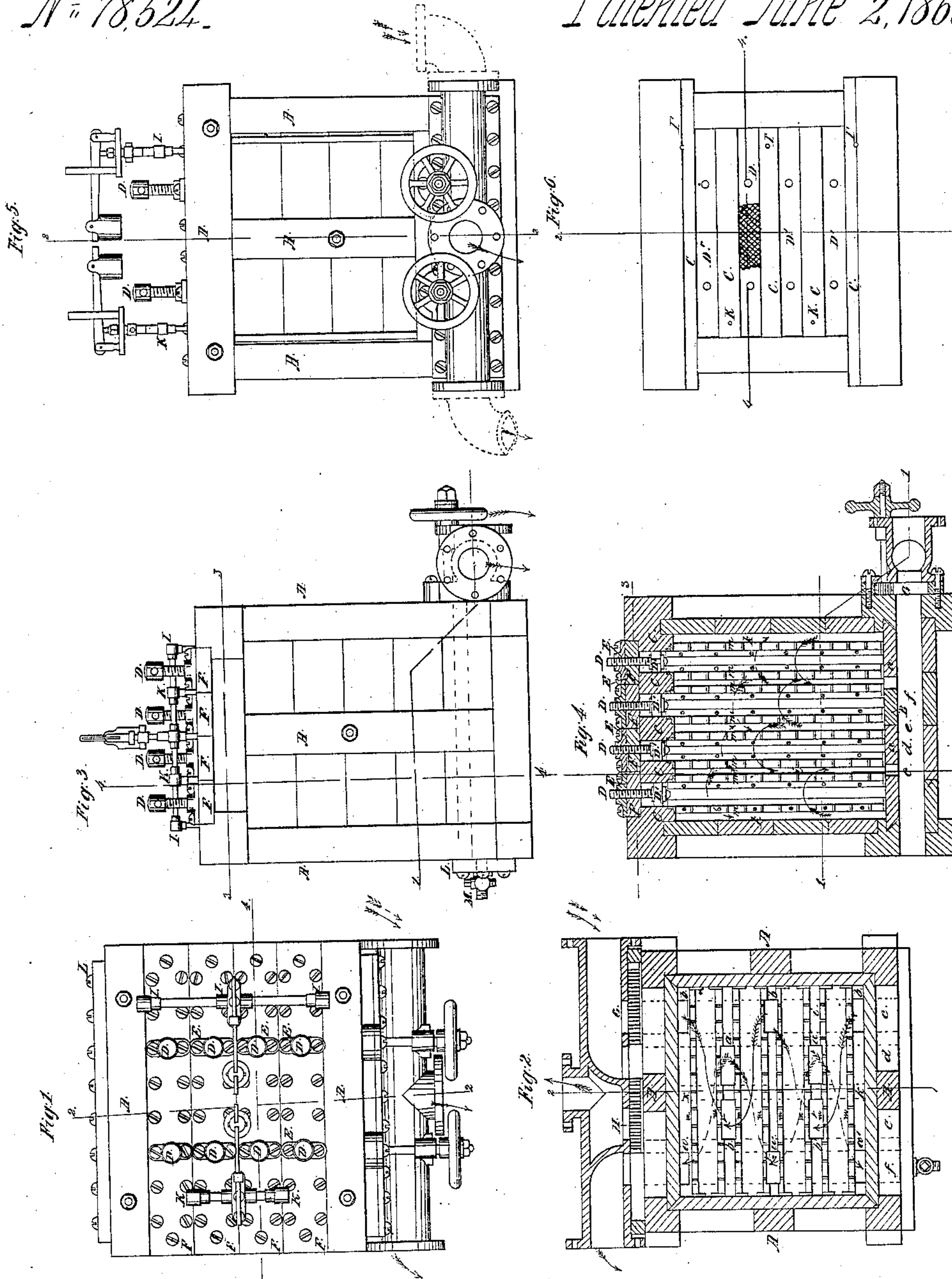


# L. Holms, Water Filter,

N<sup>o</sup> 78,524.

