No. 809,463. PATENTED JAN. 9, 1906.

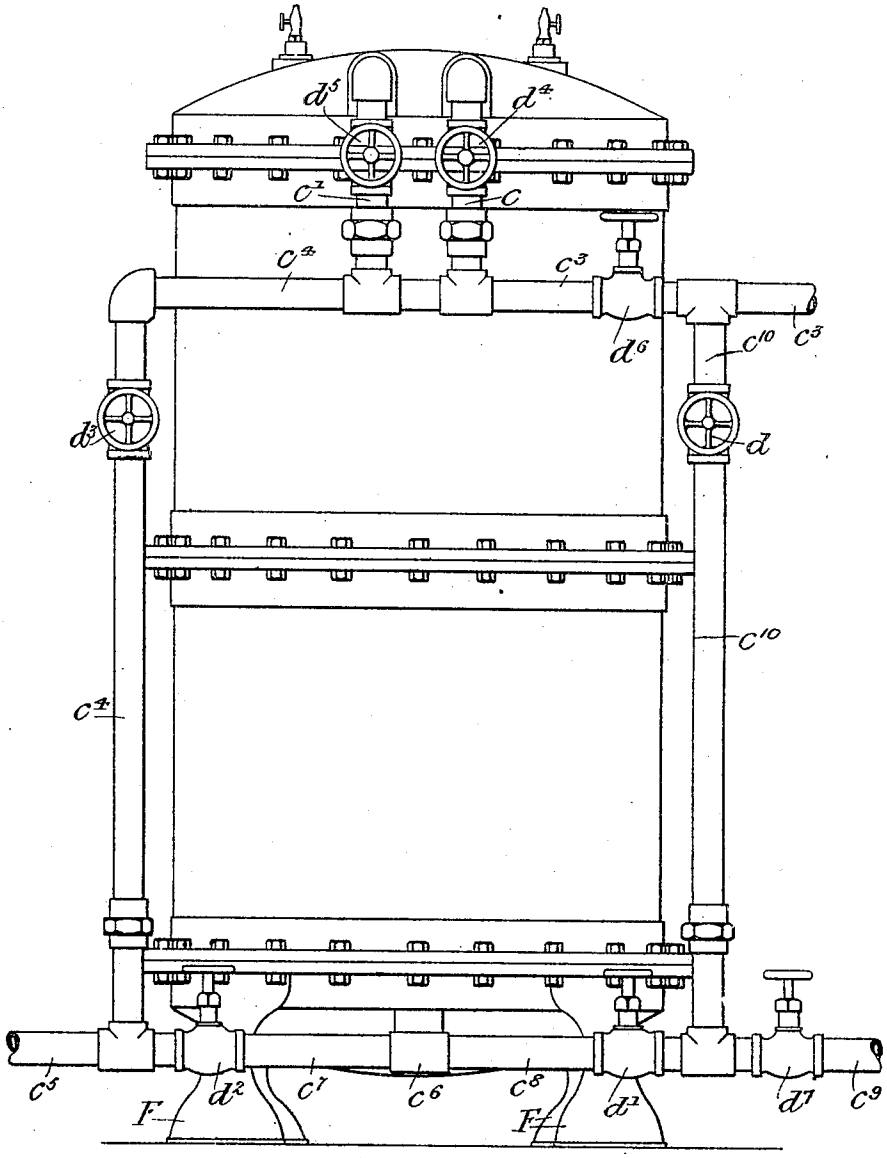
E. W. ROBERTS.

FILTER.

APPLICATION FILED MAY 26, 1903.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses:-

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Chas. W. Cox.

Inventor:-

Ellwood W. Roberts,

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3 SHEETS—SHEET 2.

Fig. 2.

