

Jan. 13, 1948.

J. MULLER

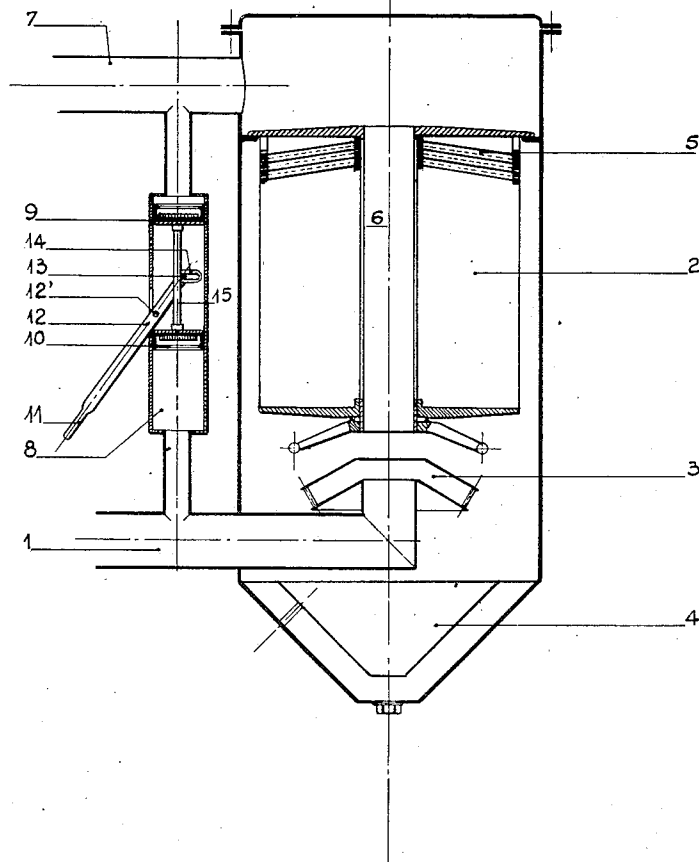
2,434,427

DEVICE FOR CLEANING FILTERS

Filed April 21, 1938

4 Sheets-Sheet 1

Fig. 1



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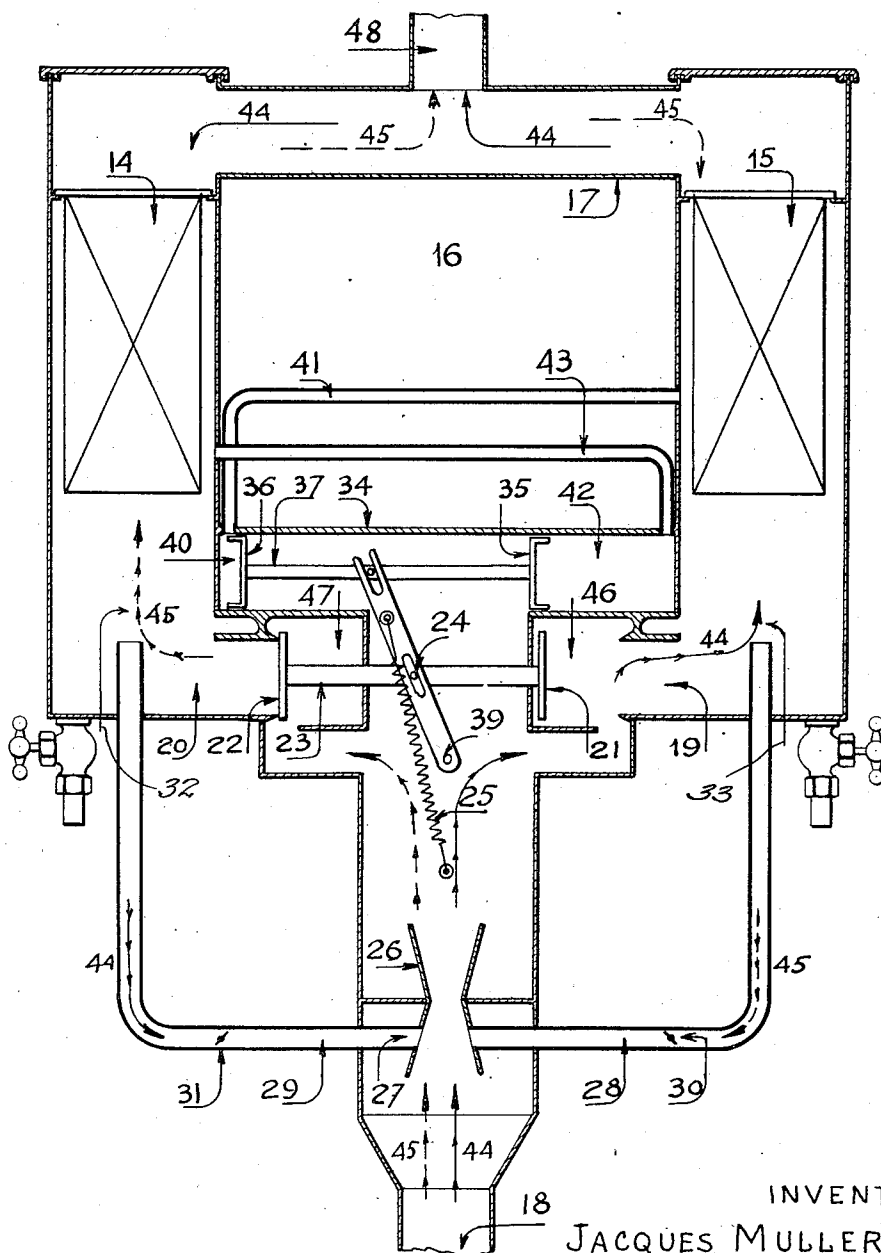
