

No. 629,942.

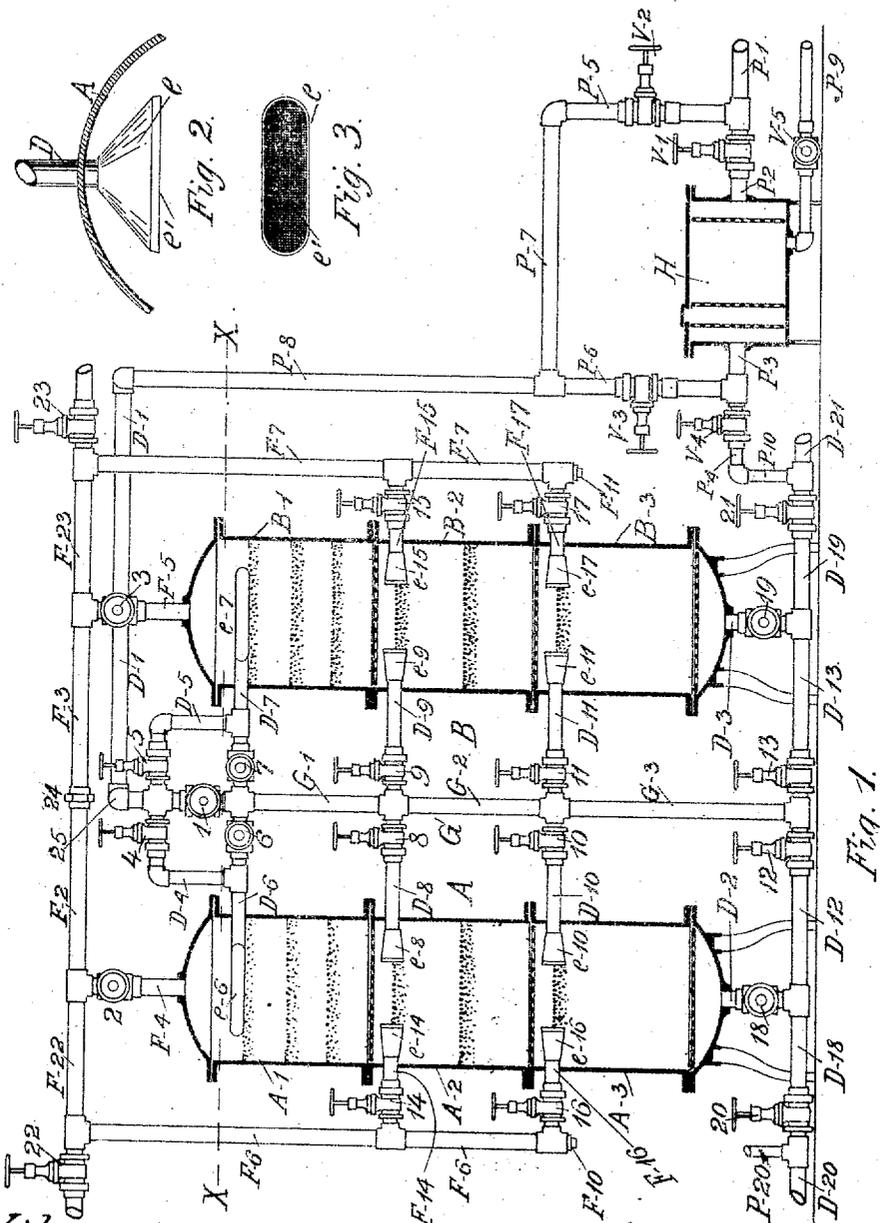
Patented Aug. 1, 1899.

L. WANNER, JR.
DOUBLE FILTER.

(Application filed Sept. 30, 1898.)

(No Model.)

7 Sheets—Sheet 1.



Witnesses
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7 Sheets—Sheet 2.

