

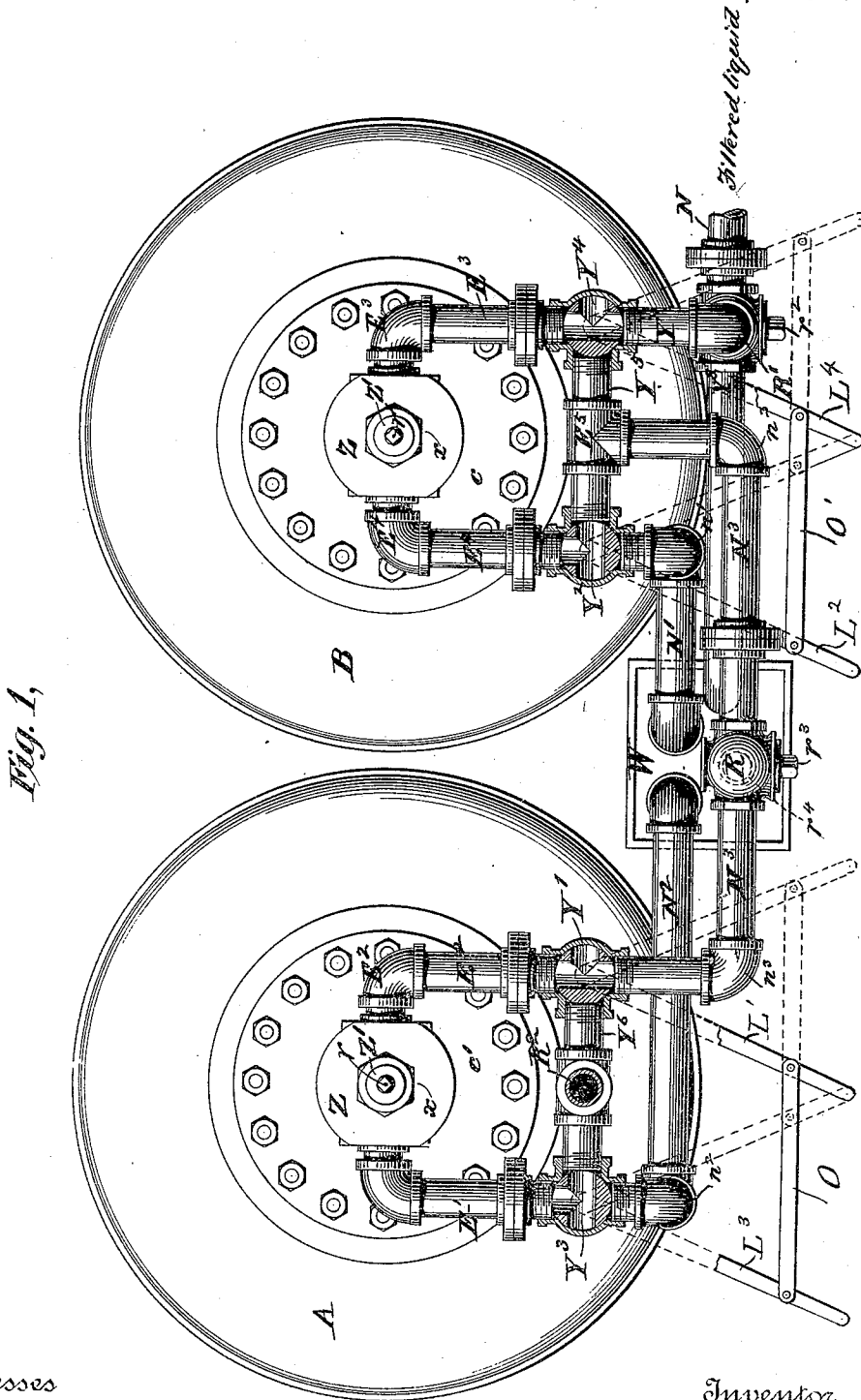
(No Model.)

4 Sheets—Sheet 1.

D. WILLIAMSON.
FILTER.

No. 511,828.

Patented Jan. 2, 1894.



Witnesses
C. E. Ashley
H. W. Lloyd.

Inventor
David Williamson
By his Attorney
William Parker & Co. Secy

(No Model.)