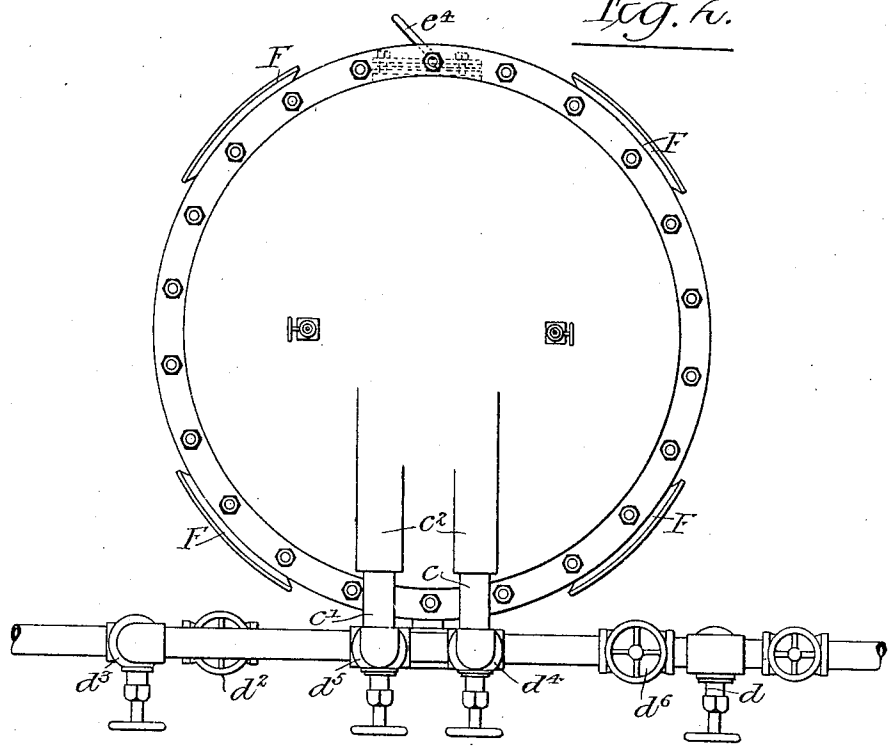


Fig. 5.

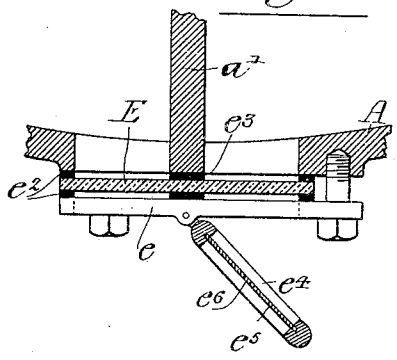
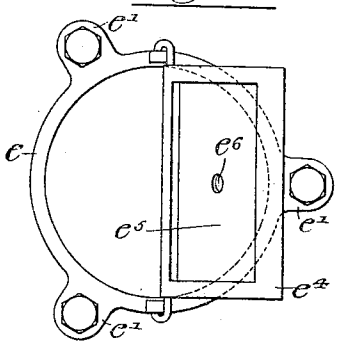


Fig. 6.



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3 SHEETS—SHEET 3.

Fig. 3.

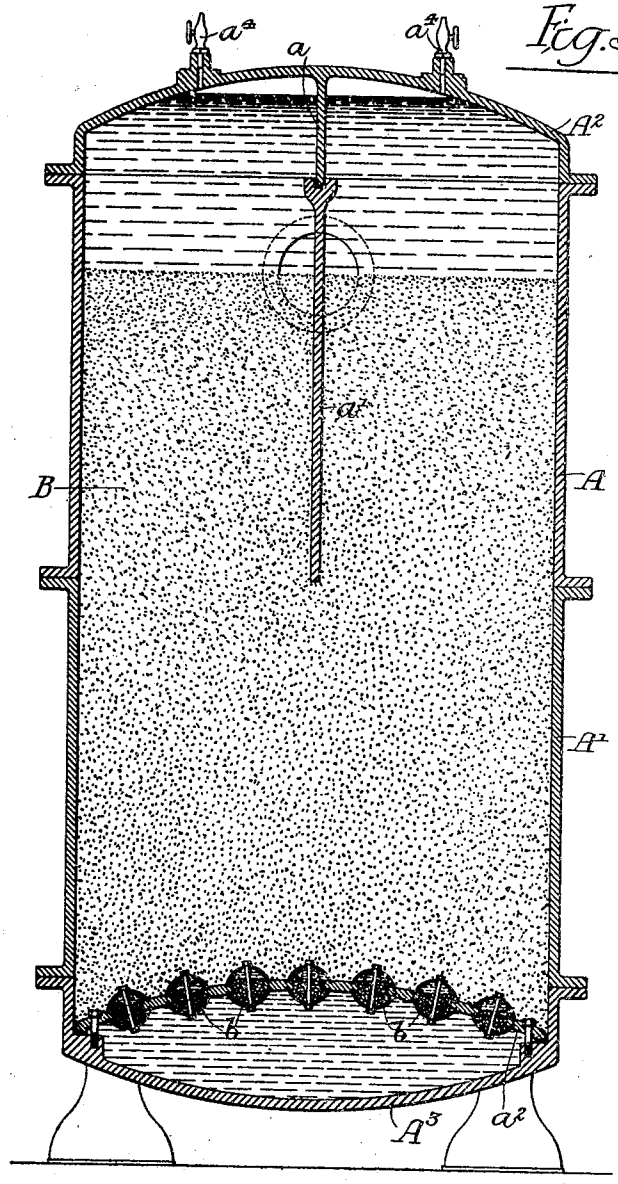
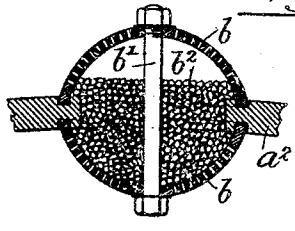


