom wall at one side of said dividing wall, and a communicating portion leading from said chamber and said filtering unit under said dividing wall to the other side of the latter.

4. In a cistern construction, the combination of a water reservoir having a bottom wall and a central dividing wall projecting vertically upwardly from the plane of said bottom wall, a separate filtering unit assembled below said bottom wall, said unit comprising a bottom and four vertical side walls and a central vertical dividing wall adapted to form a continuation of said first-named dividing wall, said dividing wall in said separate unit terminating short of the bottom of the latter.

5. In a cistern construction, the combination of a water reservoir having a bottom wall and a central dividing wall projecting vertically upwardly from the plane of said bottom wall, a separate filtering unit assembled below said bottom wall, said unit comprising a bottom and four vertical side walls and a central vertical dividing wall adapted to form a continuation of said first-named dividing wall, said dividing wall in said separate unit terminating short of

the bottom of the latter and a body of filtering media particles such as sand or the like filling the interior of said separate unit and the interior of said reservoir to a point above said bottom wall of said reservoir.

6. In a cistern construction, the combination of a water reservoir having a bottom wall and a central dividing wall projecting vertically upwardly from the plane of said bottom wall, a sub-chamber of U-shaped vertical cross sectional form located below said bottom wall and at the bottom edge of said dividing wall, and a filtering medium such as sand and the like filling such U-shaped sub-chamber, whereby water, when passing from one side to the other of said dividing wall, reverses its direction of flow through said filtering medium.

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