

Aug. 24, 1948.

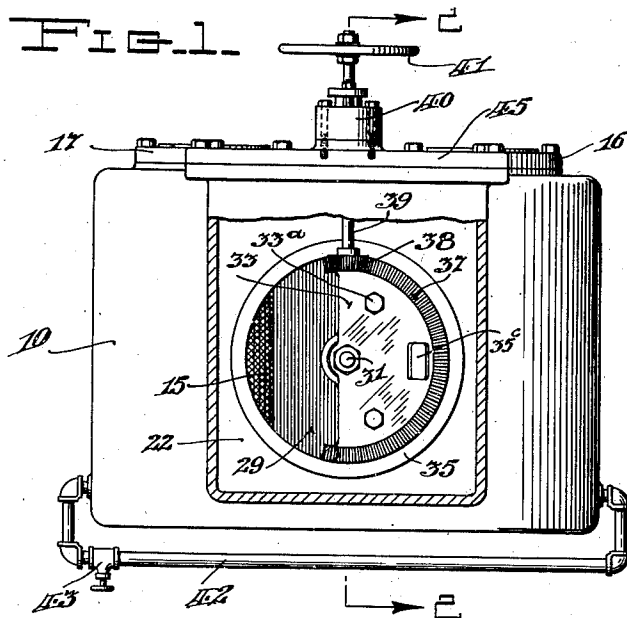
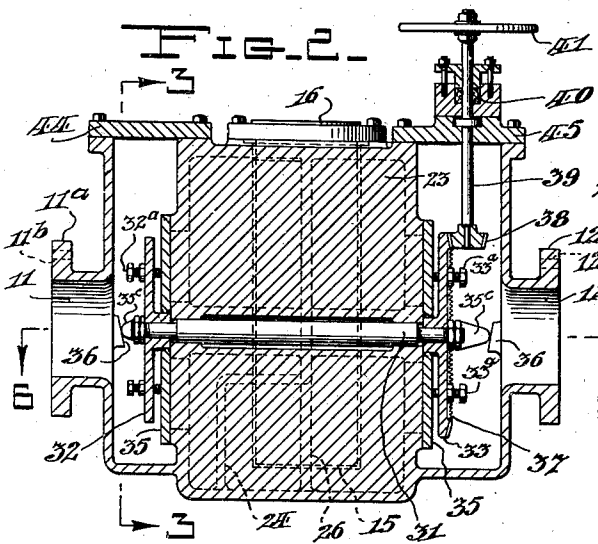
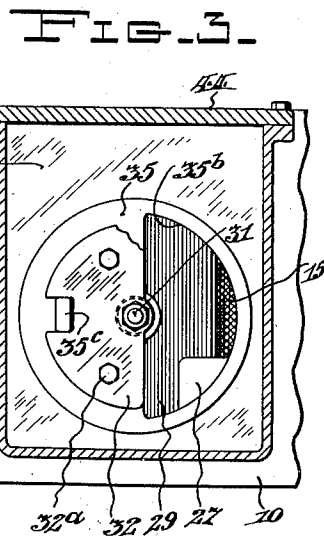
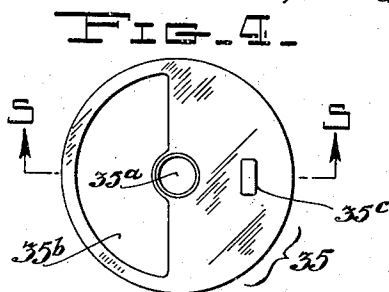
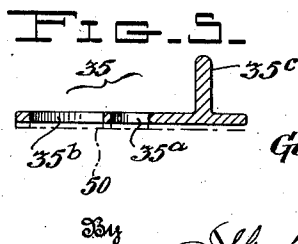
G. L. MacNEILL

2,447,952

STRAINER

Filed July 4, 1944

2 Sheets-Sheet 1



Inventor:

George L. MacNeill,

Alfred E. Ischinger,
Attorney.

