No. 707,899. Patented Aug. 26, 1902.

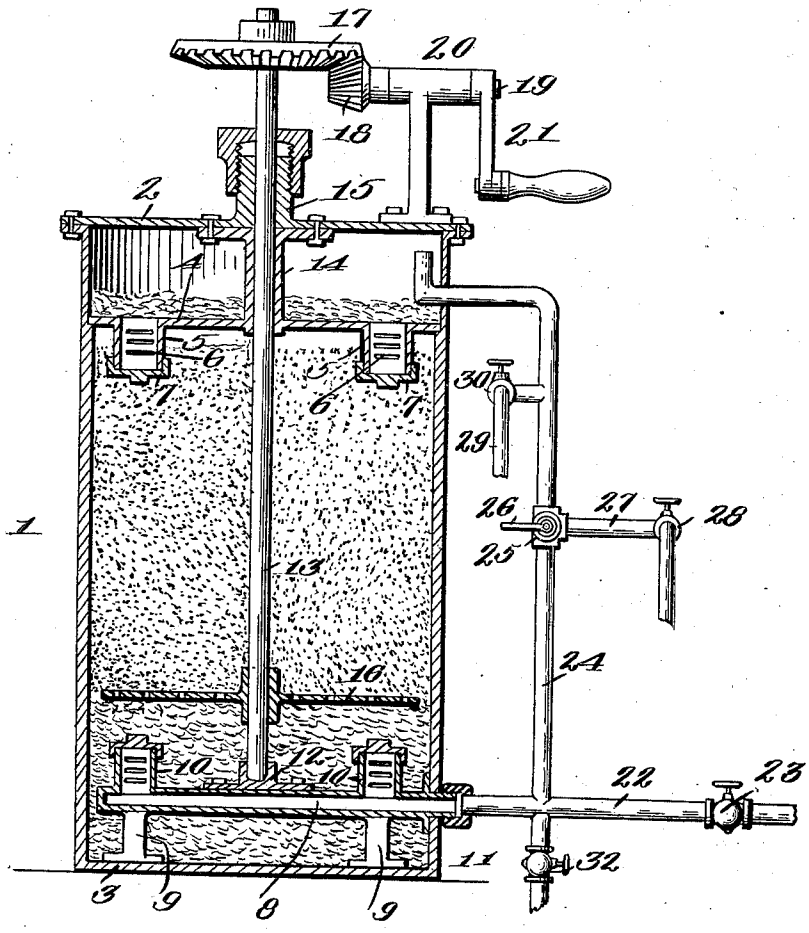
F. BOMMARIUS.

FILTER.

(Application filed Dec. 31, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



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Fig. 2.

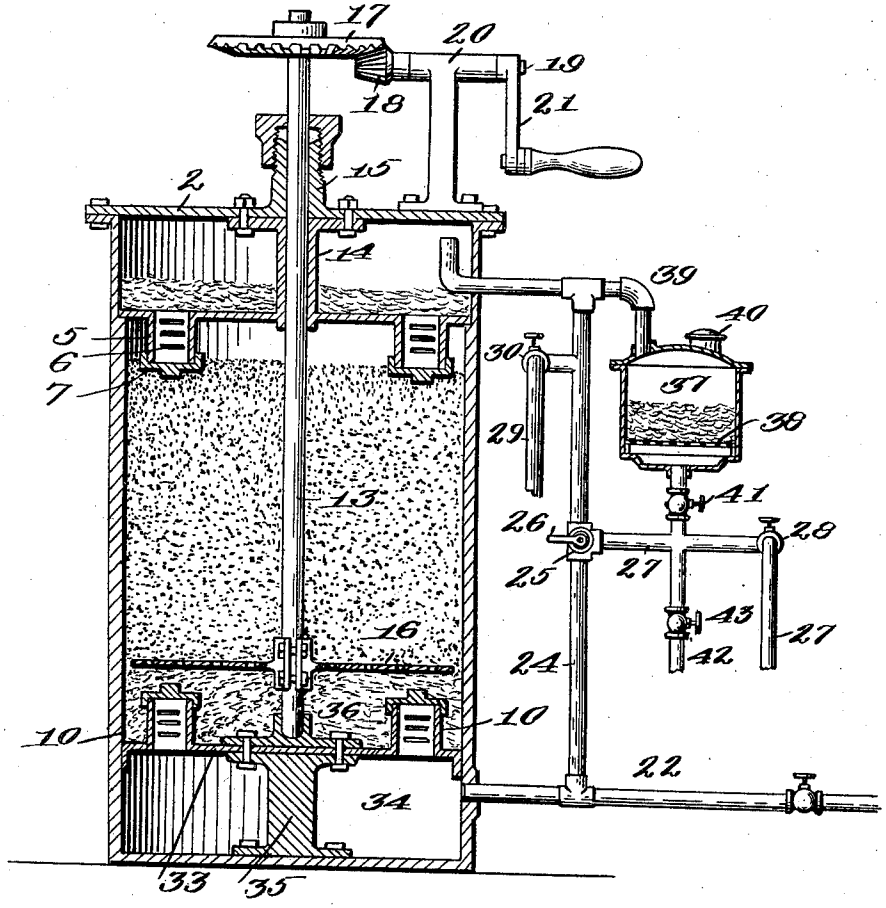
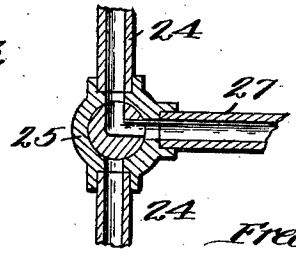