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Fig. 2



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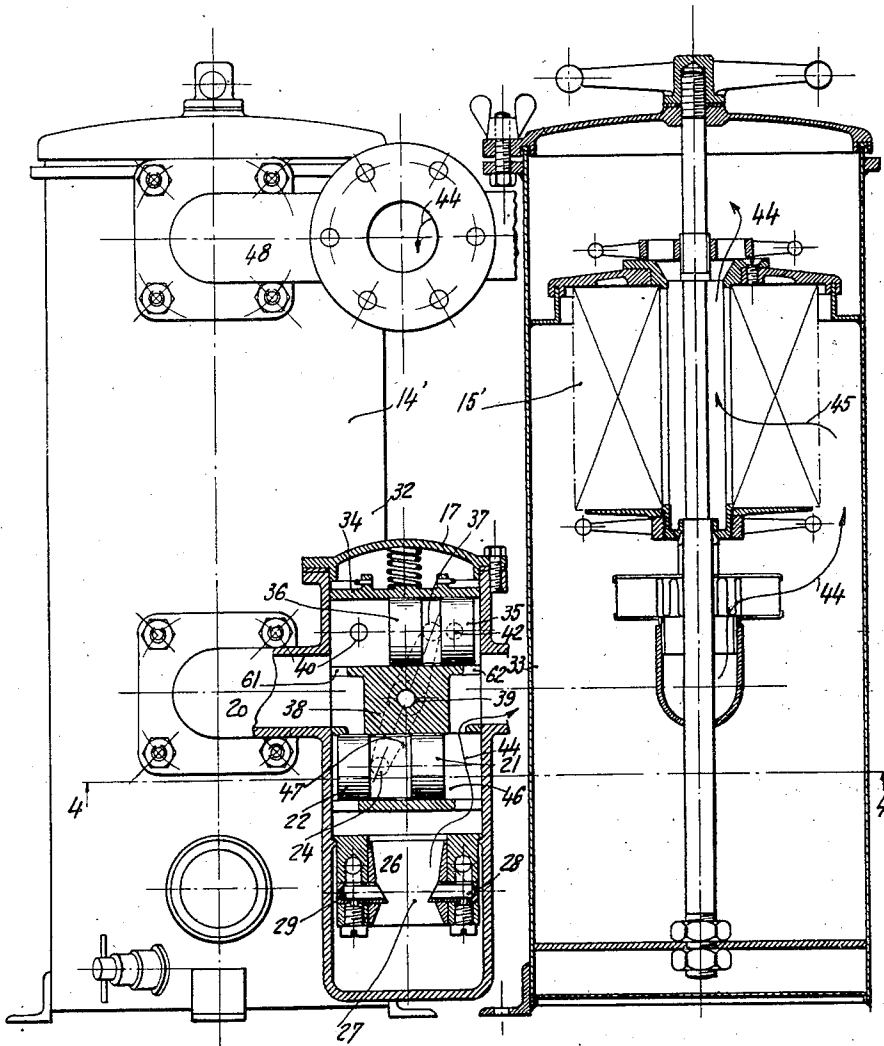
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Fig. 3