Aug. 24, 1948.

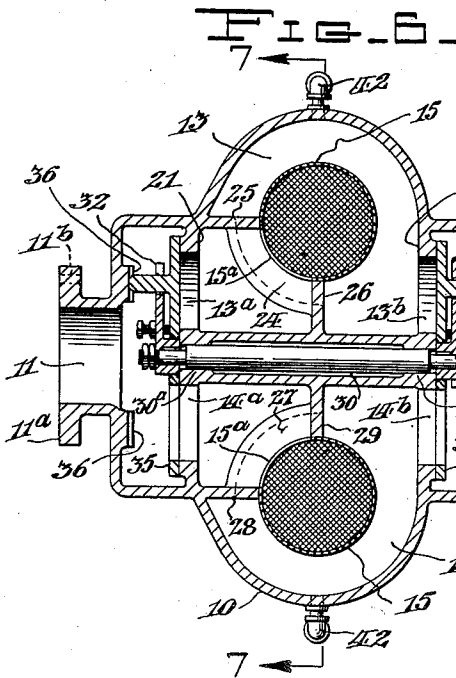
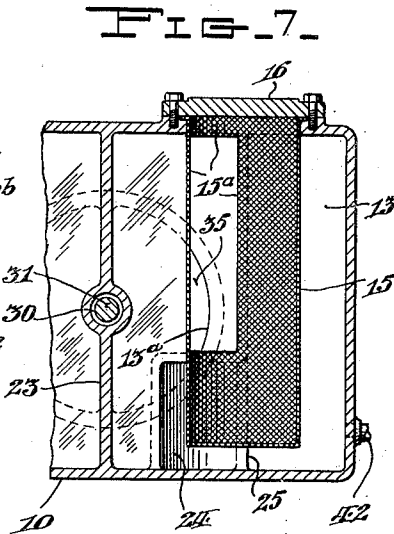
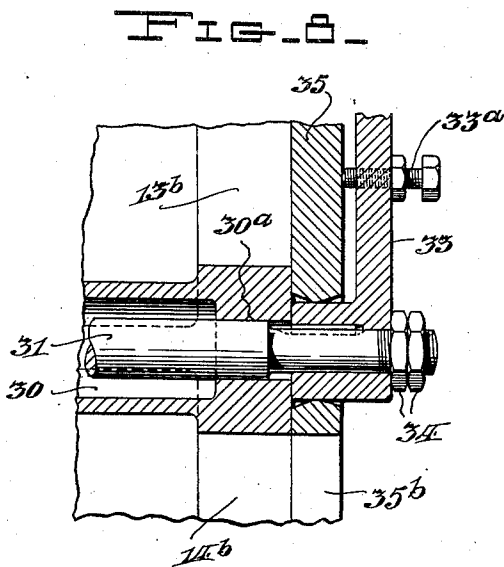
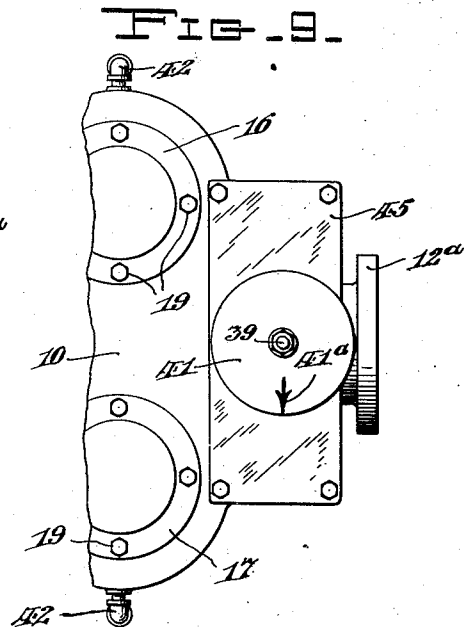
G. L. MacNEILL

2,447,952

STRAINER

Filed July 4, 1944

2 Sheets-Sheet 2



Inventor:

George L. MacNeill,

By

Alfred E. Pickinger,
Attorney.