Fig. 4.



Witnesses:-
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Ellwood W. Roberts,
by his Attorneys:
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UNITED STATES PATENT OFFICE.

ELLWOOD W. ROBERTS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ROBERTS MANUFACTURING COMPANY, INCORPORATED, A CORPORATION OF NEW JERSEY.

FILTER.

No. 809,463. Specification of Letters Patent. Patented Jan. 9, 1906.

Application filed May 26, 1903. Serial No. 158,895.

To all whom it may concern:

Be it known that I, ELLWOOD W. ROBERTS, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Filters, of which the following is a specification.

My invention consists of an improved device primarily designed for removing impurities from water, the main object of the invention being to provide a filter which while efficiently performing the functions for which it is designed shall in addition be simple to construct, easy to maintain in operative condition, and at the same time occupy but relatively little space for a given capacity.

A further object of the invention is to provide a filter of such a construction that it shall be possible to conveniently ascertain the condition of certain portions of its interior while it is in operation.

The above objects I attain as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of my improved filter, showing the piping connections therefor. Fig. 2 is a plan view of the filter. Fig. 3 is a sectional elevation, illustrating the detail construction of the interior of my improved filter. Fig. 4 is an enlarged sectional elevation of one of the perforated covers employed in the lower portion of my improved filter, as shown in Fig. 3. Fig. 5 is a sectional plan view, somewhat enlarged, showing the detail construction of the joint between the observation-glass and the filter-casing; and Fig. 6 is an elevation showing the detail construction of the observation-glass holder and the mirror therefor.

In the above drawings it is seen that the filter-casing proper consists of two cylindrical castings A and A′, united to each other by bolts connecting suitable flanged portions, the upper of these castings being provided with a head A^2 and the second with a head A^3. The head A^3 has a vertical partition a extending across it in such manner as to divide it into two substantially equal chambers, there being in the portion A a second partition a', which divides it also into two chambers and which is recessed along its top surface for the reception of the lower edge of the partition a. This edge is preferably made wedge-shaped, so that when it is made to bear upon packing within the recess of the other partition it will not only form a tight joint, but will be capable of crowding outwardly said packing, so as to permit the flanges of the sections A and A^2 to be tightly drawn together.

Near the bottom of the casing proper and extending across the head A^3 is a convex partition a^2, in which are a number of preferably circular openings, around each of which is an annular recess, as shown in Fig. 4, both in the upper and lower surface of the partition. As shown in Fig. 3, the head has an annular surface for the reception of the body of packing, and the edge of the partition is beveled, so that the innermost portion of it engages the packing before the outer portion, thus tending to crowd said packing outwardly against the walls of the head. Semispherical perforated covers b are designed to fit over the openings and be held in place in the above-mentioned annular grooves or recesses by means of bolts b', which extend through the openings in the partition-head a^2 and engage the pairs of covers, so as to firmly confine them in position. Rings of packing are placed within each of the annular grooves, so that a tight joint may be made between the covers and the partition.

I preferably place within each of the inclosures formed of the covers b a mass of relatively coarse sand or gravel b^2, the same being composed of particles larger than the perforations in the heads.