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Fig. 4

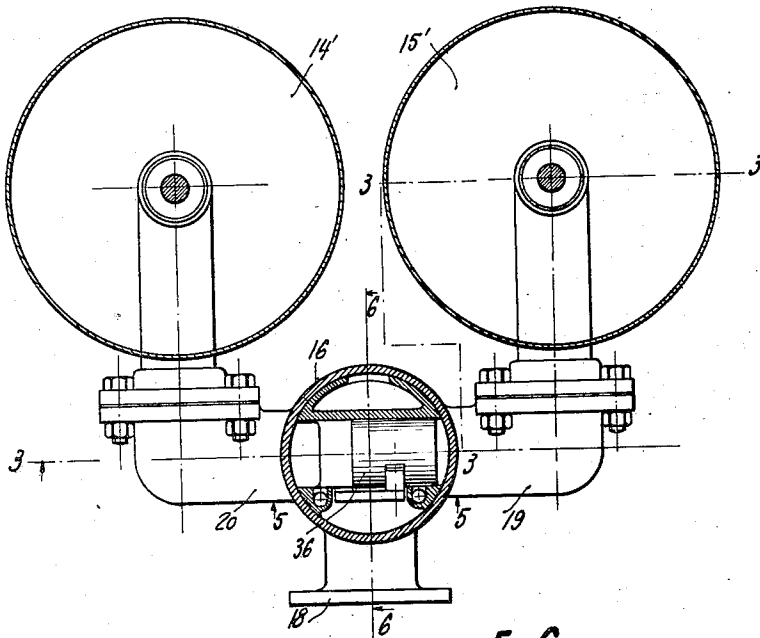


Fig. 5

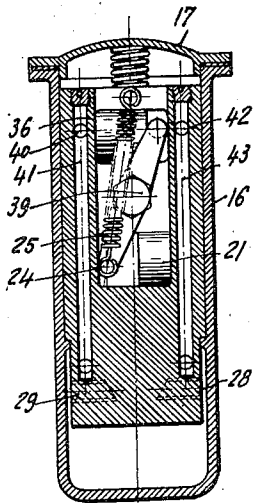
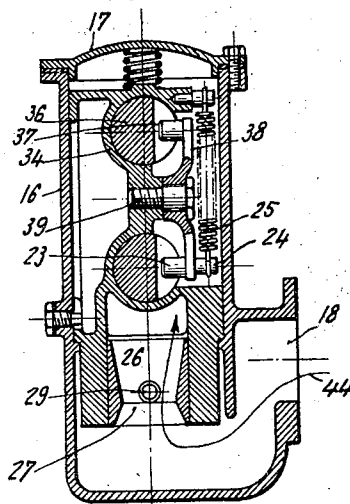


Fig. 6



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DEVICE FOR CLEANING FILTERS

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This invention relates to industrial filters wherein a filtering material, through which the liquid to be purified passes, retains the impurities contained in the latter.