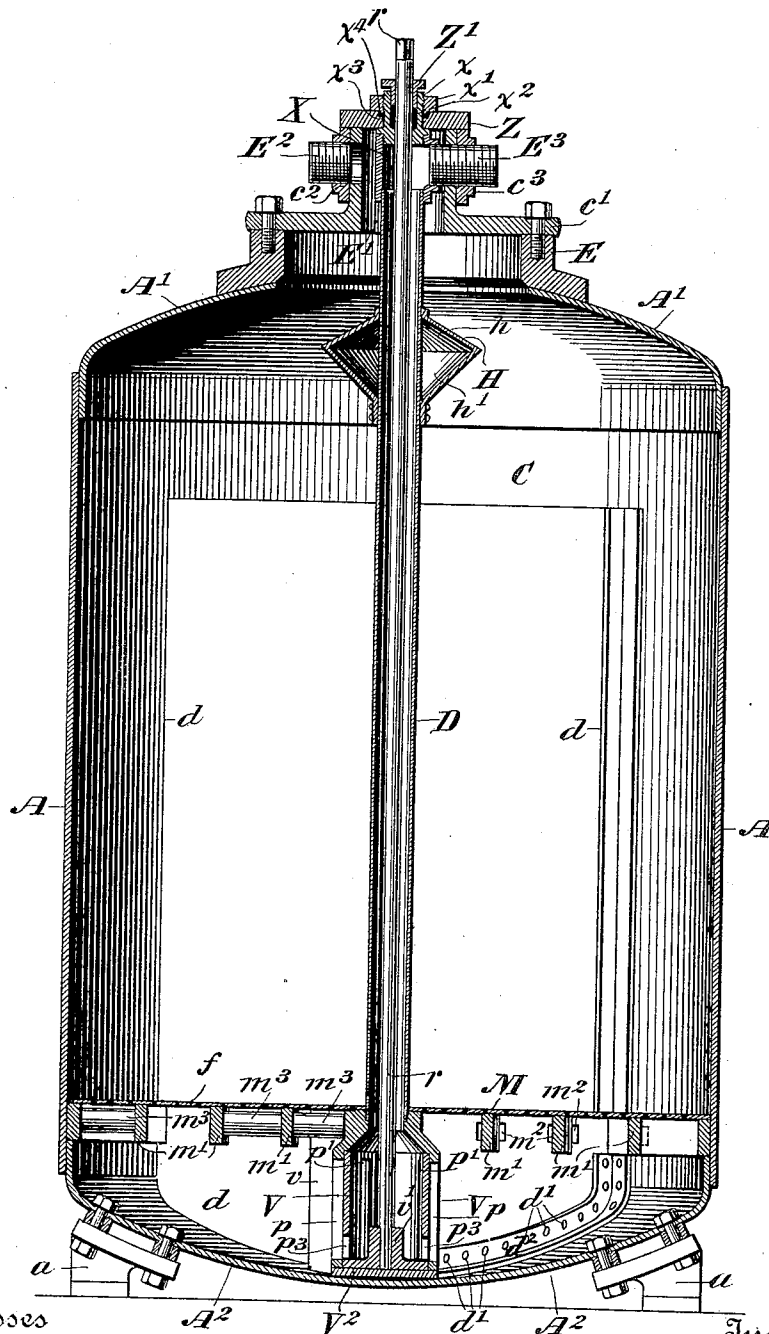
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Fig. 2.



Witnesses
C. E. Ashley
W. L. Lloyd.