As shown in Figs. 1 and 2, two pipes c and c' enter the upper portion of the casing proper through suitably-formed bosses c^2, one pipe entering the filter-casing at one side of the partition a and the other on the other side of said partition. A pipe c^3 is connected to any suitable source of water-supply and to each of the pipes c and c', it being extended beyond them by means of a section c^4, which finally enters a pipe c^5, connected to the waste.

There is an opening into the head A^3 near the bottom of the filter-casing through a pipe whose end is shown at c^6, which pipe is connected, by means of a section c^7, to the waste-pipe c^5 and by means of a section c^8 to a pipe c^9, leading to a tank or to a distributing

system for purified water. A second pipe c^{10} unites the two pipes c^8 and c^9 to the supply-pipe c^3, and I preferably interpose a valve d at some point in the length of said pipe c^{10}. I similarly provide a valve d' in the connection between the pipe c^8 and the point of junction of the two pipes c^9 and c^{10}, also placing a valve d^2 in the connection between the pipes c^7 and the point of junction of the pipes c^4 and c^5.

If desired, a valve d^3 may be placed at any desired point of the pipe c^4, and there should also be placed valves d^4 and d^5 in the pipes c and c', respectively.

Under operating conditions the cylinder-casing is filled with a body of sand or other filtering medium, as shown in Fig. 3, which rests upon the partition a^2 and fills the casing to within a relatively short distance of its top. At a point approximately on a level with the top surface of this body of filtering material I form an opening in the filter-casing in such position that it is bisected by the partition a', as clearly shown in Figs. 3 and 5, covering said opening with a plate of glass E and retaining said plate in position by means of a frame e, provided with lugs e' for the accommodation of bolts by which said frame and the glass plate may be held to the side of the casing.

Suitable gaskets e^2 are provided between the plate E and the filter-casing on one side and the plate and the frame e on the other side, so as to prevent breakage of the glass and an uneven tension on the bolts and also to form a water-tight joint with the casing. I also preferably place a gasket e^3 between the glass plate and the partition a'. To the frame e I hinge a mirror-frame e^4, in which is supported a mirror e^5, silvered on both sides and provided with an opening e^6 through said silvered portion. As shown in Fig. 6, the frame e^4 is hinged to the frame e, so that it may be caused to reflect light into the interior of the filter-casing upon either side of the partition a', being hung so as to be movable on a vertical axis passing through or parallel with the center of the circular opening in the casing.

In the device illustrated I provide feet F for supporting the filter-casing above the level of the ground and also provide cocks a^4, through which air collecting in the top of the said casing may be permitted to escape.

In operating the device to supply purified water through the pipe c^9 the valves d and d^3 are shut, while the valves d^4 and d^5 are opened, as is also the valve d^6, placed in the length of the pipe c^3 between its point of junction with the pipe c and the pipe c^{10}. Under such conditions water flows through the pipe c^3, passes into the filter-casing through the pipes c and c' into the chambers formed by the partitions a and a' and flows down through the body of filtering material B, through the material b^2 contained in the covers d, into the space between the partition a^2 and the bottom of the head A^3, and finally passes out through the pipes c^6 and c^8, the valve d', and pipe c^9, the valve d' being opened for this purpose, while the valve d^2 is closed. When the filter ceases to operate properly, or when the quantity of water delivered in any given time has become diminished to a predetermined extent, as caused by the collection of foreign matter upon the upper surface of the body of filtering material B, I close the valve d^7 and proceed to clean the filter. By the proper use of the mirror e^5 light may be reflected into the interior of the filter-casing, so as to show the condition of the top surface of the body of filtering material, thus rendering it possible to ascertain at a glance whether the filter is in proper working condition.