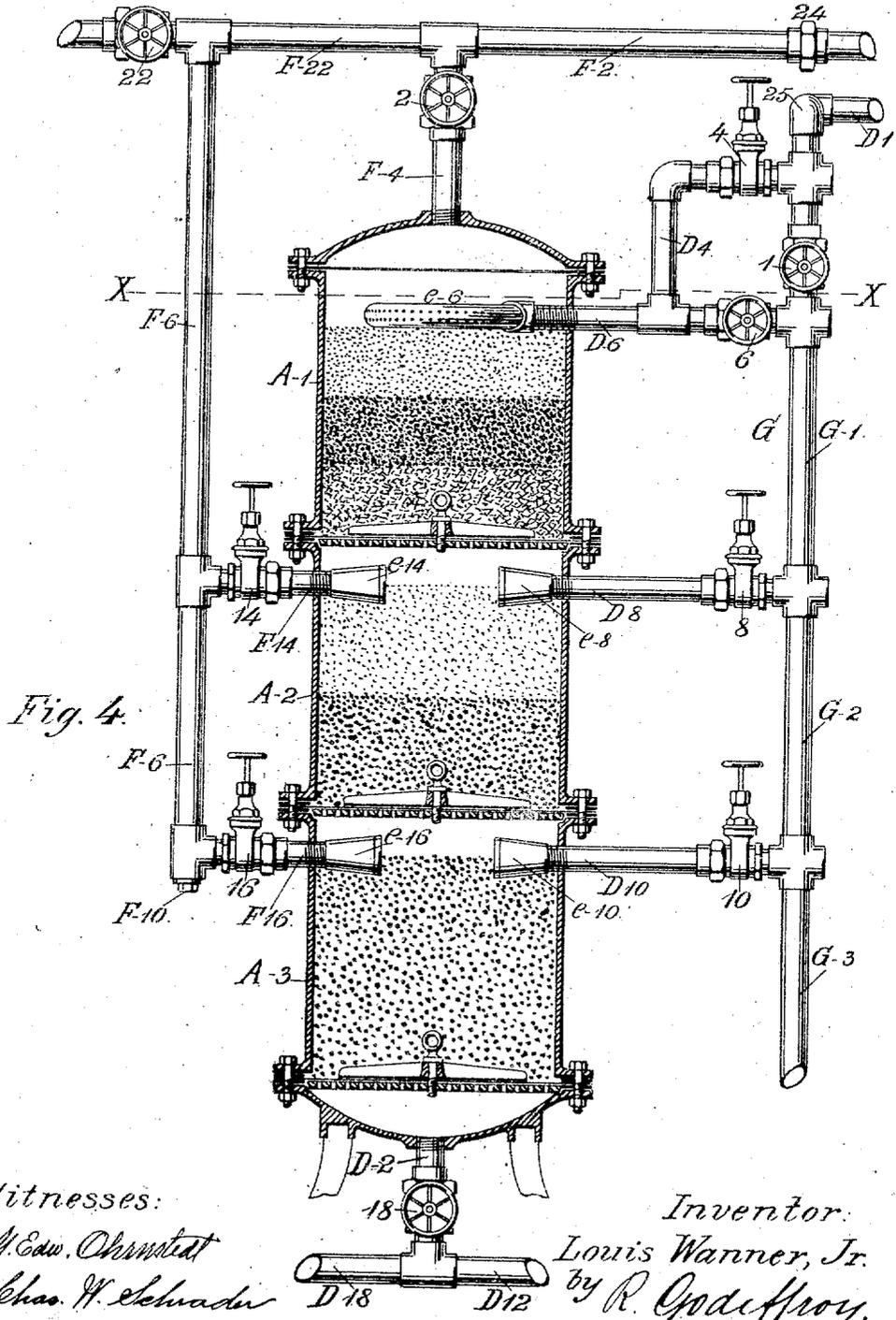


Fig. 4.

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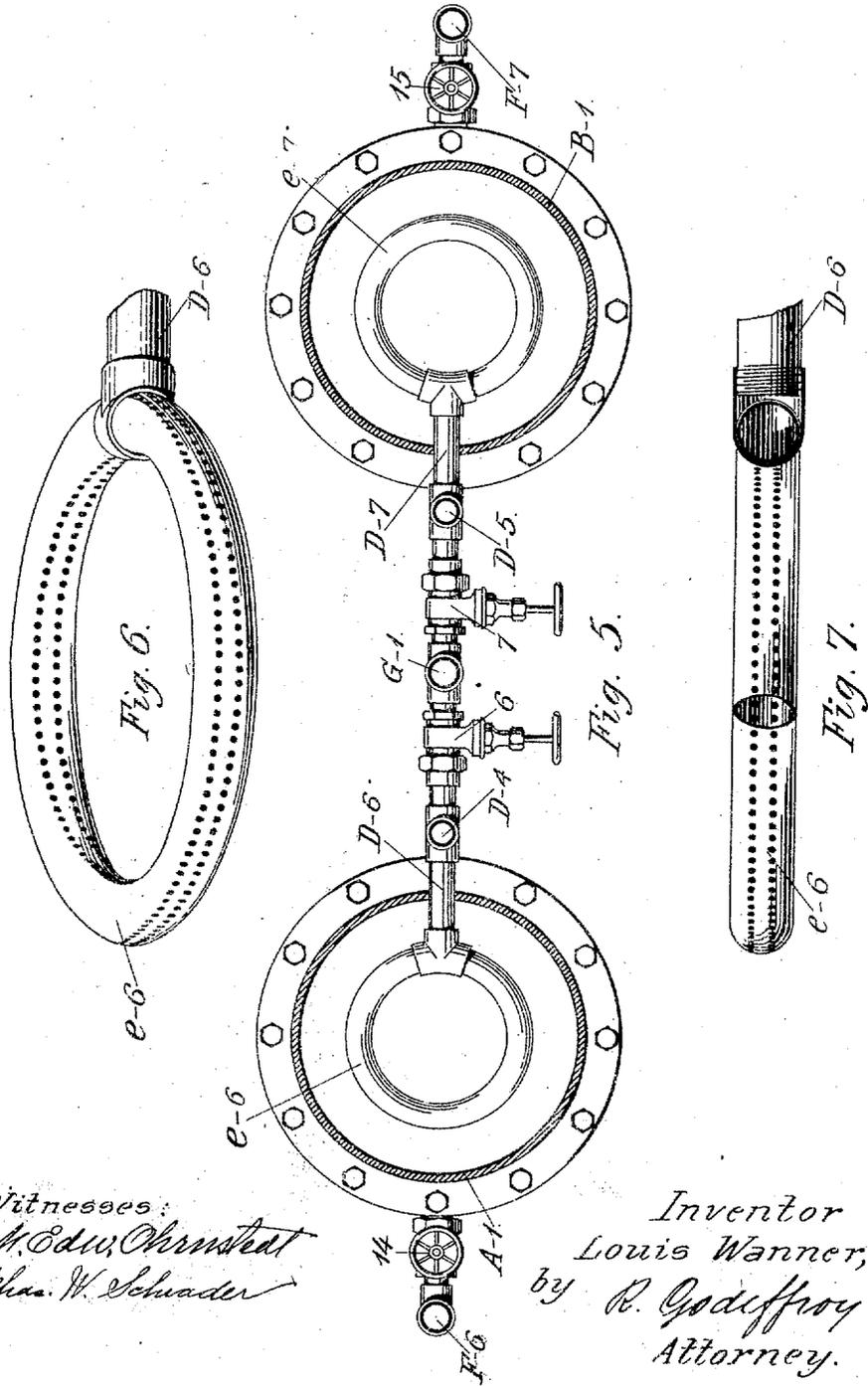
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7 Sheets—Sheet 3.