UNITED STATES PATENT OFFICE

2,447,952

STRAINER

George L. MacNeill, Pennside, Pa.

Application July 4, 1944, Serial No. 543,461

6 Claims. (Cl. 210-168)

1

This invention generally relates to mechanical devices for straining liquids, and more particularly to the type known as "duplex strainers"; although certain features of the invention are not limited to devices of this specific type.

One object of my invention is to provide a novel strainer unit for liquids having a plurality of strainer elements through which liquid is directed in selective manner, and which unit has certain structural and functional features of advantage over similar devices heretofore available for this purpose.

Another object is to provide such a unit embodying novel features adapted to overcome certain difficulties heretofore experienced in connection with the manufacture and use of the devices to which the invention relates.

It is also an object to provide such a unit in which the functioning of the valve means involves a new mode of operation effecting free and easy actuation of the movable valve members from one selective position to another, and a final positive seating action thereof at each valve-closing point.

An additional object is to provide such a unit in which the construction and operation of the valve means is such as to preclude the possibility that any material, or matter carried by the liquid, will foul the cooperating parts thereof, thus assuring perfect valve action at all times.

Another object is to provide such a unit in which the valve means has cooperatively associated therewith a novel and simple arrangement for visually indicating which of the strainer elements is active.

Another object is to provide such a unit which combines various desirable and advantageous features such as simplicity of construction and operation, compactness, minimum number of operating parts and stuffing boxes, freedom from exterior and interior parts that are troublesome, inaccessible, or obstructive under certain conditions of use, or which otherwise unsatisfactorily serve their intended purpose, or the requirements of the trade.

With these and other objects in view, which will become apparent from the following detailed description of one practical and illustrative embodiment of my improved strainer unit, shown in the accompanying drawings, the invention comprises the novel elements, features of construction and arrangement of parts in cooperative relationship as more particularly defined by the hereto appended claims.

In the drawings:

2

Figure 1 is an end elevational view of my novel strainer unit with the casing partly broken away to show certain interior parts.

Fig. 2 is a central sectional elevational view taken substantially as indicated by the arrows 2-2 on Fig. 1.

Fig. 3 is a sectional elevational view taken substantially as indicated by the arrows 3-3 on Fig. 2.

Fig. 4 is a plan view of a novel movable, or rotatable valve member forming part of my invention.

Fig. 5 is a central sectional view of the valve member shown in Fig. 4, as seen by looking in the direction of the arrows 5-5 on the latter.

Fig. 6 is a central plan sectional view taken substantially as indicated by the arrows 6-6 on Fig. 2.

Fig. 7 is a partial sectional elevational view taken substantially as indicated by the arrows 7-7 on Fig. 6.

Fig. 8 is an enlarged fragmentary sectional view of certain parts as disclosed in Fig. 6, and more clearly shows the connection details of the valve member, actuator therefor and shaft end located adjacent to the outlet passage of the strainer unit, and

Fig. 9 is a fragmentary plan view of the outlet end of the strainer unit, and discloses the visual indicator associated with the valve operating means of my invention which is arranged to point to the side of the unit where the valve members are in open position.

The novel strainer unit of my invention generally comprises a casing 10, having an inlet passage 11, an outlet passage 12, chambers 13 and 14 in each of which is removably seated a similar strainer element or cylindrical basket 15. Each of the baskets 15 is in alignment with a circular aperture in the top of the casing provided to permit removal and replacement of the strainer elements 15 whenever desired. The said circular apertures are normally closed by two lids or covers 16 and 17 secured to the casing 10 by suitable means, such as bolts 18.