Fig. 3.



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UNITED STATES PATENT OFFICE.

FREDERICK BOMMARIUS, OF NEW ORLEANS, LOUISIANA.

FILTER.

SPECIFICATION forming part of Letters Patent No. 707,899, dated August 26, 1902.

Application filed December 31, 1901. Serial No. 87,938. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK BOMMARIUS, a citizen of the United States, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented new and useful Improvements in Filters, of which the following is a specification.

This invention relates to filters, and is in the nature of an improvement on the filter for which I obtained Letters Patent of the United States on the 29th day of August, 1899, and numbered 632,091.

The present invention has for its object to improve the construction of the filter shown in said Letters Patent and to render its operation more efficient and thorough.

To these ends my invention consists in the features and in the construction, combination, and arrangement of parts hereinafter described, and particularly pointed out in the claims following the description, reference being had to the accompanying drawings, wherein—

Figure 1 is a vertical sectional view of one form of my improved filter that is particularly designed for filters of relatively small capacity. Fig. 2 is a similar view of a slightly-modified construction especially designed for filters of large capacity, and Fig. 3 is a detailed sectional view of the three-way valve employed in both arrangements.

Referring to Fig. 1 of the drawings, the numeral 1 indicates the filter-casing, preferably comprising a cylindrical upright metallic vessel having securely affixed at its upper and lower ends heads, respectively indicated by the numerals 2 and 3. Firmly affixed in the upper portion of the vessel 1 at a suitable distance below the head 2 is a diaphragm 4, having inserted therein a plurality of short tubes 5. Said tubes 5 are preferably formed of brass and are provided with horizontal slits 6. The upper ends of the tubes 5 may be threaded or expanded in suitable perforations formed in the diaphragm 4 and their lower ends are closed by screw plugs or caps 7. In the lower portion of the filter-casing 1 is arranged a horizontally-disposed pipe 8, which is supported on the bottom head 3 by pedestals 9, and fitted in the upper side of said pipe 8 is a plurality of horizontally-slitted tubes 10, constructed in all respects in manner similar to the tubes 5, before referred to. The pipe 8 projects through one side of the filter-casing and is threaded, as at 11. Formed on the upper side of the pipe 8 is a step-bearing 12, in which is stepped the lower end of the vertical shaft 13, and the upper end of said shaft projects through a sleeve 14, which passes through a central perforation formed in the diaphragm 4 and is attached at its upper end to the under side of the head 2. Secured to the upper side of said head, above the upper end of the sleeve, is a stuffing-box 15, through which the upper end of the said shaft projects and in which it is tightly packed. Fixed on the shaft 13 in its lower end are perforated stirrer-arms 16, that project horizontally and radially from said shaft. On the upper end of the shaft 13 is fixed a beveled gear-wheel 17, that gears with the corresponding beveled pinion 18, mounted on a horizontal shaft 19, having a bearing in a suitable bracket-arm 20, secured to the head 2. On the end of the shaft 19 is fixed a crank-handle 21, by means of which rotary movement may be imparted to the stirrer-arms 16, for the purpose hereinafter described. Coupled to the threaded end of the pipe 8, before referred to, is a discharge-pipe 22, provided with a hand-valve 23, and coupled to said pipe and extending vertically therefrom is a pipe 24, which at its upper end projects into the filter-casing at a point between the diaphragm 4 and head 2. Arranged in the pipe 24 is a three-way valve 25, provided with a handle 26, and coupled to the casing of said valve is a water-inlet pipe 27, that may lead from a water-main, reservoir, or any other suitable source of supply, and has arranged in it a hand-valve 28. A waste-pipe 29 is connected at one end to the pipe 24 at a point between the three-way valve and its upper end and is provided with a hand-valve 30. In the space above the diaphragm 4 is deposited a suitable quantity of iron filings, and a suitable quantity of the same material is deposited in the lower end of the filter-casing at a point below the stirrer-arms 16. The body of the filter-casing above the stirrer-arms and up to the under side of the diaphragm 4 is filled with a charge of sand.