In cleaning the filter the valves d^6, d^5, and d^2 are closed and the valves d and d^4 are opened, water from the source of supply then passing from the pipe c^3 into the pipes c^{10} and c^8 to the pipe c^6 and into the bottom of the filter-casing, after which it rises through the body of material B. Since there is no escape for it from that part of the casing in communication with the pipe c', all of the inflowing water is caused to pass through the body of filtering material in the chamber formed by the partitions a and a' and in communication with the pipe c, and it will therefore be noted that the whole volume of inflowing water is directed through a relatively small body of said material, so that said body is in a relatively short time thoroughly washed, the dirty water carrying the foreign material passing out through the pipe c^3 into the pipe c^4, through the valve d^3, and out through the waste-pipe d^5. When this portion of the filtering material in the casing has been thoroughly cleansed, as may be determined by inspection through the glass-covered opening in the side of the casing, the valve d^4 is shut and the valve d^5 is opened, thereby forcing the body of water flowing through the filter to pass through and cleanse the body of material contained in the second chamber, formed by the partitions a and a'. After all the filtering material has been thoroughly washed, as above described, valves d, d^3, and d' are closed, while the others are opened, with the result that water passes from the source of supply into the filter through both branch pipes c and c' and flows to waste-pipe c^5 through pipe c^7, such flow being allowed until the outflowing water is perfectly clear, when valves d' and d^7 are opened and valve d^2 is closed.

It will be noted that in constructing my improved filter I preferably employ pipes of the same diameter throughout, so that the water flowing in through the pipes c^3 is delivered at

full pressure to either of the relatively small volumes of filtering material contained in the chambers formed by the partitions *a* and *a'*.

The body of relatively coarse sharp gravel placed in the covers b^3 not only serves to prevent the filtering material B from passing into the bottom of the head A^3, but also by its movement as occasioned by the flow of water through said covers automatically keeps clean and free from stoppage the perforations through the same.

In using the mirror e^5 it is preferably turned on its hinge at an angle to the glass plate E and a light held between it and said plate, so that the rays from the light are strongly thrown into the interior of the filter-casing, and the condition of the material therein may be ascertained by looking through the small hole e^6 in the mirror. If it is desired to look into the other side of the filter-casing, the mirror-frame is swung on its hinges and the position of the source of light changed so that rays of light may be thrown as desired.

I claim as my invention—

1. A filter consisting of a casing containing filtering material, said casing including a portion having a partition extending across it and a head also having a partition placed to form a continuation of the partition in the first portion, said casing being provided with an inlet and an outlet for liquid to be filtered substantially as described.

2. A filter-casing, containing filtering material having a head with a vertical partition extending across the same and a body portion to said casing having a partition formed in continuation of the partition in the head, with means for forming a joint between said two partitions, said casing being provided with an inlet and an outlet for liquid to be filtered substantially as described.

3. A filter consisting of a casing containing filtering material including a substantially cylindrical section or sections and a head-section, one of the cylindrical sections having a vertical partition extending across it and the head-section also having a partition formed in continuation of the first partition, said casing being provided with an inlet and an outlet for liquid to be filtered substantially as described.

4. A casing for a filter, the same containing filtering material consisting of two sections each having a partition, one of said partitions being formed with a recess for the reception of the end of the other partition so as to form a substantially continuous surface therewith, said casing being provided with an inlet and an outlet for liquid to be filtered substantially as described.

5. A filter-casing containing filtering material, said casing including two sections each having a partition, one of said partitions being formed with a recess and the end of the other partition being tapered and adapted to enter the recess, with packing for said recess, said casing being provided with an inlet and an outlet for liquid to be filtered substantially as described.

6. A filter having openings for the entrance and exit of fluid and including a plurality of sections, certain of the same having partitions provided with means for forming a relatively tight joint between them, with filtering material filling the same below the portions having the partitions and partially filling the sections on both sides of said partitions, substantially as described.

7. A filter provided with openings for the entrance and exit of fluid and consisting of a plurality of sections including a head, said sections being mounted one upon the other, partitions extending vertically above one another across a plurality of the upper sections, and having means for forming a relatively tight joint between their adjacent ends with filtering material in the lower portion of the filter below the partitions, said material extending into the portions of the filter on both sides of the partitions, substantially as described.

8. A casing for a filter, the same containing filtering material, including sections having partitions extending across them in substantially the same plane, the end of one of the partitions being enlarged and recessed, packing in said recess, said enlarged end being placed to receive the end of the partition of the other section, said end of the other section being sharpened along the edge contacting with the packing, said casing being provided with an inlet and an outlet for liquid to be filtered substantially as described.

9. A filter-casing having a partition in its lower portion provided with filtering material, said partition having an opening or series of openings through it with a plurality of perforated covers for each of said openings, each of said covers coacting with the other so that said covers are retained in position over the openings, said covers being of material curved to project beyond the surface of the partition, said casing having openings for the entrance and exit of fluid treated, substantially as described.