Witnesses:
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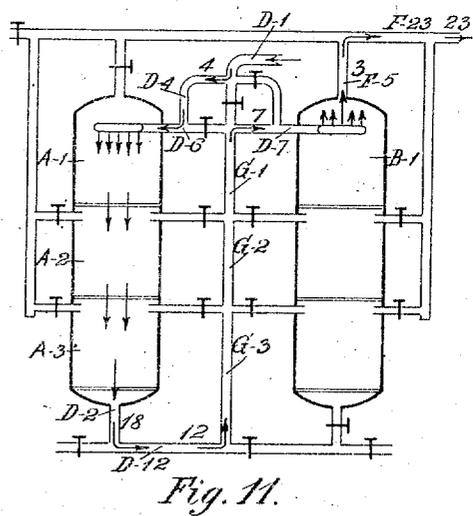
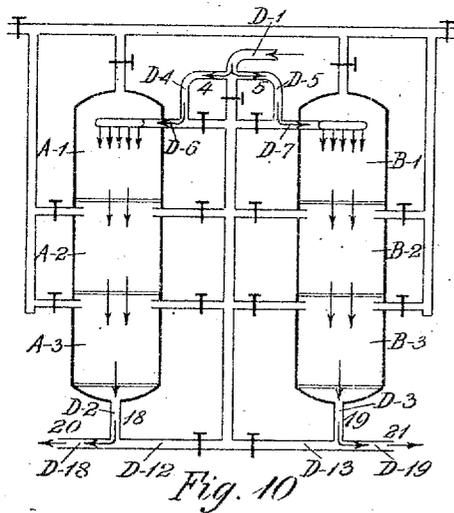
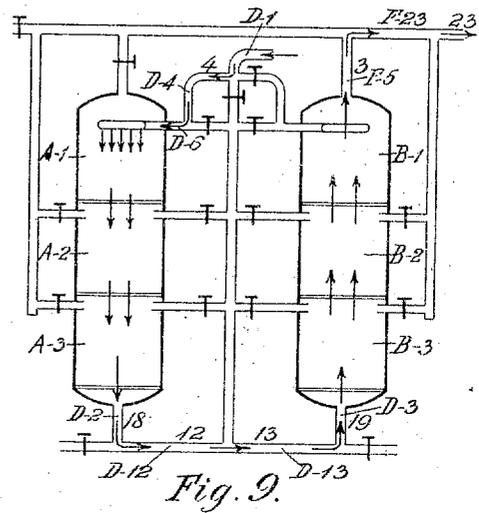
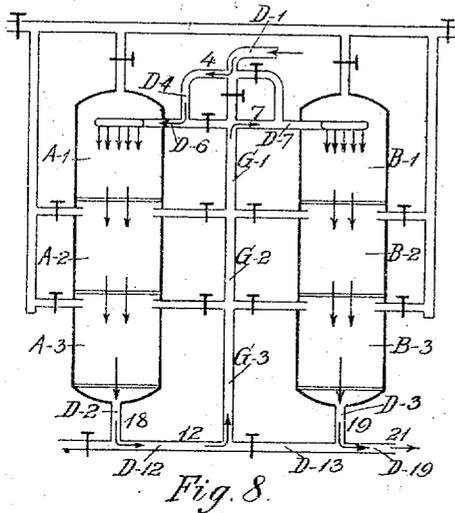
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7 Sheets—Sheet 4.



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(No Model.)

7 Sheets—Sheet 5.

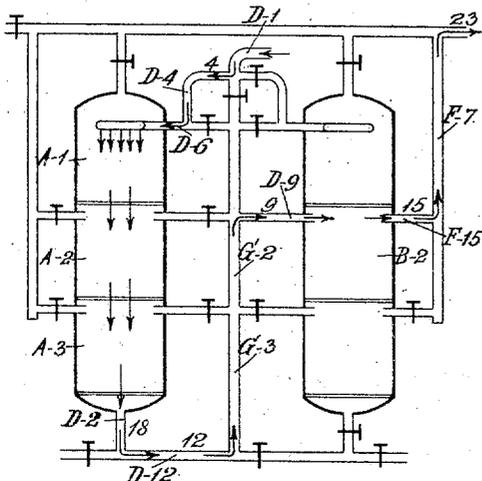


Fig. 12.

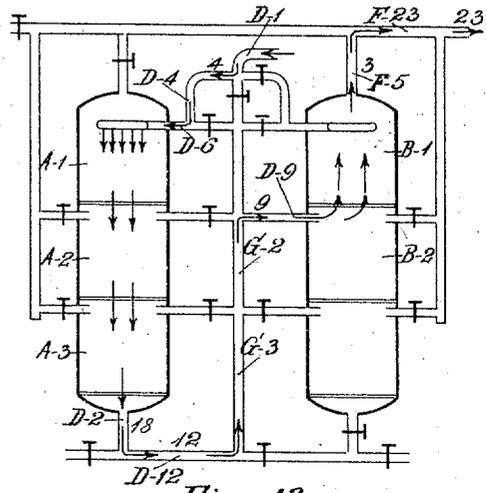


Fig. 13.

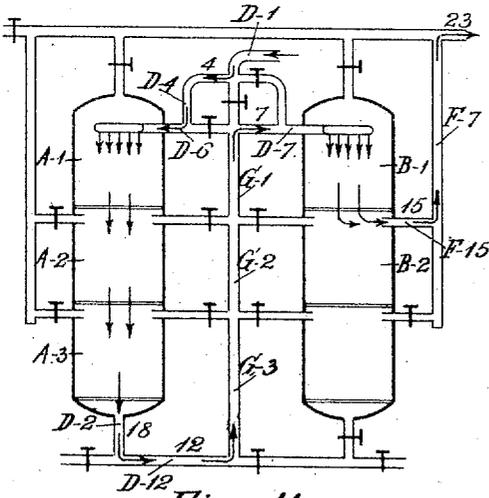


Fig. 14.

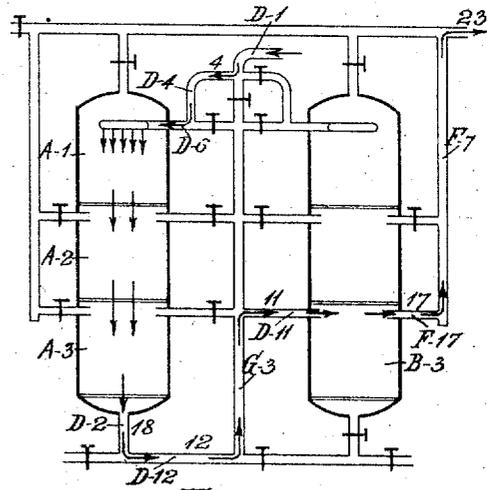


Fig. 15.