The operation of this form of my filter is as follows: The valve 30 in the waste-pipe 29

and a similar valve 32 in the lower end of the pipe 24 are closed. The valve 28 in the inlet-pipe 27 is opened, and the three-way valve 25 is turned to place the pipe 27 and the upper part of the pipe 24 in communication. Water then enters by pipes 27 and 24 into the upper end of the filter-casing above the diaphragm 4 and first passes through the iron filings and through the slitted tubes 5. It then passes on downward through the bed of sand, and in the lower end of the casing again passes through the bed of iron filings. If the valve 23 be now opened, the water will pass into the slitted tubes 10 and thence by the pipe 8 and the discharge-pipe 22 to the point where it is to be used. Should the filter become foul or in need of cleansing, the valves 23 and 32 are closed. The three-way valve is turned to a position to place the inlet-pipe 27 in communication with the lower end of the pipe 24. The valve 30 in the waste-pipe 29 is then opened, as is also the valve 28 in the inlet-pipe. The water will then flow through the inlet-pipe 27 and the lower end of the pipe 24 into the pipe 22 and from the latter into the pipe 8, from whence it will be discharged in an upward direction through the slitted tubes 10. The water then passes upward through the iron filings and the sand bed in the body of the filter-casing, thence through the slitted tubes 6 into the space between the diaphragm 4 and head 2, and thence out by the pipe 24, and is discharged through the waste-pipe 29. While the water is thus passing in this manner through the filter the crank 29 is turned and through the medium of the gearing described rotates the shaft 13 and the stirrer-arms carried by the latter and stirs up and agitates the filtering material. The water in its upward passage is thus enabled to wash off the impurities from every particle of the filtering material and discharges said impurities through the waste-pipe 29, as before stated. After the filter has been thoroughly cleansed it may be restored to its former position in the manner described and the filtering operation resumed. By arranging the diaphragm 4 in the filter-casing in the manner described the iron filings through which the water is first caused to pass are prevented from working their way down through the sand bed into the bottom of the filter, which they otherwise would do owing to their superior weight. Furthermore, by making the slitted tubes 5 pendent from the diaphragm 4 and by causing the slitted tubes 10 to project vertically upward from the pipe 8 the water during the filtering operation is distributed downwardly through the filtering material from the space above the diaphragm 4, while in the cleansing operation the water is directed by the slitted tubes 10 to flush out the filtering material. I have described the tubes as being horizontally slitted. Said slits, however, may be formed vertically or may consist of round or other suitably-shaped perforations or apertures. I have also described the pipe 8 in the lower portion of the filter-casing as being a straight pipe; but it is obvious that it might be formed in the shape of a coil or a ring or annulus or any other suitable or approved shape without departing from the spirit of the invention.

In the arrangement shown in Fig. 2 of the drawings the construction is in most respects identical with that immediately above described. Those parts shown in Fig. 2 which are constructed and arranged in the same manner as corresponding parts in the arrangement shown in Fig. 1 will be designated by the same reference-numerals.

Referring to Fig. 2 of the drawings, the numeral 1 indicates the filter-casing, closed at its top and bottom by heads respectively indicated by the numerals 2 and 3. Arranged in the upper part of the filter-casing at a suitable distance below the head 2 is a transverse diaphragm 4, pendent from which are slitted tubes 5, closed at their lower ends by plugs or caps 7, said tubes being opened at their upper ends and threaded or expanded into suitable perforations formed in the diaphragm in the manner hereinbefore described. Arranged in the lower portion of the filter-casing is a transverse diaphragm 33, projecting upwardly from which are slitted tubes 10, open at their lower ends and threaded or expanded into suitable perforations formed in said diaphragms, the upper ends of the said tubes being closed by plugs or caps in manner similar to the tubes 5. A space 34 is formed between the lower diaphragm 33 and the bottom head 3 and said space termed a "collecting-chamber," which term may also be used to designate the pipe 8. (Shown in Fig. 1.) Fixed centrally to the bottom of the head 3 is a pedestal 35, which is bolted to the under side of the diaphragm 33 and forms a support to the latter and for the shaft 13, which is stepped in a bearing 36, bolted to the upper side of the diaphragm 33 immediately above the pedestal. Said shaft is provided with horizontal radially-extending perforated stirrer-arms 16 and projects at its upper end through a sleeve 14, fixed centrally in the diaphragm 4 and connected at its upper end to the head 2. The shaft also projects through a stuffing-box 15, fixed on the upper side of the head-tube, and at its upper end is provided with a bevel or gear wheel 17, that gears with a corresponding pinion gear-wheel 18, fixed on the horizontal shaft 19, having a bearing in a bracket 20 and provided at its extremity with a crank-handle 21. Connected with the collecting-chamber 34 is a discharge-pipe 22, provided with a hand-valve 23, and connected with pipe 22 and extending vertically therefrom is a pipe 24, the upper end of which projects into the filter-casing above the diaphragm 4. This pipe 24 for the purpose of distinguishing it from the other pipes is termed the "feed-pipe," and the corresponding pipe 24 in Fig. 1 is likewise designated