Inventor
David Williamson
By his Attorney
William Parker Butler

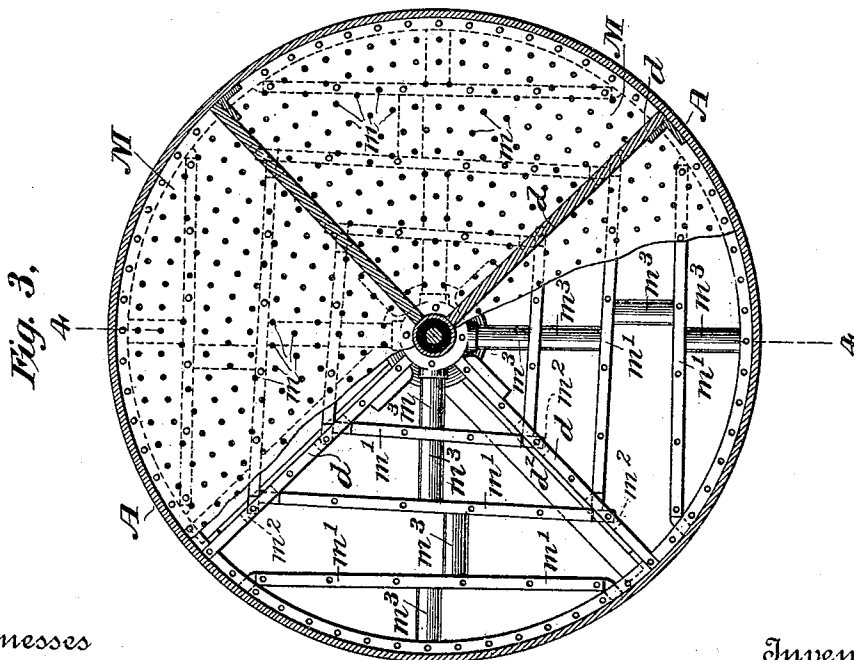
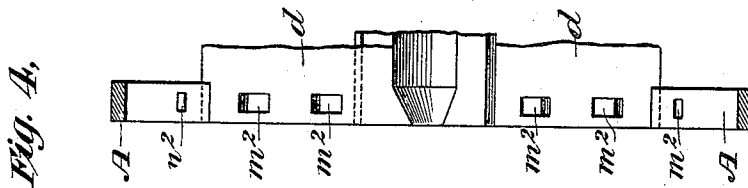
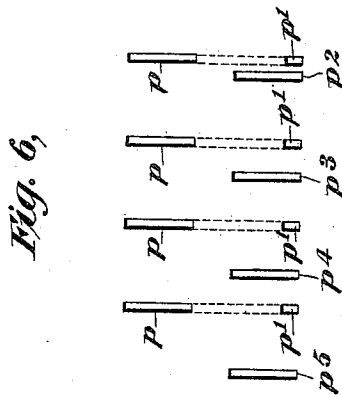
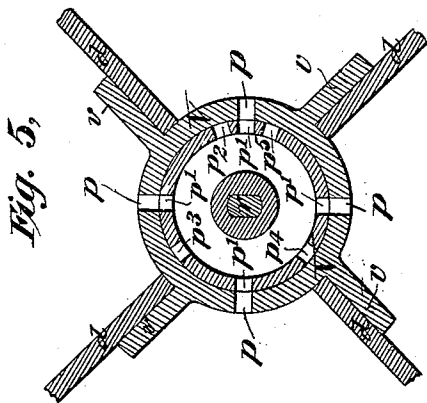
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J. W. Lloyd.

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David Williamson
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4 Sheets—Sheet 4

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Fig. 7,

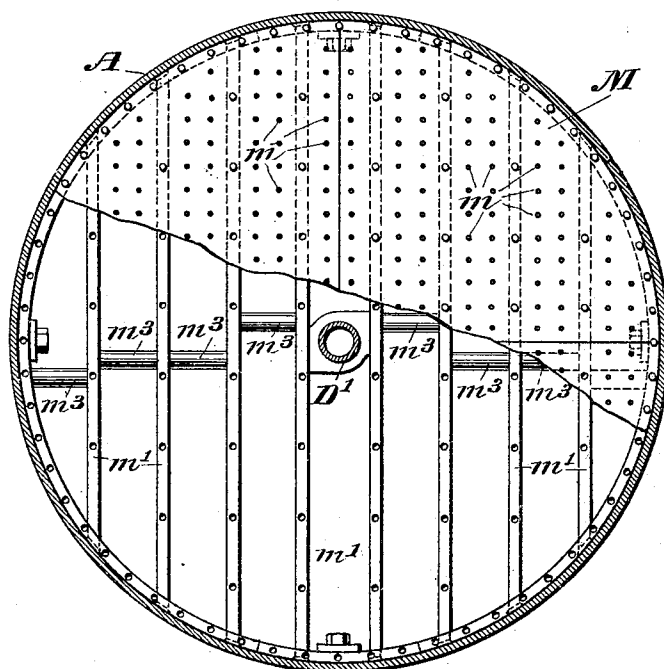
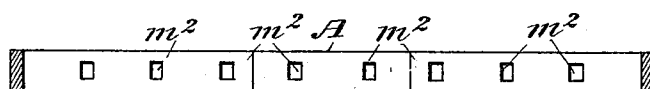


Fig. 8,



Witnesses
C. E. Ashley
H. W. Lloyd.

Inventor
David Williamson
By his Attorney
Willard Parker Butler

UNITED STATES PATENT OFFICE.