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DOUBLE FILTER.

(Application filed Sept. 30, 1898.)

(No Model.)

7 Sheets—Sheet 6.

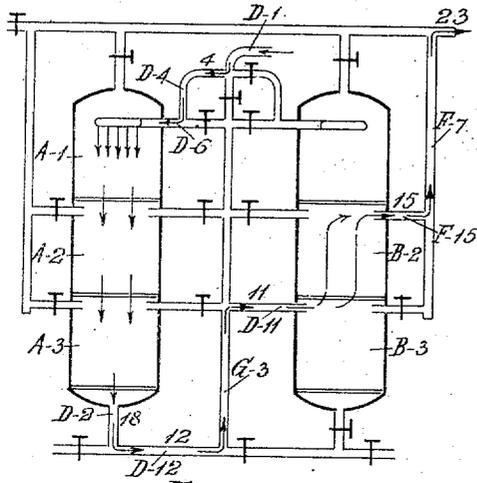


Fig. 16.

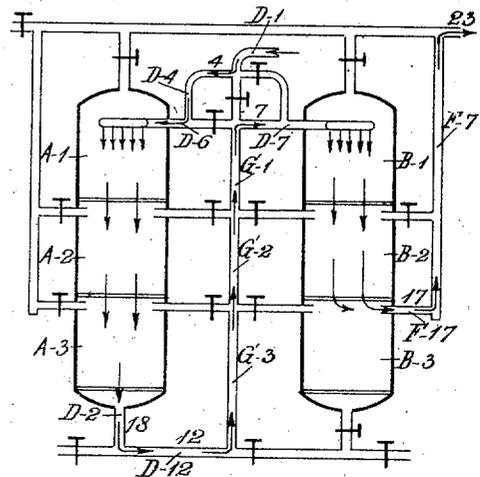


Fig. 17.

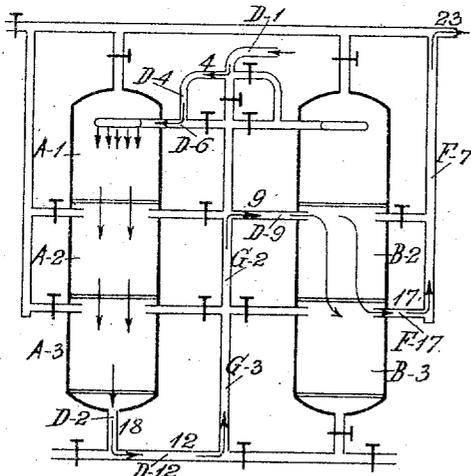


Fig. 18.

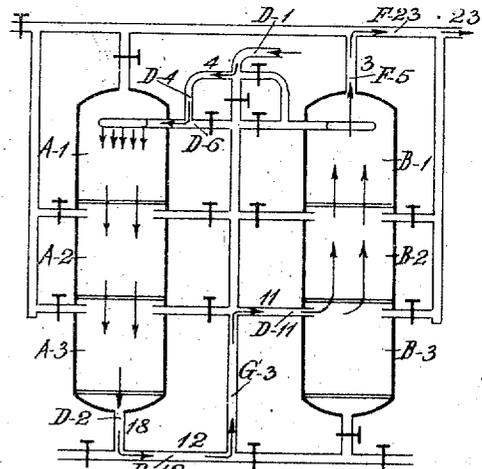


Fig. 19.

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No. 629,942.

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7 Sheets—Sheet 7.

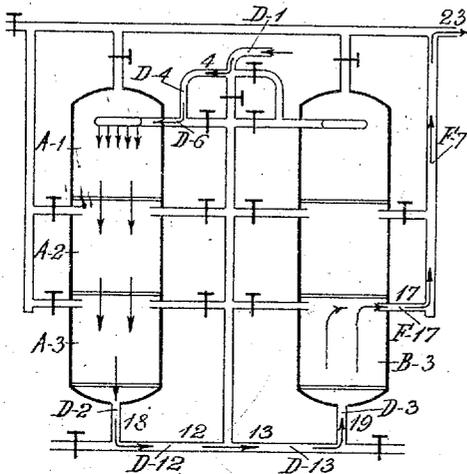


Fig. 20.

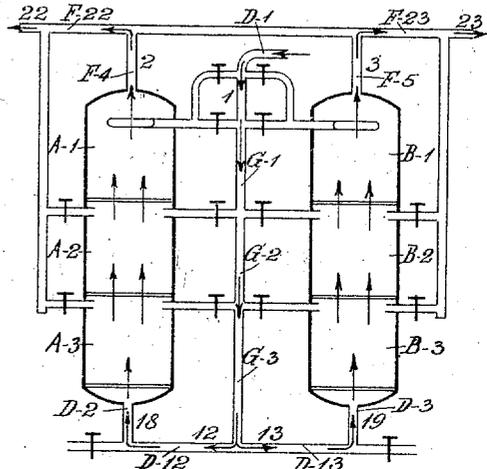


Fig. 21.

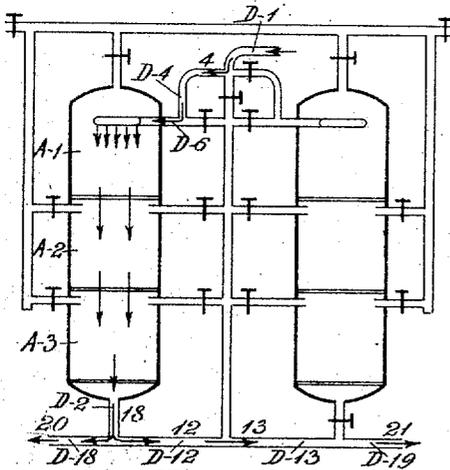


Fig. 22.