by the same term. Arranged in the feed-pipe 24 is a three-way valve 25, and connected with the casing of said valve is a service-pipe 27, leading from the water-main or other suitable source of supply. A valve 28 is arranged in the service-pipe and is for the purpose of controlling the passage of water therethrough. The waste-pipe 29 is connected with the feed-pipe 24 at a point above the three-way valve and is provided with a hand-valve 30. Arranged above the lateral branch of the service-pipe 27 and communicating at its lower end with the latter is a reservoir 37, in the lower portion of which is arranged a strainer 38, and disposed in said reservoir and resting on said strainer is a quantity of iron filings. A pipe 39 leads from the upper end of the reservoir and connects with the upper part of the feed-pipe 24. Said reservoir at its upper end is provided with a normally closed charging-inlet 40, into which the iron filings may be introduced, and at its lower end at the point where it connects with the service-pipe is provided with a hand-valve 41. A waste-pipe 42 is pendent from the lateral branch of the service-pipe 27 at a point immediately below the valve 41 and is provided with a hand-valve 43. A quantity of iron filings is disposed in the filter-casing above the diaphragm 4, and, if preferred, a suitable quantity of such filings may be disposed in the lower portion of the filter-casing between the diaphragm 33 and the stirrer-arms 16, the space between said last-named bed of iron filings and the under side of the upper diaphragm 4 being filled with a bed of sand or the like. If the valves 23, 41, 43, and 30 be closed, the three-way valve 25 be turned to place the service-pipe 27 in communication with the upper part of the pipe 24, and the valve 28 be opened, the water will then flow by the service-pipe 27 and the upper part of the feed-pipe 24 into the space in the filter-casing above the diaphragm 4. The water will then filtrate through the iron filings, will pass through the slitted tubes into that portion of the casing below the diaphragm 4, will then filtrate through the bed of sand and through the lower bed of iron filings, will pass through the slitted tubes 10 and into the collecting-chamber 34, from whence it will be conducted by the discharge-pipe 22 and may be withdrawn from the latter as needed for use. When it becomes necessary to flush out the filter to cleanse the filter-beds, the three-way valve 25 is turned to place the service-pipe 27 in communication with the lower branch of the feed-pipe 24, and the valve 30 in the waste-pipe 29 is opened. The water will then pass by the service-pipe 29 and pipes 24 and 22 into the collecting-chamber 34, will thence pass out of the said chamber by the slitted tubes 10, and will pass up through the iron filings and sand and through the slitted tubes 5 into the space above the diaphragm 4, passing through the iron filings contained in said space, and thence out by the upper branch of the feed-pipe 24 and is conducted off by the waste-pipe 29, the arrangement being identically the same as that before described with reference to the arrangement shown in Fig. 1. When, however, it is desirable that the water to be filtered should pass through a greater quantity of iron filings than is contained in the space above the diaphragm 4 before being filtered through the bed of sand, the valve 41 is opened and the three-way valve 25 is then turned so as to shut off all communication between the service-pipe 27 and both branches of the feed-pipe 24. The water will then pass through the service-pipe 27 up through the strainer and the iron filings contained in the reservoir 37, and thence pass by the pipe 39 and upper portion of the pipe 24 into the space above the diaphragm 4, and from thence the filtering operation will proceed in the manner before described. When the reservoir is to be thrown out of operation, the valve 28 may be closed and the valves 41 and 43 opened, whereupon the water contained in the reservoir will drain off by gravity through the waste-pipe 42, after which the valves 41 and 43 are closed, the valve 28 opened, and the three-way valve turned to a position to put the service-pipe 27 in communication with the upper branch of the feed-pipe, whereupon the water will pass on to the filter without passing through the reservoir.