Patented June 2, 1868.



Witnesses:  
Horton Holms  
Edward L. May Jr.

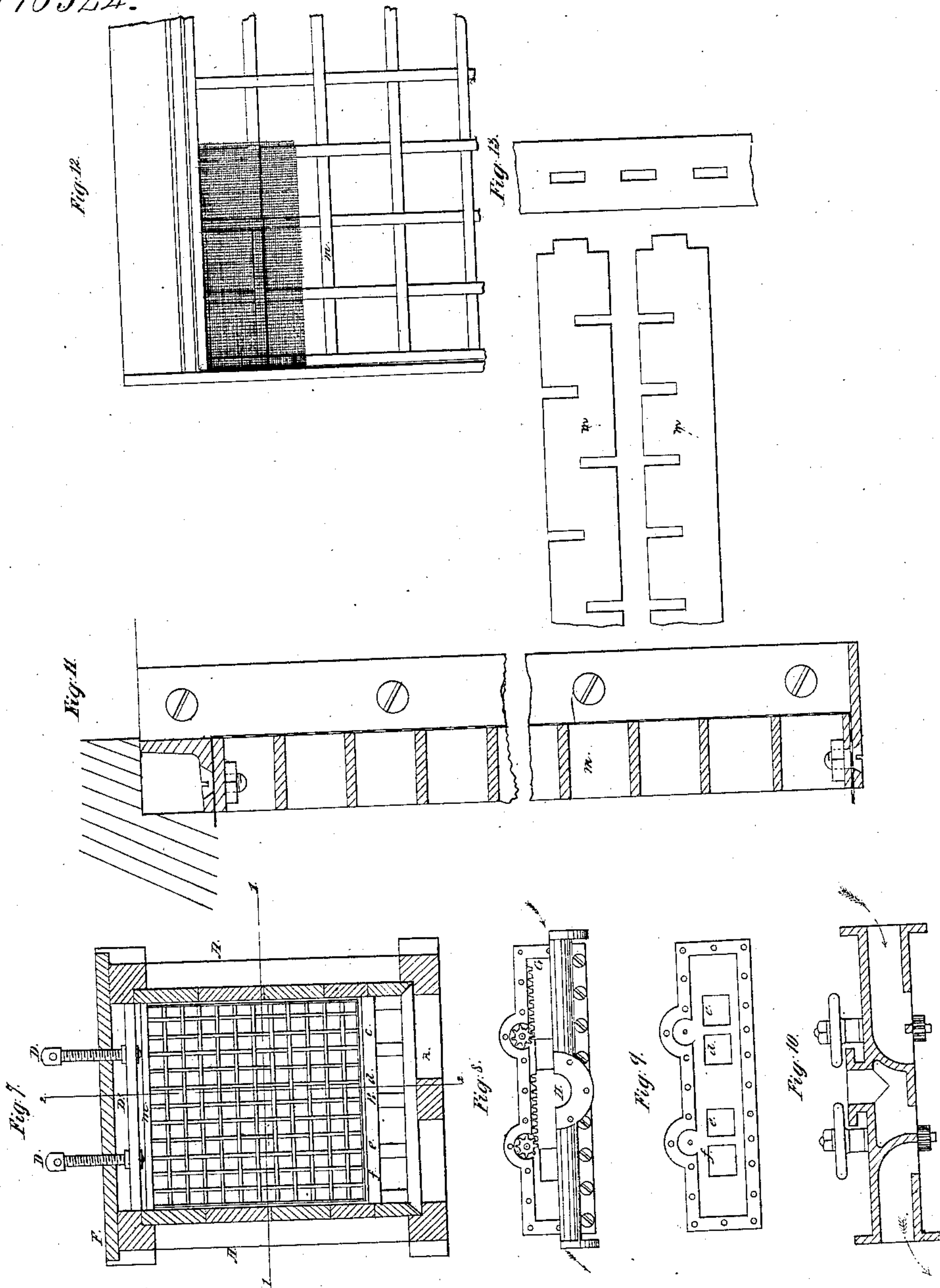
Inventor:  
Lawrence Holms

L. Holms,

Water Filter,

Patented June 2, 1868.