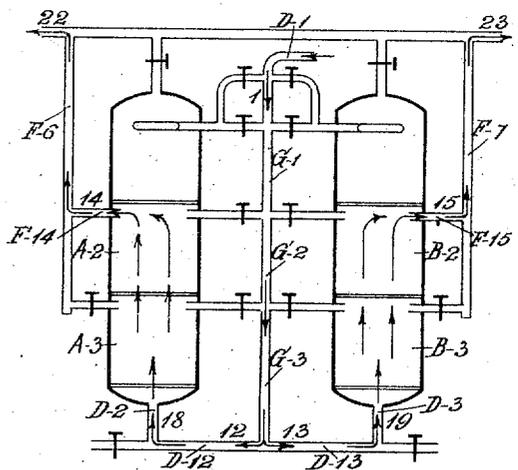


Fig. 23.

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UNITED STATES PATENT OFFICE.

LOUIS WANNER, JR., OF PHILADELPHIA, PENNSYLVANIA.

DOUBLE FILTER.

SPECIFICATION forming part of Letters Patent No. 629,942, dated August 1, 1899.

Application filed September 30, 1898. Serial No. 692,277. (No model.)

To all whom it may concern:

Be it known that I, LOUIS WANNER, Jr., a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Double Filters, of which the following is a specification, reference being had therein to the accompanying drawings.

The object of my invention is to construct a double filter by coupling two single filters with the necessary pipes and valves for the purpose of filtering the water twice and to wash out each filter separately with filtered water from the other filter. I further combine my double filter with one or two mud-catchers, as specified and described in my application for Letters Patent filed September 6, 1898, under Serial No. 690,333, for the purpose of separating the mud and other heavy matter from the water before allowing it to enter the filter.

A further object of my invention relates to the peculiar construction by which one of the filters can be thoroughly cut off from the other and the mud-catcher for the purpose of repairs, at the same time allowing the supply of filtered water through the other filter.

I attain these objects by the construction illustrated in the accompanying drawings, in which—

Figure 1, Sheet 1, is a vertical section showing the general arrangement of the double filter and its combination with a mud-catcher. This Fig. 1 being merely a diagram of the total arrangement does not show any details of the construction, but simply indicates the various parts, as sections of the filters, perforated plates in the filters and mud-catcher, the body of the latter, the pipes, and valves. The filling material of the filter is omitted in this Fig. 1 and only the top lines of the single layers slightly indicated. Fig. 4, Sheet 2, is a vertical section through one of the coupled filters, showing all the details of construction, part of which are omitted in Fig. 1. Fig. 5, Sheet 3, is a horizontal section on line X X, Sheets 1 and 2, showing the ring-shaped distributing-strainer in the upper compartments of the filters. Fig. 6, Sheet 3, is a perspective view of one of these strainers e^6 ; and Fig. 7, Sheet 3, is a partial side elevation and

partial section of one of these strainers e^6 , both views being drawn to a larger scale. Fig. 2, Sheet 1, is a top-view; Fig. 3, Sheet 1, is a front view of the strainers discharging the water into or drawing the same from the two lower compartments of the filters, drawn to the same scale as Figs. 6 and 7, Sheet 3. Figs. 8 to 23 on Sheets 4, 5, 6, and 7 are diagrams showing the various ways in which and the various purposes for which the double filter can be used, as will be explained farther on.

Similar letters and figures refer to similar parts throughout the several views.

The double filter consists of two single sectional filters A and B, coupled together by means of pipes and valves and connected with one or two mud-catchers, only one of which is shown at one end in Fig. 1, while the other can be connected to the pipe P^{20} .

The mud-catcher being thoroughly described in my application for Letters Patent for the same filed September 6, 1898, under Serial No. 690,333, I desist from explaining its working here for the purpose of showing the working of the double filter and will only allude to the mud-catcher. I therefore assume in the following description that all water entering through the pipe D' has passed through the mud-catcher.

D' is the supply-pipe to the filters.

G' G² G³ is the main connection-pipe, with the valve 1.

D⁶ D⁸ D¹⁰ D⁷ D⁹ D¹¹ are the branch connections, with the valves 6 8 10 7 9 11.

D⁴ and D⁵ are the by-pass pipes, with by-pass valves 4 and 5.

F⁶ F²² and F⁷ F²³ are the main clean-out pipes, with the clean-out valves 22 and 23.

F² and F³ are the clean-out connections, with the union 24.

F⁴ and F⁵ are the top branch clean-outs, with valves 2 and 3.

F¹⁴ F¹⁶ F¹⁵ F¹⁷ are the side branch clean-outs, with valves 14 16 15 17.

D² and D³ are the bottom outlets, with valves 18 and 19.

D¹⁸ D²⁰ and D¹⁹ D²¹ are the house-supply pipes, with valves 20 and 21.

D¹² and D¹³ are the supply-pipe connections, with valves 12 and 13.

P¹⁰ and P²⁰ are the connection return-pipes to the mud-catchers.

e^6 and e^7 are the ring-shaped distributing-strainers.

e^8 e^{10} e^9 e^{11} are the supply-strainers.

e^{14} e^{16} e^{15} e^{17} are the clean-out strainers.

5 F^{10} and F^{11} are plugs.

As the double filter can only be used when the water enters the same under pressure, be it from the city-supply, elevated tanks, or through other means, it is once for all assumed that this pressure, being essential for the working of the filtering apparatus, exists, and this pressure is alluded to in the following part of the specification wherever it is mentioned.

15 The single filters being essentially the same as patented September 28, 1897, under No. 590,868, those details which have been specified and explained there and which are not essential to the construction of the double filters and which comprise the perforated plates, the wire-gauze, the spiders, the bolts, and the gaskets are merely shown in the accompanying drawings and not marked with letters, and as these parts essentially belong to the compartments of the filters they will not be separately mentioned when the action of the double filter is explained. The two filters for the double filter differ from this single filter only in a few points, viz: First, the perforated plate, the wire-gauze, the spider, and bolt are omitted at the top of the upper sections; second, the ring-shaped strainers take the place of the T-head in the upper section; third, the T-heads in the two other sections are replaced by strainers of a different shape, as shown in Figs. 2 and 3, Sheet 1; fourth, the upper sections of the double filter have three layers of filtering material instead of two.