Having described my invention, what I claim is—

1. In a filter, the combination with the filter-casing having an inlet in its upper end and an outlet in its lower end, of a perforated diaphragm fitted in the upper part of the casing below the inlet, slitted tubes fitted at their upper ends in said perforations and closed at their lower ends, a collecting-chamber arranged in the lower end of the casing and connecting with the outlet, slitted tubes projecting upwardly from said collecting-chamber and closed at their upper ends, and filtering-beds arranged respectively above and below the diaphragm in the upper portion of the filter-casing, substantially as described.

2. In a filter, the combination with the filter-casing having an inlet in its upper end and an outlet in its lower end, of a perforated diaphragm fitted in the upper part of the casing below the inlet, slitted tubes fitted at their upper ends in said perforations and closed at their lower ends, a collecting-chamber arranged in the lower end of the casing and connecting with the outlet, slitted tubes projecting upwardly through said collecting-chamber and closed at their upper ends, and means for reversing the passage of the water through the filter, substantially as described.

3. In a filter, the combination with the filter-casing having an inlet in its upper end and an outlet in its lower end, of a perforated diaphragm fitted in the upper part of the casing below the inlet, slitted tubes fitted at

their upper ends in said perforations and closed at their lower ends, a collecting-chamber arranged in the lower part of the casing and communicating with the outlet, slitted tubes projecting upwardly from said collecting-chamber and closed at their upper ends, a filter-bed of iron filings arranged in the casing above the upper diaphragm, and a filter-bed of sand arranged in the casing below the upper diaphragm, substantially as described.

4. In a filter, the combination with the filter-casing having an inlet in its upper end, and an outlet in its lower end, of a perforated diaphragm fitted in the upper part of the casing below the inlet, slitted tubes fitted at their upper ends in said perforations and closed at their lower ends, a collecting-chamber arranged in the lower end of the casing and communicating with the outlet, slitted tubes projecting upwardly from said collecting-chamber and closed at their upper ends, filter-beds arranged above and below the diaphragm in the upper portion of the filter-casing, a vertical shaft arranged centrally in the filter-casing and projecting through the top of the latter, perforated stirrer-arms fixed on the lower portion of said shaft above the collecting-chamber, and gearing arranged externally of the casing for rotating said shaft and stirrer-arms, substantially as described.

5. In a filter, the combination with the filter-casing having an inlet in its upper end and an outlet in its lower end, of a perforated diaphragm fitted in the upper part of the casing below the inlet, slitted tubes fitted at their upper ends in said perforations and closed at their lower ends, a collecting-chamber arranged in the lower end of the casing and communicating with the outlet, slitted tubes projecting upwardly from said collecting-chamber and closed at their upper ends, a valved discharge-pipe leading from the outlet, a feed-pipe leading from the discharge-pipe to the inlet, a service-pipe connected with said feed-pipe intermediate the ends of the latter and a three-way valve for diverting the water from the service-pipe to either branch of the feed-pipe, substantially as described.

6. In a filter, the combination with the filter-casing having an inlet in its upper end and an outlet in its lower end, of a perforated diaphragm fitted in the upper part of the casing below the inlet, slitted tubes fitted at their upper ends in said perforations and closed at their lower ends, a collecting-chamber arranged in the lower end of the casing and communicating with the outlet, slitted tubes projecting upwardly from said collecting-chamber and closed at their upper ends, filter-beds arranged respectively above and below the diaphragm in the upper part of the casing, a valved disharge-pipe leading from the outlet, a feed-pipe leading from the discharge-pipe to the inlet, a service-pipe connected with said feed-pipe intermediate the ends of the latter, a three-way valve for diverting the water from the service-pipe to either branch of the feed-pipe, and a valved waste-pipe connected with the feed-pipe above said three-way valve, substantially as described.

7. In a filter, the combination with a filter-casing having an inlet in its upper end and an outlet in its lower end, and a collecting-chamber in its lower end communicating with said outlet, of a valved discharge-pipe leading from the outlet, a feed-pipe connected with one end of said discharge-pipe and at its other end with the upper end of the filter-casing, and provided with a valved waste-pipe, a service-pipe connected with the feed-pipe intermediate the ends of the latter, a three-way valve for diverting the water from the service-pipe to either branch of the feed-pipe or for shutting off the communication between said pipes altogether, a reservoir connected at its lower end by a valved communication with said service-pipe and at its upper end communicating by a pipe with the upper branch of the feed-pipe, a strainer arranged in the lower end of said reservoir, and a bed of iron filings supported on said strainer, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FREDERICK BOMMARIUS.

Witnesses:

JAMES W. KIRCHHOFF,

W. H. COOK.