On the inside of the casing 10 are integrally formed transverse partitions 21 and 22 which serve as end walls for the chambers 13 and 14. The partition 21 has provided therein two substantially semi-circular apertures 13^a and 14^a which serve as inlet ports for the chambers 13 and 14, and the partition 22, directly opposite to or in alignment with the apertures 13^a and 14^a, is provided with apertures 13^b and 14^b which correspond in size and shape with the apertures 13^a

and 14^a and serve as outlet ports for the chambers 13 and 14.

The chambers 13 and 14 are centrally divided by a vertically extending partition or wall 23 which is also integrally formed with the casing 10. The upper portions of the chambers 13 and 14, intermediate their inlet ports 13^a and 14^a and their respective strainer basket 15, are provided with passages arranged to direct the liquid entering the inlet ports 13^a and 14^a into a suitable opening 15^a provided in each of the baskets 15. The said passages are similarly formed by wall sections adjacent to the partition 21, and in the chamber 13 include a curved vertically and horizontally extending wall section 24 and two vertically extending wall sections 25 and 26, and in the chamber 14 a similar arrangement of a curved vertically and horizontally extending wall section 27, and two vertically extending wall sections 28 and 29.

Centrally formed in the wall 23 is a longitudinally extending aperture 30 for accommodating a shaft 31 which is rotatably supported in bearing portions 30^a and has keyed to its reduced ends the hubs of two similar substantially semi-circular valve actuators 32 and 33. The end surfaces of the hubs of said actuators are turnably held in abutting relation with the outer surfaces of the bearing portions 30^a by lock nuts 34 applied to the screw threaded portions of the ends of the shaft 31, as clearly shown in Fig. 8.

Seated on the outside of each of the hubs of the valve actuators 32 and 33, is a circular valve member, plate, or disk 35, such as shown in Figs. 4 and 5. Each valve member 35 is provided with a central aperture 35^a of slightly greater diameter than the outside diameter of the hubs of actuators 32 and 33, a substantially semi-circular valve opening 35^b which corresponds in shape and size with the inlet ports 13^a, 14^a, and outlet ports 13^b, 14^b of the chambers 13 and 14, and an integral lug or extension 35^c arranged to extend through a connecting notch or aperture provided therefor in the actuator on which the valve plate is mounted, and having a rounded tip adapted to cooperate with one of two pairs of oppositely arranged cam elements 36, integrally formed on the inside of the end walls of the casing 10.

The parts just described are arranged so that the shaft 31, actuators 32 and 33, and the two valve members 35, are selectively rotatable in unison in both directions through an arc of 180 degrees. At each end of such movement, the valve apertures 35^b of the members 35, are in registry with the inlet and outlet ports of one of the chambers 13 or 14. The cam elements 36 are so located in the path of travel of the valve lugs 35^c, that as the valve members 35 are selectively moved to completely open the inlet and outlet ports of one of the chambers 13 or 14, the tips or lugs 35^c of the two members 35 will each encounter one of the cam elements 36 and move upwardly on the inclined edge thereof during the final increment of rotary movement of the valve members 35, and this action will tend to shift the members 35 axially along the hubs of actuators 32 and 33, so as to press them tightly against their respective valve seating surfaces. The circular flat rim sections of the valve members 35 will then be held in firm abutment or contact with their cooperating seating surfaces, and the solid sections of the valve members, opposite to apertures 35^b will close off the inlet and outlet ports of the other one of the chambers 13 or 14. When the shaft 31 is thereafter rotated in the opposite direction,

the initial increment of rotary movement will cause the tips of lugs 35^c to slightly move down the inclined surfaces of the respective cam elements 36 with which they are engaged, and this will immediately release the valve members 35 for free and easy rotary movement. This free movement will continue until the point is reached where the lugs 35^c of each of the two valve members 35 ride up and are stopped by the other two opposed cam elements 36 at the end of the 180 degree rotary movement of the valve members 35, when the latter are again pressed against their valve seats as before.