In filters of this type, the pores of the filtering substance after being in use for a predetermined period of time, are clogged by the retained impurities, which necessitates increasing the pressure for the purpose of ensuring the normal delivery of the filter, this clogging frequently rendering the filter inoperative.

It is therefore necessary to stop the filter or to disengage it from the circuit, for the purpose of cleaning the filter, this stoppage or separating from the circuit being reduced to a minimum so as not to interfere with the normal operation of a continuous installation.

The present invention relates more particularly to devices for cleaning industrial filters wherein the clogged filtering materials are freed from the impurities which they retain by causing the whole or a portion of the treated liquid to circulate in the opposite direction, either manually or automatically, whilst preferably using in the latter case the increase in pressure or the depression produced by the clogging for actuating a device for effecting the reversing of the circulation of fluid.

In some cases it is possible to combine the cleaning on the counter current principle, which is operated independently, with the automatic operation by the addition of suitably located stop valves.

One of the preferred methods of cleaning filters by an independent member consists in connecting the inlet for the liquid to be purified and the outlet for the purified liquid by a by-pass which shunts the filter, and producing in this by-pass, for example by a piston, the movement of the liquid.

In the case of cleaning by the automatic reversal of the direction of the liquid stream and for maintaining the continuous operation of an installation reference will be made to a system comprising two filters or two batteries of filters between which are located reversing members sensitive to the pressure or a pressure reduction in the fluid stream and which, when this exceeds a predetermined and adjustable limit, places directly in circuit the cleaned filter and in the shunt circuit the filter to be cleaned.

A preferred embodiment of this automatic reversing device may be provided with a double piston receiving alternately the pressure of the fluid at each of its ends and actuating the double shut-

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ter, the adjustment of the pressure of operation being obtained by causing a portion of the liquid to be purified to pass into a venturi of which the neck is connected by passages to the chambers of the filters.

Other features of the invention appear from the following description with reference to the accompanying drawings, which show by way of example, in

Fig. 1 a sectional view of a filtering block of the known type with a by-pass and manually actuated pump, in

Fig. 2 a diagrammatic sectional view of two batteries of filters between which is located a reversing device sensitive to the pressure of the liquid stream, in

Fig. 3 a view partly in cross section and partly in elevation as on the line 3-3 of Fig. 4 of two filters between which is located a reversing device sensitive to the pressure of the liquid stream, in

Fig. 4 a plan view in cross section as on the line 4-4 of Fig. 3, in

Fig. 5 a sectional view as on the line 5-5 of Fig. 4 and in

Fig. 6 a sectional view as on the line 6-6 of Fig. 4.

Like numerals of reference indicate like parts in the different views.

In Fig. 1 the liquid to be purified arrives through the passage 1 at the axis of a filtering block 2 and impinges upon a conical deflector 3 which causes the heavy impurities to be deposited under the action of gravity into a lower hopper 4 from which they are directed into a decantation chamber, not shown. The liquid, of which the major portion is purified, leaves at the periphery of the deflector 3, passes through the filtering block 2 provided with filtering rings 5 which retain the fine impurities and leaves purified by a central pipe 6 of the block leading to the outflow pipe 7.

Between the pipes 1 and 7 there is mounted in shunt a cylinder 8 in which moves a double piston 9, 10 actuated from the outside by a handle 11, operating a lever 12 pivotally mounted at 12' and terminating in a roller 13 moving in a loop 14 of a rod 15 which connects together the two pistons 9, 10.