DAVID WILLIAMSON, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO
HENRY B. ANDERSON, OF SAME PLACE.

FILTER.

SPECIFICATION forming part of Letters Patent No. 511,828, dated January 2, 1894.

Application filed December 28, 1892. Serial No. 456,575. (No model.)

To all whom it may concern:

Be it known that I, DAVID WILLIAMSON, a citizen of the United States, and a resident of the city, county, and State of New York, have
5 invented certain new and useful Improvements in Filters, of which the following is a specification.

My invention relates to an improvement in apparatus for filtering all kinds of liquids,
10 and particularly to that class of filtering apparatus which is known as high pressure filters, in which the liquid to be filtered is forced through the apparatus by means of pressure from any suitable source or gravity.

15 The invention relates more particularly to that class of filters in which the filtration is effected in a downward direction through one or more suitable filter beds.

The object of the present invention is to
20 provide more convenient means of cleansing the filter beds than has heretofore been practicable, and to consolidate and concentrate the supply and discharge pipes, with a view to reducing to a minimum the number of
25 valves and connections employed and to enable the apparatus to be controlled and manipulated as far as possible from a central point in the system, and at the same time, by means of the construction of certain details
30 of the interior parts of the apparatus, to facilitate the removal and cleansing of the beds and the apparatus itself, and render the method of washing out more effective.

The invention will be best understood by
35 reference to the accompanying four sheets of drawings forming a part of this specification, in which—

Figure 1 is a plan view of the apparatus, constructed with two filtering chambers; Fig.
40 2, a vertical section of one of the chambers; Fig. 3 a plan view of the lower part of the filter chamber showing the floor of the filtering chamber partly broken away; Fig. 4, a vertical section on the line 4—4 of Fig. 3; Fig. 5, a
45 plan view of the valve in the bottom of the filter chamber; Fig. 6, a developed view of the valve ports, and Fig. 7 an alternative construction of the filter-bed floor where sectional washout is used in the bottom of the chamber and Fig.
50 8 a vertical cross section of the form of floor shown in Fig. 7.

Similar letters refer to similar parts throughout the several views.

In the drawings, A B Fig. 1 represents two
vertical cylindrical filter vessels composed of
55 suitable material terminating at top and bottom in the caps A' and A². In the interior is a floor *f*. The interior of the chamber C, is subdivided into any number of separate compartments, of which four are here shown, by means
60 of the vertical diaphragms *d d d d*, which extend upward a certain distance into the chamber from the floor *f*, and downward below the same to the bottom A², of the shell A., so as to
65 subdivide the space below the floor *f* in the same manner, into separate compartments. Through the center of the compartments passes a vertical discharge pipe D., which
70 passes downward through the floor *f* and terminates at its bottom in a valve V., by means of which it is connected with the separate
chambers below the filter bed. The shell A. is supported upon the brackets *a a*, resting
75 upon suitable pillars of masonry or other suitable foundation. The cap A' is provided with a circular casing E, and the discharge
80 pipe D, passes up through the casing and through an opening E' in the top of the same. The opening E', projects vertically upward as shown in Fig. 2, and contains two ports
85 through one of which the supply pipe E² enters the opening and through the other of which E³, the discharge pipe passes out. The space E' is closed on top by a plate Z.
90 This plate is provided at the center with a circular opening *x*³. The pipe D terminates within in the space E' in a T joint X, from one side of which a hollow coupling *x*² passes
95 upward through the opening *x*³ in the plate Z. This coupling is provided at its upper extremity with a screw-thread *x*, over which a nut *x*¹ provided with a circular flange *x*³ is
100 screwed fitting down over a gasket *x*⁴ in the edge of the opening *x*³. By screwing down the nut *x*¹ to the upper surface of the plate Z, the whole system is firmly held together and braced and in this way the heads
A' and A² can be made of lighter metal than they could otherwise be made of and at the
same time resist the necessary pressure in the
apparatus. The pipe D terminates below the
105 bed *f*, in a circular valve V, Figs. 2, 3 and 6

provided with the radial lugs or wings v , by means of which it is attached to the diaphragms d d . This valve rests upon the plate V^2 upon the bottom of the chamber A^2 , which is bolted to the angle irons d^2 d^2 provided with rivets d' d' by which the diaphragms d d are attached to the head A^2 and its outer walls are provided with vertical slots, each of which serves as a port for each of the separate compartments. The cut off is effected by a cylindrical sleeve V within the valve seat, resting upon a bearing v' , which is rotated by a rod r , the lower extremity of which is flattened out and set into an opening sunk in the bearing v' , which is cast in one piece with the sleeve. The sleeve V is provided with any convenient number of ports p' p^2 p^3 p^4 p^5 p^6 p^7 p^8 , of varying size, so arranged with reference to each other, that the water may be allowed to emerge from any one or all of the compartments beneath the filter bed.