N<sup>o</sup> 78524.



Witnesses:  
*Marston Holmes*  
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# United States Patent Office.

LAWRENCE HOLMS, OF PATERSON, NEW JERSEY.

*Letters Patent No. 78,524, dated June 2, 1868.*

## IMPROVEMENT IN FILTERS.

*The Schedule referred to in these Letters Patent and making part of the same.*

### TO ALL WHOM IT MAY CONCERN:

Be it known that I, LAWRENCE HOLMS, of Paterson, in the county of Passaic, in the State of New Jersey, have invented certain new and useful Improvements in Water-Filters; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, making part of this specification, and to the letters and figures of reference marked thereon.

Figure I is a plan or horizontal outside view of the apparatus entire.

Figure II is a horizontal section of the interior, taken on the line 1.

Figure III is a vertical end view of the outside, showing, in elevation, the compacting-screws, the safety-valves, the nozzle, for the discharge of pure water, and the cock, for discharging such unfiltered water as may remain, after washing, in the pure-water chambers, all to be further hereinafter described.

Figure IV is an interior vertical section, taken on the line 2. In this elevation, the cross-section of the filtering-beds, in purple, together with their supporting gratings and wire-gauze enclosures, is shown.

Figure V is an outside longitudinal elevation, showing the several nozzles of ingress and egress; also the compacting-screws and safety-valves, to be further hereinafter described.

Figure VI is a horizontal section, taken on the line 3, showing the framework of the upper portion of the casing; also the platens or followers, which, in connection with the screws D, are used for compacting the medium of the filtering-beds, to be further hereinafter described.

Figure VII is an interior vertical section, taken on the line 4. In this elevation the general form of the casing is shown; also the supplementary bottom, covering the passages *c d e f*; also the pressing-platen and screws; also the grating for supporting the wire gauze and medium are shown, all to be further hereinafter described.

Figures VIII, IX, and X are details of the valves, inlets, and outlets for regulating and controlling the entrance and discharge of the water.

Figures XI, XII, XIII are details, full size, of the gratings for supporting the wire gauze and filtering-medium, to be further hereinafter-described.

The Figs. I to VI are on Plate I, and the Figs. VII to XIII are on Plate II; like letters and figures denoting like parts in all the drawings.

I construct a strong rectangular water-tight case or vessel, of a size proportioned to the volume of water desired to be filtered. This vessel, marked A, may be constructed of either iron or wood, or of any other suitable material, and must be capable of sustaining considerable internal as well as external pressure. The internal pressure is communicated by the amount of head or altitude of supply of water, if the filtration is effectuated by the force of gravitation, or by the force-pump, if that is the method adopted for pressing the water through the filtering-medium. The external pressure is exerted in certain instances by the pressure of the atmosphere, a vacuum being formed in certain chambers for effectuating an object to be further hereinafter described.

In the case A there is a supplementary bottom, B, which covers four passages or pipes, *c d e f*, seen in dotted lines in Fig. II, and also in section in Figs. IV and VII. This bottom, B, is divided into nine nearly equal-sized spaces, four of which are occupied by the filter-beds, whose lower edges rest and are secured thereon. The intervening spaces I denominate water-chambers or spaces. These are pierced through B by ten rectangular openings, *a a' a' a'*, *b b b' b'*, which form ports of communication with the four passages *c d e f*, for the purpose of conducting the water to and from the different sides of the filter-beds.