40 Experience having shown that in the single filter patented September 28, 1897, No. 590,868, the mud and other heavy matter deposited in the filtering matter of the upper section through the act of filtration when the direction of the current of water is reversed for the purpose of washing out the filter will clog up the holes in the perforated plate and wire-gauze at the top of the upper section of the filter in such a manner as to interfere with the cleansing of the filter, and thus to require the filter to be opened at comparatively short intervals for the purpose of cleaning this perforated plate and the wire-gauze, I have found it advisable to omit these and to separate the mud and other heavy matter contained in the water by inserting a mud-catcher between the supply-pipe and the filter. This mud-catcher forms an essential part of the double filter, as an accessory to the same, for the purpose stated above.

60 The ring-shaped strainers e^6 and e^7 consist of tubular rings connected at one end to T's, into which the connection branch pipes D^6 and D^7 are screwed. On the inner and outer circumferences these tubular rings have one or more rows of perforations. In the present instance two rows are shown both on the in-

ner and outer circumferences of the rings. These ring-shaped strainers have the purpose of distributing the water which enters from D^6 and D^7 under pressure approximately evenly over the surfaces of the upper layers of the fillings of the upper compartments of the filters. Another object of the ring-shaped strainers is that the water escaping from the perforations of the same under pressure will prevent any mud or similar matter that might not have been retained by the mud-catcher from clogging up the interstices in the filtering material of the upper sections of the double filter, and thus allow the same to be carried away through the upper clean-out branches when the flow of the water is reversed for the purpose of washing out the filters as a whole or the upper sections alone and the escape of these particles with the clean-out water, the perforated plate and wire-gauze being omitted, which in the single filter referred to above formed an obstruction to the proper escape of the same.

90 The strainers e^8 e^9 e^{10} e^{11} and e^{14} e^{15} e^{16} e^{17} are constructed as shown in Figs. 2 and 3. They are funnel-shaped, wider at the mouth in horizontal than in vertical direction, contracted to a circular section at the other end, and provided with a thread for receiving the threaded end of the pipes. The mouth of these strainers is provided with fine wire netting or gauze. The purpose of these strainers e^8 e^9 e^{10} e^{11} is to spread the water entering through these over the surface of the filtering material in the two lower compartments of the filters A and B, while the strainers e^{14} e^{15} e^{16} e^{17} offer a wider surface to the water entering the same during the action of cleansing the sections. In the strainers e^8 e^9 e^{10} e^{11} the fine wire netting or gauze will force the water to escape in fine threads, thus preventing the same of moving the particles in the upper layers of the filtering material. In the strainers e^{14} e^{15} e^{16} e^{17} this wire netting or gauze has the purpose to prevent any of the filtering material to escape when the sections are being cleansed.

115 The filtering material in the upper sections A' and B' is composed of three layers in the present instance, experience having shown that the two layers used heretofore were insufficient.

120 The filtering material is composed as follows: In sections A' and B' the upper layer consists of sharp quartz sand, the second layer of ground marble, and the bottom layer of Turkish emery. In sections A² and B² the upper layer consists of very fine bone-black and the bottom layer of medium bone-black. In section A³ and B³ the filtering material consists of coarse bone-black. It is understood, however, that the filtering material may be varied according to the conditions and chemical analysis of the water to be filtered. It is further understood that local conditions may modify the distribution and location of the various valves and that in consequence their number may be increased or decreased with-

out affecting the general principle of the double filtering apparatus.

To explain the action of the filter for the various purposes it is intended for, the diagrams Figs. 8 to 23 on Sheets 4 to 7 show the direction of the current of water through the pipes and filters by the means of arrows. The open valves are indicated by their respective numbers and the closed valves by a heavy T across the pipes:

The operation of the filter for the various purposes is as follows:

A, Fig. 8, Sheet 4: The valves 4 18 12 7 19 21 are open; the others closed. The water entering by the supply-pipe D' will pass through the left-hand by-pass D⁴ into the left-hand filter A, will pass downward through the three compartments of filter A through the left-hand supply connection D¹², the main connection G³ G² G', the upper right-hand branch connection D⁷ into the right-hand filter B, downward through the same, and the supply-pipe D¹⁹ D²⁰ to the house connection. For the reverse of this action open valves 5 19 13 6 18 20 and close the others. In both these cases the water will pass through both filters, and thus be thoroughly filtered twice before entering the house connections.

B, Fig. 9, Sheet 4: The valves 4 (or 1 and 6) 18 12 13 19 3 23 are open; the others closed. The water entering by the supply-pipe D' will pass through the by-pass pipe D⁴ (or through the valves 1 and 6) and the branch D⁶ into the left-hand filter A and downward through the three compartments of the same, through the supply connection pipes D¹² D¹³ and the bottom outlet-pipe D³ into the right-hand filter B, upward through the three compartments of the same, the clean-out pipes F⁵ and F²³, and out into the sewer connection. For the reverse of this action open the valves 5 (or 1 and 7) 19 13 12 18 2 22 and close the others. In both these cases the water will be filtered in one filter and wash out the other one with thoroughly filtered water.

C, Fig. 10, Sheet 4: The valves 4 (or 1, 6, and 7) 5 18 20 19 21 are open; the others closed. The water entering by the supply-pipe D' will pass through the by-pass pipes D⁴ and D⁵ (or through the valves 1, 6, and 7) and the branches D⁶ and D⁷ into the filters A and B, downward through the three compartments of the same and one half out through the outlet D² and supply D¹⁸ D²⁰, the other half out through the outlet D³ and the supply D¹⁹ D²¹. In this case the water will undergo single filtration in each filter, and one part, passing filter B, may be used for cleaning out the mud-catcher with filtered water, while the part passing filter A may supply the house with filtered water, or vice versa.