In accordance with well-known practice, each of the valve members 35 may, if desired, also be provided with gasket means of rubber, fibrous, or other yieldable material. For example, a flat gasket of such material may be associated with the active side or face of each member 35, and secured thereto in any practical manner, and such gasket may be of the same size and configuration as the valve face and have apertures therein corresponding with the valve member apertures 35^a and 35^b, as indicated in dot-and-dash outline by the numeral 50 in Fig. 5. The addition of such yieldable gasket means will obviously increase the previously explained slight axial movement of the valve members 35 when the latter are coacting with the cam elements 36 during the incremental rotary valve locking or releasing movement which takes place at the end or beginning of each selective valve operating action.

The actuator 33 is provided with a bevel gear segment 37 adjacent to its outer perimeter, in mesh with a bevel pinion 38 fixed to the end of a shaft 39 extending through a conventional stuffing box 40 adapted to prevent leakage of the liquid from the unit at this point. Fixed to the outer end of the shaft 39 is a hand-wheel 41 adapted to be rotated in both directions to effect selective operation of the valve members 35, through the gear and other connections, as above explained.

The ratio between the bevel gear segment 37 and the bevel pinion 38 may, for example, be in the order of 1 to 5, as shown, so that two and one-half revolutions of the pinion 38 or hand-wheel 41, will cause rotation of the gear segment 37 through an arc of 180 degrees as required in order that the apertures 35^b of the valve members 35 move from one extreme or ultimate selective position of cooperation with the inlet and outlet ports of one of the chambers 13 or 14, to that of the other. An indicating device 41^a, such as an arrow, on the handwheel 41 will consequently move with the handwheel through two and one-half revolutions when the handwheel is turned from one selective valve setting position to the other, and when the handwheel comes to rest after being rotated in one direction, the arrow 41^a will be on one side of the wheel, as shown in Fig. 9, and on the diametrically opposite side when the handwheel is given two and one-half turns in the opposite direction. In other words, the arrow 41^a is arranged so that when the wheel 41 comes to rest at one or the other selective valve setting position, it will point to the side of the unit where the valve members 35 have been moved so that they will completely open the inlet and outlet ports of one of the chambers to permit passage of liquid through the respective chamber and its strainer element. This result can, of course, also be achieved with other gear ratios, such as ratios of 1 to 1, 1 to 3, 1 to 7, etc., and it is consequently to be understood that the

gear arrangement is not limited to a ratio of 1 to 5 as shown in the drawings.

The valve members 35 are also cooperatively associated with the actuators 32 and 33 in such manner that the flat rim section of each of the valve members which is constantly in juxtaposed relation with its respective valve seat, may be adjusted axially, so as to freely but contactingly rotate on its respective valve seating surface during selective operation of the valves. To effect this adjustment, the actuators are provided with spacing screws or bolts 32^a and 33^a, respectively, which are threadedly engaged in apertures of the actuators 32 and 33, and are fixed in adjusted position by lock nuts, as clearly shown. This arrangement provides a balanced axially adjustable positioning means for the valve members 35, adapted to maintain the latter in parallel-plane relationship with their respective seating surfaces.

When the strainer unit is used for services under pressure, it is provided with a pressure equalizing means in the form of a pipe line 42, having suitably inserted therein a valve 43. As shown, the pipe line is arranged to permit flow of the liquid, when the valve 43 is opened, from the chamber through which the liquid is flowing to the other chamber, so as to equalize the pressure on both sides of all valve members 35 before selective operation of the same takes place from one position to the other.

To permit access to the unit at the inlet end, for inspection, adjustment, or other purposes, the unit is provided with a suitable opening at its top at said end of the unit, which is normally closed by a cover plate 44 held in position by bolts, or other suitable means. Similarly, the outlet end of the unit is also provided at its top with an opening which normally has secured thereto, by bolts or other known means, a plate or cover 45, on which the stuffing box 46 is mounted as shown.