When the filtering portions 5 of the block 2 are to be cleaned the filter is isolated from the circuit by closing the inlet and outlet valves, not shown, then the double piston 9, 10 is actuated. The liquid which fills the filtering block then circulates in both directions, that opposite the normal

circulation entraining the materials which clog the pores from the filtering part of the filter, these materials being then conducted to the periphery of the filter and fall by gravity into the decantation chamber. The removal of the impurities is promoted by vibrations in the opposite direction produced by the alternating movement of the pistons, whilst their deposition under the action of gravity is effected in a relatively calm medium, due to the large cross-sectional area of the filter relatively to the outflow orifices of the cylinder 8. When there are used filtering elements which are arranged as shown in Fig. 1, that is to say in the form of truncated cones arranged vertically, the slope which results also promotes the removal by gravity of the impurities detached towards the periphery of the filter, but it will be understood that this arrangement is not given in a limiting sense, the systems shown being applied to any filter of the same type. It may be mentioned that with the conditions of operation of the device described the deposition of the impurities removed takes place very rapidly thus reducing the period of time during which the filter is out of circuit to a minimum.

In Figs. 2, 3, 4, 5 and 6 for the purpose of preventing stoppage, even temporarily, of the filtering system, there are provided two batteries of filters 14', 15' located on opposite sides of a central chamber 16, closed at the top at 17.

The liquid to be purified arrives at 18 in the axis of the chamber 16 and escapes towards the batteries of filters 14', 15' through the respective passages 19, 20 forming an extension one with the other. 48 is the outflow passage for the purified liquid after leaving the filters.

The inner orifices of the passages 19, 20 may be closed alternately by a double sliding shutter 21, 22, of which the rod 23 is connected at the middle 24 to a spring 25 which, when it has passed its central position slackens in one direction or the other so as to close one of the passages 19, 20.

In the path followed by the liquid to be purified between the passage 18 and the passages 19, 20 is located a venturi 26 of which the neck 27 is connected by passage 28, 29 (provided with adjustable valves 30, 31 in Fig. 2), to the chambers 32, 33, respectively of the filters 14', 15'.

The function of the Venturi tube is to produce low pressure in pipes 44 and 45 and in the lower ends of the chambers 19, 20. In the case of the chamber containing the active filter bed, the pressure reduction merely seeks oil back to the main inlet pipe, while in the case of the chamber containing the clogged filter bed the pressure reduction induces reverse flow of oil from the conduit connecting the outlets, through the clogged filter bed. The valves 30, 31 in the passages 28, 29 are both always open and they permit regulation of the flow in these passages and of the degree of clogging at which reversal takes place.

Above the shutter 21, 22 is located a cylinder 34 in which moves a double piston 35, 36, of which the rod 37 is connected by the link 38 pivotally mounted at 39, to the pivot 24 of the rod 23 of the double shutter 21, 22. One of the ends 40 of the cylinder 34 communicates by the passage 41 with the liquid inlet opening 19 and the other end 42 of the cylinder 34 communicates by the passage 43 with the liquid inlet opening 20 (Fig. 2).

In Figs. 3, 4, 5 and 6, the end 40 communicates by the passage 61 with the liquid inlet opening 20 and 42 by 62 with 19.

In the position shown in Figs. 2, 3, 4, 5 and 6

the block 15' is in operation, the liquid to be purified following the circuit indicated by the arrow 44.

A portion of the purified liquid passes on the counter-current principle into the filter 14' which it cleans and returns by passages 20, 40, 41, 29 (Figs. 3, 4, 5 and 6), or the passage 29 (Fig. 2), into the neck 27 of the venturi in which the depression is adjustable by the valve 31 (Fig. 2). When the clogging of the filter 15' increases the pressure of circulation of the fluid, this pressure is transmitted by the passage 41 to the piston 36 in the case of Fig. 2, which is moved towards the right whilst entraining by its rod 37 and the link 38, the double shutter 21, 22 and the spring 24. When the latter has passed its vertical dead centre position it slackens suddenly, the shutter 21 closes the passage 19 and the circuit is reversed. In case of Figs. 3, 4, 5 and 6 the depression is transmitted by the passage 19 and 62 to the piston 35 which is moved towards the left whilst entraining by its rod 37 and the link 38 the double shutter 21, 22 and the spring 24 for closing the passage 40 and reversed the circuit.

In Fig. 2 the circuit follows the direction of the broken arrows 45 whilst cleaning the filter 15' and so on.