D, Fig. 11, Sheet 4: The valves 4 18 12 7 3 23 are open; the others closed. The water entering by the supply D' will pass through the by-pass D⁴, the branch supply D⁶ into the filter A, downward through the three compartments of the same, through the outlet D², the

supply connection D¹², the main connection G³ G² G', the supply branch D⁷, into the top of filter B and out through the top clean-out branch F⁵ and the clean-out pipe D²³. For the reversed action open valves 5 19 13 6 2 22 and close the others. In both these cases the water will undergo single filtration in one filter and will pass out unused to the sewer connection.

E, Fig. 12, Sheet 5: The valves 4 (or 1 and 6) 18 12 9 15 23 are open; the others closed. The water entering and passing through the filter A D² D¹², as before, will pass up the main connection G³ G², through the branch connection D⁹, into and across the middle compartment B² of the filter B, through the branch F¹⁵, up the pipe F⁷, and out to the sewer connection. For the reverse action open the valves 5 (or 1 and 7) 19 13 8 14 22 and close the others. In both cases the water will undergo single filtration in one filter and will wash off the surface of the filling in the middle compartment of the other filter with filtered water.

F, Fig. 13, Sheet 5: The valves 4 (or 1 and 6) 18 12 9 3 23 are open; the others closed. The water entering and passing through the filter A' D² D¹², as before, will pass up the main connection G³ G², through the branch connection D⁹, into the compartment B² of the filter B, up through the compartment B' of the same, the top clean-out branch, out through F²³ to the sewer connection. In both cases the water will undergo single filtration in one filter, will wash off the surface of the filling in the middle compartment, and the whole upper compartment of the other filter with filtered water.

G, Fig. 14, Sheet 5: The valves 4 18 12 7 15 23 are open, the others closed. The water entering and passing through the filter A and pipes D² and D¹², as before, will pass up through G³ G² G' D⁷ into the filter B, down through the upper compartment B' of the same into the compartment B², through F¹⁵ F⁷, and out to the sewer connection. For the reversed action open valves 5 (or 1 and 7) 19 13 6 14 22 and close the others. In both cases the water will undergo single filtration in one filter, wash out the whole upper compartment, and wash off the surface of the filling of the middle compartment of the other filter with filtered water.

H, Fig. 15, Sheet 5: The valves 4 (or 1 and 6) 18 12 11 17 23 are open, the others closed. The water entering and passing filter A D² D¹², as before, will pass up g³, through D¹¹, into and across the compartment B³ of the filter B, through F¹⁷ F⁷, and out to the sewer connection. For the reversed action open the valves 5 (or 1 and 7) 19 13 10 16 22 and close the others. In both cases the water will undergo single filtration in one filter and will wash off the surface of the filling of the bottom compartment of the other with filtered water.

I, Fig. 16, Sheet 6: The valves 4 (or 1 and

6) 18 12 11 15 23 are open, the others closed. The water entering and passing through the filter A, D², and D¹², as before, will pass up G³, through D¹¹, into the lower compartment B³ and through the middle compartment B² of the filter B, through F¹⁵, up F⁷, and out to the sewer connection. For the reversed action open the valves 5 (or 1 and 7) 19 13 10 14 22 and close the others. In both cases the water will undergo single filtration in one filter, will wash off the surface of the filling of the lower compartment, and wash out the whole middle compartment of the other filter with filtered water.

15 K, Fig. 17, Sheet 6: The valves 4 18 12 7 17 23 are open, the others closed. The water entering and passing through the filter A, pipes D² and D¹², as before, will pass up G³ G² G¹, through D⁷, into filter B, through the compartments B' and B², across B³, through F¹⁷, up F⁷, and out to the sewer connection. For the reversed action open the valves 5 19 13 6 16 22 and close the others. In both cases the water will undergo single filtration in one filter, partial filtration in the other, and will wash off the surface of the filling of the lower compartment with water filtered through five compartments.

30 L, Fig. 18, Sheet 6: The valves 4 (or 1 and 6) 18 12 9 17 23 are open, the others closed. The water entering and passing through filter A D² D¹², as before, will pass up G³ G² D⁹, into and downward through compartment B², across compartment B³ of filter B, through F¹⁷, up F⁷, and out to the sewer connection. For the reversed action open the valves 5 (or 1 and 7) 19 13 8 16 22. In both cases the water will undergo single filtration in one filter, partial filtration in the other, and will wash off the surface of the filling of the lower compartment with water filtered through four compartments.

45 M, Fig. 19, Sheet 6: The valves 4 (or 1 and 6) 18 12 11 3 23 are open, the others closed. The water entering and passing the filter A D² D¹², as before, will pass up G³, through D¹¹, into the compartment B³, up through the compartments B² and B' of the filter B, out through F⁵ and F²³, into the sewer connection. For the reversed action open the valves 5 (or 1 and 7) 19 13 10 2 22 and close the others. In both cases the water will undergo single filtration in one filter, will wash off the surface of the filling of the lower compartment, and wash through the two upper compartments of the other filter with filtered water.

60 N, Fig. 20, Sheet 7: The valves 4 (or 1 and 6) 18 12 13 19 17 23 are open, the others closed. The water entering and passing through the filter A D² D¹², as before, will pass through D¹³, up D³, up through compartment B³ of filter B, through F¹⁷, up F⁷, out to the sewer connection. For the reversed action open the valves 5 (or 1 and 7) 19 13 12 18 16 22 and close the others. In both cases the water will undergo single filtration in one filter and will

wash out the lower compartment of the other filter with filtered water.

O, Fig. 21, Sheet 7: The valves 1 12 13 18 19 2 3 22 23 are open, the others closed. The water entering by the supply D' will pass down through G' G² G³, will branch off through the two supply connections D¹² and D¹³, up through D³ and D³, upward through both filters, up through F⁴ and F⁵, and out through F²² and F²³ into the sewer connection. In this case both filters will be washed out from the bottom to the top through all three compartments with water that has only undergone the preliminary filtration through the mud-catcher.