In accordance with the standard manufacturing practices followed in making up strainer units of the type to which my invention relates, the various parts of my unit can be produced of the metals which give the best results under the intended operating conditions. In this connection it will also be understood that certain, or substantially all of the parts of the unit, can if desired be made of other modern materials such as synthetic or plastic materials suitable for this purpose.

It is particularly noted that since the valve members 35 are adjustable so that their rim sections are in uniform, light contact with their cooperating valve seating surfaces at all times, this arrangement precludes the possibility of any substance or material carried by the liquid from fouling, or becoming lodged between these parts, and consequently assures perfect valve action. Also, that the united or synchronized operation of the valve members 35 to simultaneously and progressively open the inlet and outlet ports of one of the chambers 13 and 14, and simultaneously close the inlet and outlet ports of the other of said chambers, obviates the possibility of the liquid flow from being substantially restricted or entirely stopped. Furthermore, that the final positive seating action of the valve members 35, as effected by cooperation of their lugs 35^a with the cam elements 36, results in perfectly sealing the chamber which is closed at its inlet and outlet ports, so that the casing lid above said chamber can be removed and the strainer element or

basket taken out for cleaning, without danger of liquid leaking into the chamber during such operation.

At the outer ends of the circular inlet and outlet passages 11 and 12, the casing 10 is provided with circular connecting flanges 11^a and 12^a through each of which extend a balanced series of bolt apertures indicated at 11^b and 12^b arranged in correspondence with the similar apertures of the pipe couplings to which the unit is to be attached.

The strainer unit of my invention may be used to effect the straining of various liquids, such as water, oil, gasoline, etc., and for this purpose may be made in any suitable size best adapted to serve its intended purpose. The strainer elements or baskets 15 are constructed of wire or other suitable material so that they will embody the service qualities as required under the conditions of use for which the unit is designed, and are made in coarser or finer mesh or gauge as needed to strain a particular liquid passing through such unit.

Of course it will be understood that the improved strainer unit and the parts thereof as specifically shown and described, can be changed and modified in various ways as required or deemed desirable under certain circumstances, without departing from the invention herein disclosed and hereinafter claimed.

I claim:

1. A liquid strainer unit of the character described comprising: a unit casing having a main inlet and a main outlet opening arranged in the opposite end walls thereof; a vertically extending wall centrally located within the casing in axial alignment with said main inlet and outlet openings and arranged to form a common dividing wall between two similar juxtaposed chambers each having a front wall section spacedly positioned adjacent to said main inlet opening which wall section is provided with a chamber inlet port, and a rear wall section spacedly positioned adjacent to said main outlet opening which wall section is provided with a chamber outlet port; a strainer element removably seated in each of said chambers between the inlet and outlet ports thereof so as to effect straining of the liquid flowing through the chambers; a disc-like valve member arranged to be rotatably seated against said front wall sections of the chambers in overlapping relationship with respect to the two chamber inlet ports, which member is provided with an aperture adapted to be brought into registry with one or the other of said inlet ports by rotary movement of the valve member; a disc-like valve member arranged to be rotatably seated against said rear wall sections of the chambers in overlapping relationship with respect to the two chamber outlet ports, which member is provided with an aperture adapted to be brought into registry with one or the other of said outlet ports by rotary movement of the valve member; a shaft rotatably mounted in said centrally extending wall within the casing on the ends of which shaft the valve members are concentrically supported in such manner as to maintain them in said seated relationship with the apertures thereof positioned in alignment relative to each other; means connecting the shaft and valve members to effect rotary movement thereof in unison; and means adapted to impart rotary movement to the shaft so that the aligned apertures of the valve members will effect opening of

the inlet and outlet ports of one of said chambers while the valve member portions opposite to said apertures will effect closing of the inlet and outlet ports of the other chamber.