In Fig. 2 it will be seen that by reason of the venturi 27, the pressure and velocity of the fluid can be adjusted according to the degree of clogging of the latter by means of the valves 30, 31.

Preferably and as shown in the drawing, the closure flaps 21, 22 are located respectively in chambers 46, 47 in which they are not exposed to the direct action of the fluid stream thus preventing any defective operation or any premature operation.

The reversing system shown in Figs. 2, 3, 4, 5 and 6 may also be arranged for actuation by hand.

It will be understood that various modifications may be made without departing from the scope of the invention, thus for example when the mechanism for effecting the automatic reversal is mounted on the inlet orifices of the filters and operates by pressure on the charging circuit of the pump, it is possible, if desired, to mount it on the suction circuit. For this purpose it is sufficient to place the automatic reversing mechanism on the outlet orifices of the filter, the operation being then obtained by depression.

I claim:

1. A device of the character described, comprising two filter chambers, a filter bed in each chamber, each chamber having an inlet and an outlet, a conduit for supplying liquid to be filtered to the inlets of said chambers, valves for closing the inlets of said chambers, means connecting said valves to open the inlet to one chamber when the inlet of the other chamber is closed, means responsive to the pressure on the inlet side of the filter in one chamber urging the valves to a position to close the inlet to said chamber, means responsive to the pressure on the inlet side of the filter of the other chamber urging the valves to a position to close the inlet of said other chamber, whereby when one filter becomes clogged its inlet valve will be closed and the inlet valve of the other filter opened, a conduit connecting the outlets of the two filter chambers, and means for forcing filtered liquid issuing from one filter chamber in reverse direction through the other filter chamber to remove impurities settled on the filter in the latter chamber.

2. A device of the character described, compris-

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ing two filter chambers, a filter bed in each chamber, each chamber having an inlet and an outlet, a conduit for supplying liquid to be filtered to the inlets of said chambers, valves for closing the inlets of said chambers, means connecting said valves to open the inlet to one chamber when the inlet of the other chamber is closed, means responsive to the pressure on the inlet side of the filter in one chamber urging the valves to a position to close the inlet to said chamber, means responsive to the pressure on the inlet side of the filter of the other chamber urging the valves to a position to close the inlet of said other chamber, whereby when one filter becomes clogged its inlet valve will be closed and the inlet valve of the other filter opened, a pivoted lever interposed between said pressure responsive means and the valves for transmitting actuating movement to the valves, spring means connected to said lever in toggle fashion for urging the valves from an intermediate position to a position wherein one of the valves is closed, a conduit connecting the outlets of the two filter chambers, and means for forcing filtered liquid issuing from one filter chamber in reverse direction through the other filter chamber to remove impurities settled on the filter in the latter chamber.

3. A device of the character described, comprising two filter chambers, a filter bed in each chamber, each chamber having an inlet and an outlet, a conduit for supplying liquid to be filtered to the inlets of said chambers, valves for closing the inlets of said chambers, means connecting said valves to open the inlet to one chamber when the inlet of the other chamber is closed, means responsive to the pressure on the inlet side of the filter in one chamber urging the valves to a position to close the inlet to said chamber, means responsive to the pressure on the inlet side of the filter of the other chamber urging the valves to a position to close the inlet of said other chamber, whereby when one filter becomes clogged its inlet valve will be closed and the inlet valve of the other filter opened, a conduit connecting the outlets of said chambers, a discharge outlet in said conduit, and a Venturi tube in the supply conduit, said Venturi tube being connected to the inlet ends of said chambers and adapted to create there a pressure reduction sufficient to induce reverse flow through the filter bed in the chamber whereof the inlet is closed by one of said valves.