10. A filter-casing having a partition in its lower portion, said partition having an opening or a series of openings through it with a plurality of perforated covers for each of said openings, the covers being formed of curved material and one of the same having a portion extending above the partition and the other projecting below said partition, said casing containing filtering material and being provided with openings for the entrance and exit of fluid treated, substantially as described.

11. A casing having a partition extending

across it, said partition being provided with openings each of which is surrounded by annular recesses in both the upper and lower faces of the partition, with two perforated covers for each opening, said covers having portions entering the recesses and means for holding the covers in position, said casing containing filtering material and being provided with openings for the entrance and exit of fluid treated, substantially as described.

12. A casing having a partition extending across it, said partition having a series of openings, each of which is surrounded by annular recesses, there being a recess in the upper and one in the lower face of the partition, two perforated covers for each opening, each extending into one of the recesses and projecting from opposite sides of the partition, and a bolt for connecting said covers, said casing containing filtering material and being provided with openings for the entrance and exit of fluid treated, substantially as described.

13. In a filter, the combination of a casing, having openings for the entrance and exit of fluid treated, a partition having a series of openings and extending across the lower portion of the casing, a pair of perforated covers of curved material projecting beyond the surface of the partition for each opening, one projecting above and the other below said partition, means for holding said covers in position and granular material confined between each pair of said covers, substantially as described.

14. In a filter, the combination of a casing, having openings for the entrance and exit of fluid treated, a partition extending across said casing and provided with openings, a pair of similar perforated covers for each of the openings projecting from opposite faces of the partition, means for holding said covers in position, means for making a tight joint between the edges of the covers and the partition, and granular material between each pair of covers, substantially as described.

15. A filter-casing containing filtering material in combination with a perforated partition across the same, said casing having a surface for the reception of the said partition, packing between the said surface and the partition, the edge of the partition being beveled so that the portion thereof nearest the center engages the packing before the portion farther from said center, said casing having openings for the entrance and exit of fluid substantially as described.

16. A filter-casing consisting of a plurality of sections, one of said sections having a surface for the reception of a ring of packing, a partition extending across the casing, packing on said surface for engagement by the edge of the partition, said edge being formed to force the packing outwardly from the center thereof, openings through said partition, perforated covers for said openings and a body of filtering material carried upon said partition, said casing having openings for the entrance and exit of fluid substantially as described.

17. A filter-casing having a vertically-placed partition extending across it and provided with an opening in its wall extending on both sides of said partition, filtering material in the casing with a plate of transparent material covering said opening and means for forming a tight joint between itself and the edge of the partition and the side of the casing, said casing having openings for the entrance and exit of fluids under treatment substantially as described.

18. A filter-casing having a partition extending across its upper portion and provided with an opening extending on both sides of said partition, filtering material in the casing, a plate of glass closing said opening, with means for projecting light into the casing, said casing having openings for the entrance and exit of fluids under treatment substantially as described.

19. A filter-casing having a partition extending across its upper portion and provided with an opening extending on both sides of said partition, filtering material in the casing, a plate of glass closing said opening, and a mirror supported so as to be capable of projecting light into the casing on either side of the partition, said casing having openings for the entrance and exit of fluids under treatment substantially as described.

20. A filter-casing having a partition extending across its upper portion and provided with an opening extending on both sides of said partition, filtering material in the casing, a plate of glass closing said opening, and a mirror hinged to the casing so as to be free to swing in a position which will make it possible to project light into the casing on either side of the partition, said casing having openings for the entrance and exit of fluids under treatment substantially as described.

21. A casing having a partition extending across it, and provided with an opening extending on both sides of the partition, filtering material in the casing, a plate of glass closing said opening, and packing between the wall of the casing and the plate and between the edge of the partition and the plate with means for retaining said plate in position, said casing having openings for the entrance and exit of fluids under treatment substantially as described.

22. A casing having a partition extending vertically across it and provided with an opening extending on either side of said partition, filtering material in the casing, a plate

of glass covering said opening, a frame hinged in a line substantially coincident with the plane of the vertical partition and a mirror carried in said frame so as to be free to project light into the casing on either side of the partition, said casing having openings for the entrance and exit of fluids under treatment, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ELLWOOD W. ROBERTS.

Witnesses:
WILLIAM E. BRADLEY,
JOS. H. KLEIN.