2. A liquid strainer unit of the character described comprising: a unit casing having a main inlet and a main outlet opening; a vertically extending wall centrally located within the casing in axial alignment with said inlet and outlet openings and arranged to form a common dividing wall between two similar juxtaposed chambers each having a front wall section spacedly positioned adjacent to said main inlet opening which wall section is provided with a chamber inlet port and a rear wall section spacedly positioned adjacent to said main outlet opening which wall section is provided with a chamber outlet port; a strainer element removably seated in each of said chambers between the inlet and outlet ports thereof so as to effect straining of the liquid flowing through the chambers; a disc-like valve member arranged to be rotatably seated against said front wall sections of the chambers in overlapping relationship with respect to the two chamber inlet ports, which member is provided with an aperture adapted to be brought into registry with one or the other of said inlet ports by rotary movement of the valve member; a disc-like valve member arranged to be rotatably seated against said rear wall sections of the chambers in overlapping relationship with respect to the two chamber outlet ports; which member is provided with an aperture adapted to be brought into registry with one or the other of said outlet ports by rotary movement of the valve member; a shaft rotatably mounted within the casing on which the valve members are concentrically supported in such manner as to maintain them in said seated relationship with the apertures thereof positioned in alignment relative to each other; means connecting the shaft and valve members to effect rotary movement thereof in unison; and means adapted to impart rotary movement to the shaft so that the aligned apertures of the valve members will effect opening of the inlet and outlet ports of one of said chambers while the valve member portions opposite to said apertures will effect closing of the inlet and outlet ports of the other chamber.

3. A liquid strainer unit of the character described comprising: a unit casing having a main inlet and a main outlet opening; a vertically extending wall centrally located within the casing in axial alignment with said inlet and outlet openings and arranged to form a common dividing wall between two similar juxtaposed chambers each having a front wall section spacedly positioned adjacent to said main inlet opening which wall section is provided with a chamber inlet port, and a rear wall section spacedly positioned adjacent to said main outlet opening which wall section is provided with a chamber outlet port; a strainer element removably seated in each of said chambers between the inlet and outlet ports thereof so as to effect straining of the liquid flowing through the chambers; a disc-like valve member arranged to be rotatably seated against said front wall sections of the chambers in overlapping relationship with respect to the two chamber inlet ports, which member is provided with an aperture adapted to be brought into registry with one or the other of said inlet ports by rotary movement of the valve member; a disc-like valve member arranged to be rotatably seated against said rear wall sections of the

chambers in overlapping relationship with respect to the two chamber outlet ports, which member is provided with an aperture adapted to be brought into registry with one or the other of said outlet ports by rotary movement of the valve member; a shaft rotatably mounted within the casing on which the valve members are concentrically supported in such manner as to maintain them in said seated relationship with the apertures thereof positioned in alignment relative to each other; means connecting the shaft and valve members to effect rotary movement thereof in unison; a gear segment secured to said shaft; a pinion in mesh with said gear segment; a shaft on which said pinion is mounted, which shaft extends through the unit casing; and means secured to the latter shaft on the outside of the unit casing for effecting rotation thereof.

4. A liquid strainer unit of the character described comprising: a unit casing having a main inlet and a main outlet opening; a vertically extending wall centrally located within the casing in axial alignment with said inlet and outlet openings and arranged to form a common dividing wall between two similar juxtaposed chambers each having a front wall section spacedly positioned adjacent to said main inlet opening which wall section is provided with a chamber inlet port, and a rear wall section spacedly positioned adjacent to said main outlet opening which wall section is provided with a chamber outlet port; a strainer element removably seated in each of said chambers between the inlet and outlet ports thereof so as to effect straining of the liquid flowing through the chambers; a disc-like valve member arranged to be rotatably seated against said front wall sections of the chambers in overlapping relationship with respect to the two chamber inlet ports, which member is provided with an aperture adapted to be brought into registry with one or the other of said inlet ports by rotary movement of the valve member; a disc-like valve member arranged to be rotatably seated against said rear wall sections of the chambers in overlapping relationship with respect to the two chamber outlet ports, which member is provided with an aperture adapted to be brought into registry with one or the other of said outlet ports by rotary movement of the valve member; a shaft rotatably mounted within the casing; two separate elements each respectively secured to one end of said shaft, which elements are provided with hubs on which the valve members are concentrically supported in such manner as to maintain them in said seated relationship with the apertures thereof positioned in alignment relative to each other; means connecting said elements and valve members to effect rotary movement thereof in unison; means connecting the shaft and elements to effect rotary movement thereof in unison; and means adapted to impart rotary movement to the shaft so that the aligned apertures of the valve members will effect opening of the inlet and outlet ports of one of said chambers while the valve member portions opposite to said apertures will effect closing of the inlet and outlet ports of the other chamber.