4. A device of the character described, comprising two filter chambers, a filter bed in each chamber, each chamber having an inlet and an outlet, a conduit for supplying liquid to be filtered to the inlets of said chambers, valves for closing the inlets of said chambers, means connecting said valves to open the inlet to one chamber when the inlet of the other chamber is closed, means responsive to the pressure on the inlet side of the filter in one chamber urging the valves to a position to close the inlet to said chamber, means responsive to the pressure on the inlet side of the filter of the other chamber urging the valves to a position to close the inlet of said other chamber, whereby when one filter becomes clogged its inlet valve will be closed and the inlet valve of the other filter opened, a conduit connecting the outlets of said chambers, a discharge outlet in said conduit, a Venturi tube in the supply conduit, and conduits connecting the neck of the Venturi tube with the inlet ends of both chambers, said Ven-

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turi tube being adapted to create at said ends a pressure reduction.

5. A device of the character described, comprising two filter chambers, a filter bed in each chamber, each chamber having an inlet and an outlet, a conduit for supplying liquid to be filtered to the inlets of said chambers, valves for closing the inlets of said chambers, means connecting said valves to open the inlet to one chamber when the inlet of the other chamber is closed, means responsive to the pressure on the inlet side of the filter in one chamber urging the valves to a position to close the inlet to said chamber, means responsive to the pressure on the inlet side of the filter of the other chamber urging the valves to a position to close the inlet of said other chamber, whereby when one filter becomes clogged its inlet valve will be closed and the inlet valve of the other filter opened, a conduit connecting the outlets of said chamber, a discharge outlet in said conduit, a Venturi tube in the supply conduit, conduits connecting the neck of the Venturi tube with the inlet sides of both chambers, and means in said last-mentioned conduits for controlling the flow of fluid therethrough.

6. A device of the character described, comprising two filter chambers, a filter bed in each chamber, each chamber having an inlet and an outlet, a conduit for supplying liquid to be filtered to the inlets of said chambers, a conduit connecting the outlets of said chambers, a discharge conduit branching from said connecting conduit, valves for closing the inlets of said chambers, means connecting said valves to open the inlet to one chamber when the inlet of the other chamber is closed, means responsive to the pressure on the inlet side of the filter in one chamber urging the valves to a position to close the inlet to said chamber, means responsive to the pressure on the inlet side of the filter of the other chamber urging the valves to a position to close the inlet of said other chamber, whereby when one filter becomes clogged its inlet valve will be closed and the inlet valve of the other filter opened, a Venturi tube in the supply conduit, and conduits connecting the neck of the Venturi tube with the inlet sides of both chambers to create a suction on the inlet side of the clogged filter chamber and cause a portion of the filtered fluid flowing in the conduit connecting the chamber outlets to be drawn from the outlet to the inlet side of the filter out of service.

7. A device of the character described, comprising two filter chambers, a filter bed in each chamber, each chamber having an inlet and an outlet, a conduit for supplying liquid to be filtered to the inlets of said chambers, a conduit connecting the outlets of said chambers, a discharge conduit branching from said connecting conduit valves for closing the inlets of said chambers, means connecting said valves to open the inlet to one chamber when the inlet of the other chamber is closed, means responsive to the pressure on the inlet side of the filter in one chamber urging the valves to a position to close the inlet to said chamber, means responsive to the pressure on the inlet side of the filter of the other chamber urging the valves to a position to close the inlet of said other chamber, whereby when one filter becomes clogged its inlet valve will be closed and the inlet valve of the other filter opened, a Venturi tube in the supply conduit, conduits connecting the neck of the Venturi tube with the inlet sides of both chambers to create a suction on the inlet

side of the clogged filter chamber and cause a portion of the filtered fluid flowing in the conduit connecting the chamber outlets to be drawn from the outlet to the inlet side of the filter out of service, a pivoted lever interposed between said 5 pressure responsive means and the valves for transmitting actuating movement to the valves, and spring means connected to said lever in toggle fashion for urging the valves from an intermediate position to a position wherein one of 10 the valves is closed.

8. A device according to claim 6, in which the closure valves are located in chambers by which they are not exposed to the dynamic action of the liquid to be purified.

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