The openings *a a* and water-spaces *i i* receive the water from the general inlet by the opening of the valve G and the passage *d*, whence it is forced through the several filtering-beds into the water-chambers *k k k*, and thence discharged through the openings *a' a' a'* into the passage *f*, and so out by the valve H and the pure-water nozzle, plainly marked in the drawings. The other openings, *b b b' b'*, are for the purpose of receiving water for washing the filtering-beds, and for discharging the same by the openings and passages appropriate thereto. These openings and passages are similar in every respect to those above described and used for filtering purposes, except that they communicate, for the different objects of ingress and egress, with the opposite sides



of the filtering-beds, the passage C conveying water, under pressure, through the openings *b b b* into the water-chambers *k k k*, and thence through the filtering-beds in the opposite direction, to which the previous filtration had taken place, and so out to the wash-water nozzle of discharge by the openings *b' b'*, passage *e*, and port of valve H, opened for the purpose. In thus reversing the direction of the currents, any sediment, filth, or foreign matters which may be lodged on the surfaces of the filtering-beds, the residuum of the filtered water, become forced back from the wire gauze and gratings, and are washed out of the water-chambers *k k k*, through the wash-water outlet, as previously stated.

The course of the washing-water is indicated on the drawings by the red arrows; that of the water to be filtered by the blue arrows. It is evident, however, that the openings and discharges used for the cleansing of the filtering-beds may be used for filtering purposes, and the pure water discharged by the wash-water nozzle. I therefore do not confine myself to the particular method described, when a mere inversion of the functions of the several parts may accomplish the same objects.

Each filtering-bed is represented in purple color on the drawings, and consists of two strongly-constructed reticulated gratings, lined with fine wire gauze, *y*, between which the filtering-medium is compressed. Those gratings are strongly secured to the sides, bottom, and upper framework of the casing, in such a way that no water can pass from one compartment to another, unless through the filtering-medium enclosed between each pair. The gratings are constructed in such a manner as to insure great strength, and at the same time to present as little surface of obstruction to the passage of the water through the wire gauze and filtering-medium as is consistent with a perfect support of the wire gauze and filtering-medium.

Those gratings, marked *m*, Figs. II, IV, and VII, are also represented in detail and section, full size, on Plate II, Figs. XI, XII, XIII, and consist of bars of iron one-eighth of an inch thick by one inch deep, notched in such a way as to interlock each other, when put together, in a reticulated grating or diaphragm, with a flat surface for the support of the wire gauze and filtering-medium, as before stated. I also further strengthen those gratings by coating them with zinc or tin, after they are constructed. The hot metal enters all the interstices of the reticulations and the joints or points of union, and thus solders the entire reticulations into one solid framework. Corrosion is also prevented by this protection of the surfaces. I do not, however, limit myself to this mode of construction, so long as the same objects may be attained by any device equivalent thereto. The gratings being secured to the sides and bottom of the case A, the upper edges are fastened to the beams C C C C C, or their equivalents, the spaces between which beams constitute auxiliary chambers for containing an extra supply of medium-material, *x*, which may at any time be forced downwards by means of the screws D and platens D'. In this way the medium *x*, between the wire gauze, can be, at any time, compacted to any degree of density necessary for the filtration of the water passing through. By this mode of compression any interstices which may have resulted from the percolation of the water through the medium, or from any other cause, will become closed, and a uniform thickness and density maintained, unattainable by any other means hitherto known.

The arrangement and construction of the valves for controlling and directing the water-currents, are clearly shown in the several Figs. I, II, III, IV, VII, IX, and X. The valves consist of two plates, G and H, on the upper edge of each of which is formed a rack, into which a pinion works in gear. These pinions are sunk into appropriate recesses in the valve-casing, and are secured upon shafts, which extend outwardly through proper bearings, and have hand-wheels keyed on their outer ends, for conveniently operating the valves.

Each of these valves covers two of the passages *c d e f*, either of which can be opened, or all of which can be closed at will.

The valves are faced on both sides, and thus form, when combined with and operating in their chambers, as shown, water-tight gates for the closing or controlling of the water-passages, both as to inward and outward pressure.