Fig. 6 shows the arrangement of the ports, in diagrammatic form, in which the circular valve is supposed to be developed by rolling out and laying flat. In this figure, the small rectangles p' p' p' p' , are four openings on the lower line the aggregate area of which is equal to the whole cross-section of the discharge pipe and the large rectangles are four large openings, each of which is equal to the whole cross section of the discharge pipe. When the valve is turned so that the ports p' are brought opposite to the ports p , the ingress of liquid for wash out, is equal through each of the four chambers beneath the filter bed. When now, the valve is turned so that the port p^2 comes opposite to the port p , all the wash-out liquid passes through the port p , into one chamber, and all the other chambers are cut off. The same is the case when the ports p^3 , p^4 and p^5 are brought opposite to the ports p in any other chamber. The effect of turning the larger ports on the lower line of the diagram, so that the same shall come opposite the external port, is merely to admit the whole volume to any given chamber and cut off the volume from the other chambers entirely.

For the purpose of distributing the liquid to be filtered over the bed, a distributor H may be employed composed of two hollow cones h and h' placed around and bolted to the pipe D , with their bases put together as shown in Fig. 2.

The floor of the filter bed is composed of horizontal sheet iron plates M . M . M ., fitting into each compartment, and provided with any suitable number of perforations m , m , m . These plates rest upon the girders m' , m' , m' , the ends of which are loosely inserted into the openings m^2 , m^2 in the vertical diaphragms d , d , d , d . The tops of the girders may contain suitable openings for bolting the plates down upon the girders.

When the chamber C is not divided into radial compartments, the floor may be con-

structed, as shown in Figs. 7 and 8 of any number of perforated plates M , resting on similar horizontal girders m' m' , the ends of which are riveted into openings m^2 m^2 , in segments of rings m^3 , of convenient size to be admitted through the top of the apparatus running around the interior of the chamber, below the filter bed, as shown in Figs. 7 and 8. In this construction of filter bed, the valve at the bottom of the pipe D is dispensed with, as the discharge of the filtered liquid can be controlled and regulated by the valve in the pipe E^3 .

The arrangement of supply and discharge pipes used where two separate filter chambers are employed, side by side, is shown in Fig. 1. Here A and B represent the two chambers. E' and E^4 are in each case the inlet pipes and E^2 and E^3 the discharge pipes. Each of these terminate in the three way valves Y^2 and Y^3 and Y' and Y^4 respectively, which are connected by the pipes Y^5 and Y^6 . A "T" joint is provided in each of the pipes Y^5 and Y^6 . Into the "T" joint R^2 the main supply pipe is inserted, and the "T" joint E^5 is connected by the pipe N^3 emerging from the valve Y' . In the pipe N^3 is placed a further three-way valve R one way of which discharges by a pipe r^4 downward into the discharge tank W , which is operated from the square r^3 . The valve Y^2 connects with the discharge tank W by means of the pipes N' and the valve Y^3 by means of the pipe N^2 . From the valve Y^4 a pipe Y^7 leads to a "T" joint R' , containing a three way valve r^2 ; from this the pipe N leads to the reservoir for storing the filtered liquid, and the pipe Y^8 leads to the discharge tank W .

The valves Y' and Y^3 are actuated by the levers L' and L^3 connected by the bar O so as to operate together, and the valves Y^2 and Y^4 are similarly actuated by the levers L^2 and L^4 similarly connected by the bar O' , as shown in Fig. 1. By moving the levers to the right or to the left, the position of both the valves is reversed and the direction of the liquid is changed, and the liquid is either filtered through the bed or else the bed is washed out.