85 P, Fig. 22, Sheet 7: The valves 4 (or 1 and 6) 18 20 12 13 21 are open, the others closed. The water entering and passing through the filter A, as described heretofore, will pass down through the outlet D² and partly through D¹⁸ and D²⁰ to one branch of the house-supply and partly through D¹² D¹³ D³ D²¹ to the other branch. For the reversed action open the valves 5 (or 1 and 7) 19 21 13 12 20. In both cases the water will undergo single filtration. One part can be used for supplying the house, while another part may wash out the mud-catcher with filtered water.

95 Q, Fig. 23, Sheet 7: The valves 1 12 13 14 22 19 15 23 are open, the others closed. The water entering by the supply D' will pass down through G' G² G³, one part through D¹² D², upward through the compartments A³ A² of the filter A, through F¹⁴ F⁶, out to the sewer connection, and the other part through D¹³ D³, upward through the compartments B⁵ B² of the filter B, through F¹⁵ F⁷, out to the sewer connection. In this case the water preliminarily filtered in the mud-catcher will wash out the two lower compartments of both filters.

110 It is obvious that a number of other combinations of the open and closed valves will cause other conditions for the flow of the water through the pipes and filters, but those shown on the diagrams will sufficiently explain the action of the double filter.

The various combinations explained hereinabove show as follows:

115 First. The water can undergo complete double filtration by passing through both filters, as explained in case A.

120 Second. The water can undergo single filtration in one filter and the other whole filter can be washed out with filtered water, as shown in case B.

Third. The water can undergo single filtration separately in each filter, as shown in case C.

125 Fourth. The water can undergo single filtration in one filter and can partially wash out the other filter with filtered water, as shown in the cases D E F G H I K L M N.

130 Fifth. Both filters can be thoroughly washed out with water that has only undergone the preliminary filtration in the mud-catcher, as shown in the case O.

Sixth. Both filters can be partially washed out with water that has only undergone the preliminary filtration in the mud-catcher, as shown in the case Q.

5 Seventh. The water can undergo single filtration in one filter, while the other filter is thoroughly cut off from all connections, as shown in the case P.

10 The mud-catcher H, with the necessary pipes and valves, as specified in my application filed September 6, 1898, is an important and indispensable accessory to the double filter. There should preferably be two of them—
15 one at each end—connected by the pipes P¹⁰ and P²⁰. The coupling 25 is illustrated as an ordinary L-coupling; but obviously if two mud-catchers are used this coupling must be a T to connect the two pipes leading therefrom to the main pipe G. One of the mud-
20 catchers would furnish the water for the filter in all cases shown on Sheets 4 to 7, while the other could be cleaned by arranging the valves as shown in Figs. 8, 10, and 22 or by opening suitable valves during any of the
25 other operations.

What I claim as my invention, and desire to have secured by Letters Patent of the United States, is—

30 1. The herein-described double filter, consisting of two single sectional filters, an inlet-pipe, a valved main connection-pipe, a valved by-pass, and a valved branch connection-pipe, connecting each section, valved main and
35 branch clean-out pipes, clean-out connection-pipes, valved outlets, valved supply-pipes leading therefrom and valved supply connection-pipes, all substantially as described and set forth.

40 2. The herein-described double filter consisting of two single sectional filters, and inlet-pipes, each of which is connected to a main valved pipe, valved by-pass pipes connected to the main pipe, and valved branch pipes extending from the main pipe into the upper
45 part of each section, a ring-shaped tubular strainer secured to each branch in the upper section of the filter, strainers secured to the branches leading into the other sections, valved outlet-pipes leading from the lower
50 section of each filter, a valved supply-pipe connected to each outlet, mud-catchers, connections between them and the supply-pipes, valved clean-out pipes, a connection between said pipes, a valved pipe connecting the top
55 of each filter with the clean-out pipes, valved branch pipes leading from the upper portions of each section of the filters except the top one and strainers secured to these branches, substantially as and for the purpose set forth.

60 3. The herein-described double filter, consisting of two sectional single filters, with an in-

let for each, a valved main connection-pipe and valved branches leading therefrom into the upper portions of each filter, a tubular ring-shaped strainer secured to each branch in the
65 upper section and provided with perforations on its inner and outer circumference, the under side of said strainer being on a line with the filtering material, valved branches also extending from the main pipe into the upper
70 portions of the remaining sections, flattened bell-shaped strainers secured thereto, branch clean-out pipes extending from the upper portions of all sections except the top, to the main clean-out pipe and at a point opposite
75 the branch inlet-pipes, strainers secured to said pipes, valved pipes extending from the upper section of the filters to the main clean-out pipes, and a pipe connecting said clean-out pipes all substantially as and for the pur-
80 pose set forth.

4. The herein-described double filter, constructed of two single sectional filters, the upper section of each being free of strainer-plates above the filtering material, a valved
85 main and branch connection pipes, a tubular ring-shaped strainer secured thereto in each of the upper sections, and flattened bell-shaped strainers in the other sections, a valved main clean-out pipe, branches leading thereto
90 from all sections except the top and strainers secured to the branches, valved outlet-pipes leading from the bottom sections, pipes connected thereto, mud-catchers, valved supply-pipes, connections between said supply-pipes
95 and catchers, a coupling secured to the main pipe and valved pipes connecting the mud-catchers with the coupling, all substantially as and for the purposes set forth.

5. The combination with a double filter, 100 constructed of two single sectional filters; of a valved main connection-pipe between the same, valved by-pass pipes secured thereto, valved branch pipes, extending into the upper portions of the sections of the filters,
105 valved main clean-out pipes, with valved branches, two of which connect with the top, and the others with the upper portion of the remaining sections of the filters, valved outlets, valved supply-pipes, valved supply con-
110 nection-pipes, mud-catchers and connections therefor, all of the valves being adapted to be so operated as to compel the water entering the filters to flow in any desired manner therethrough, substantially as and for the pur-
115 poses set forth.

In testimony whereof I affix my signature in presence of two witnesses.

LOUIS WANNER, JR.

Witnesses:

GEO. H. RAPSON,

W. WALTER HENDERSON.