The compacting-screws D, eight in number, work through appropriate nuts, E, which are secured above, and together with the cap-pieces or covers F F F F. The lower ends of these screws are swivelled, and turn freely in the platens or followers D' D' D' D', which they raise or force down, when turned to the right or left, by means of the capstan-heads, seen in the drawings.

I employ two safety-valves, I K, situated on and above the case A. These communicate respectively with the water-chambers *i i* and the water-chambers *k k k*, and are for the purpose of relieving the case of any excess of pressure arising from any cause. They are also used for withdrawing any accumulation of atmospheric air from the upper portion of the water-chambers, which may from time to time be carried in by the currents of water, or from any other cause. Those safety-valves are also used, in connection with the valves G and H, for creating a vacuum in the water-chambers, for the purpose of more effectually insuring a flow of water of such volume as may be due to the area of the filter-beds, the altitude of pressure, and the orifices of supply. The safety-valves are of the ordinary construction, such as are used on steam-boilers, and therefore need not here be further described. The connections are made with the water-spaces by means of pipes, which penetrate and are secured in the beams C C C C C.

The upright pipes or connections of the safety-valve I penetrate the chambers *k k k*, all of which are regulated by the same valve, by means of the elbows, T-pieces, and other appropriate parts.

The valve K is connected with the water-chambers *i i*; also by means of vertical and horizontal pipes, elbows, and T-pieces, appropriate thereto, all clearly seen in the drawings. The two several valves communicate respectively with the opposite sides of the filtering-beds, and by entering the beams C C C C C by the holes I' I' I' and K' K', seen in Fig. VI.

The cap-piece L, which is securely fastened to the case A, and which closes one end of the passages *c d e f*, may at any time be removed, and such ~~sediment~~ and or mud withdrawn, which may have accumulated in the



water-passages, or gates may be placed in the cap-piece for the discharge, from time to time, of such accumulations.

The cock M, secured in the cap-piece L, is for the purpose of drawing off such residuum as may remain in the pure-water chamber *k k k*, after the operation of washing has taken place, and previously to opening the pure-water outlet.

The operation of the filter, and the use of the several parts described, are as follows:

The general inlet-nozzle of the valve-chambers being connected by proper pipes with the source of supply, which may be either a reservoir, dam, or pump, and the valve G opened so as to throw the current of water into the passage *d*, the water will then ascend through the openings *a a*, and fill the chambers *i i*. Previously to this, however, it will be necessary to raise the lever of the safety-valve K, for the purpose of allowing such air to escape as may have been previously present in the chambers. This valve is now closed and weighted according to the pressure the filter is intended to be worked under. The other safety-valve, I, must now be opened, and the air in the opposite chambers, *k k k*, allowed to escape before the water, which will now percolate through the dense masses of the filtering-medium. The valve G may now be slightly closed, and the valve H opened to the extent of the port *f*, when, by the discharge of the water from the chambers *k k k*, a partial vacuum will be created therein, and a continuous flow of water through the filtering-beds insured.

By a reversion of the valves G and H, the pressure of the water will be admitted by the passage C, through the openings *b b b*, to the chambers *k k k*, and thus the water will be forced through the filtering-beds in an opposite direction to that described in the filtering process, and thus force back any accumulations of foreign matters which may have been deposited on the wire gauze, gratings, or in the chambers *i i*, which are thence discharged by the passage *d* and wash-water nozzle, so marked in the drawings. The safety-valve I may be manipulated, in connection with the inlet and outlet-valves G and H, in the same manner as described for the filtering process, and a partial vacuum obtained in the chambers *i i*, which will serve to facilitate the cleansing operation of the filtering-beds and water-spaces.

I claim as my invention—

The arrangement of the valves G H, passages *c d e f*, openings *a b a' b'*, water-spaces *i k*, and filtering-beds *m x*, as and for the purpose described.

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Witnesses:

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EDWARD C. MAY, Jr.