The operation of the apparatus is as follows: When water is to be filtered it is allowed to enter through the opening R^2 and the top of the chamber A . It passes downward through the filter bed, and through the floor f , and enters the space under the filter chamber; from thence it passes upward through the discharge pipe D , and emerges through the pipe E^2 ; thence it passes through the valve R and through the pipe N^3 , through the valve Y^2 which is set in the manner shown in Fig. 1; and thence downward through the pipe E^4 into the vessel B ; thence it traverses the filter bed, in the same manner as before, and passes downward through the floor and emerges through the pipe D out through the pipe E^3 , and thence through the valve Y^4 into the pipe N , where it passes into the reservoir.

When it is desired to wash out the cham-

bers, the valves are turned so as to take the reverse position, as above indicated. The liquid to be filtered passes then in through the valve Y' and the pipe E^2 , into the first cylinder A., passing downward through the pipe D. and upward and through the filter bed, thus washing out the same. The discharge from this bed passes out through the valve Y^3 through the pipe N^2 , into the discharge tank W.

When it is desired to wash out the vessel B. the filtered water from A. is allowed to traverse the pipe N^3 , and traverse the valve R. into the T joint E^5 . The valves Y^2 and Y^4 are then reversed from the position shown in Fig. 1, and the water passes through Y^4 and enters pipe E^3 , and thence passes downward through the pipe D. within the vessel B. to the bottom of the same and up through the bed, scouring and washing out the same, and emerges through the pipe E^4 , and thence through the valve Y^2 and the pipe N' into the discharge tank. After the operation of washing out is completed, and the operation of filtering begun again, the earlier portions of the filtered liquid are sometimes found to contain a little sediment. For this purpose the valves R and R' are provided, by means of which the earlier water resultant from filtration may be removed and drawn off, by turning the valves R and R' so as to cut off the water from the pipes N and N^3 and allow it to pass through the pipe Y^3 and downward through R into the discharge tank W. As soon as this water emerges from the pipe Y^3 or from R, pure and clear, the direction of the valves may be reversed and the filtered liquid allowed to enter the reservoir.

I claim as my invention—

1. In a filtering apparatus the combination substantially as hereinbefore set forth with the top of the chamber of the cylindrical passage E' in the top of the casing c' a pipe E^2 leading into the same from the source of supply, a T joint placed in the center of the passage, a pipe leading from the bottom thereof through the center of the apparatus to the space below the filter bed, a second pipe leading therefrom out through the casing to the filtered water reservoir and a third pipe leading out through an opening in the top of the casing surrounded by a suitable packing, and surmounted by a suitable screw nut by which the internal parts of the apparatus are held together.

2. In a filter apparatus the combination substantially as hereinbefore set forth, of a vertical shell of suitable construction, diaphragms extending upward from the bottom of the shell whereby the chamber is divided into a convenient number of separate com-

partments, a horizontal floor supporting a granular filter bed in each compartment, a central discharge pipe passing vertically downward through the upper part of the chamber to the bottom and provided below the floor with a valve through which the discharge of the chambers below the floor is effected and a supply pipe passing into the top of the shell.

3. In a filtering apparatus the combination substantially as hereinbefore set forth, of a vertical shell subdivided into compartments, each containing a granular filter bed supported by a perforated horizontal floor, and a discharge pipe vertically through said apparatus a valve in which the discharge pipe terminates, placed beneath the floors provided with ports connecting into each compartment, whereby all of the wash-out liquid entering through the discharge pipe may be admitted into any one compartment or equally into all of the compartments.

4. In a filtering apparatus the combination substantially as hereinbefore set forth, with the vertical diaphragms whereby the chamber is divided into compartments, of a filter bed floor placed in each compartment, composed of perforated metal plates resting upon removable girders, the ends of which fit into openings in the vertical diaphragms.

5. In a filtering apparatus the combination with the central discharge pipe passing downward and riveted to the bottom of the shell, of the "T" joint X in which the same terminates, the screw coupling x passing out through the top of the exterior casing surrounded by the packing x^4 and held in position by the screw nut x' provided with the ring x^2 and the rod r for actuating the wash-out valve V passing through the screw coupling x and held in position therein by the coupling Z'.

6. In a filtering apparatus the combination with the discharge pipe below the filter floor of a valve composed of a cylindrical shell placed in the center of the chamber and from which the separate chambers radiate, ports leading from the valve into each chamber and a cylindrical sleeve containing ports of different dimensions within the valve actuated by a rod passing vertically upward through the discharge pipe and arranged to be turned from the outside of the filter.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 17th day of December, 1892.

DAVID WILLIAMSON.

Witnesses:

WILLARD PARKER BUTLER,
HENRY B. ANDERSON.