5. A liquid strainer unit of the character described comprising: a unit casing having a main inlet and a main outlet opening; a vertically extending wall centrally located within the casing in axial alignment with said inlet and outlet openings and arranged to form a common di-

viding wall between two similar juxtaposed chambers each having a front wall section spacedly positioned adjacent to said main inlet opening which wall section is provided with a chamber inlet port, and a rear wall section spacedly positioned adjacent to said main outlet opening which wall section is provided with a chamber outlet port; a strainer element removably seated in each of said chambers between the inlet and outlet ports thereof so as to effect straining of the liquid flowing through the chambers; a disc-like valve member arranged to be rotatably seated against said front wall sections of the chambers in overlapping relationship with respect to the two chamber inlet ports, which member is provided with an aperture adapted to be brought into registry with one or the other of said inlet ports by rotary movement of the valve member; a disc-like valve member arranged to be rotatably seated against said rear wall sections of the chambers in overlapping relationship with respect to the two chamber outlet ports, which member is provided with an aperture adapted to be brought into registry with one or the other of said outlet ports by rotary movement of the valve member; a shaft rotatably mounted within the casing; two semi-circular elements that are respectively secured to the ends of said shaft, which elements are provided with hubs on which the valve members are concentrically supported in such manner as to maintain them in said seated relationship with the apertures thereof positioned in alignment relative to each other; a notch formed in each of said semi-circular elements; an integral projection extending laterally from each of the valve members through and beyond the notch of the elements; movement limiting means on the inside of said unit casing arranged to be engaged by said valve member projections and positioned to effect stopping of the valve members when the apertures thereof are in registry with the ports of one or the other of said chambers; means connecting the shaft and elements to effect rotary movement thereof in unison; and means adapted to impart rotary movement to the shaft so that the aligned apertures of the valve members will effect opening of the inlet and outlet ports on one of said chambers while the valve member portions opposite to said apertures will effect closing of the inlet and outlet ports of the other chamber.

6. A liquid strainer unit of the character described comprising: a unit casing having a main inlet and a main outlet opening; a vertically extending wall centrally located within the casing in axial alignment with said inlet and outlet openings and arranged to form a common dividing wall between two similar juxtaposed chambers each having a front wall section spacedly positioned adjacent to said main inlet opening which wall section is provided with a chamber inlet port, and a rear wall section spacedly positioned adjacent to said main outlet opening which wall section is provided with a chamber outlet port; a strainer element removably seated in each of said chambers between the inlet and outlet ports thereof so as to effect straining of the

liquid flowing through the chambers; a disc-like valve member arranged to be rotatably seated against said front wall sections of the chambers in overlapping relationship with respect to the two chamber inlet ports, which member is provided with an aperture adapted to be brought into registry with one or the other of said inlet ports by rotary movement of the valve member; a disc-like valve member arranged to be rotatably seated against said rear wall sections of the chambers in overlapping relationship with respect to the two chamber outlet ports which member is provided with an aperture adapted to be brought into registry with one or the other of said outlet ports by rotary movement of the valve member; a shaft rotatably mounted within the casing; two separate elements each respectively secured to one end of said shaft, which elements are provided with hubs on which the valve members are concentrically supported in such manner as to maintain them in said seated relationship with the apertures thereof positioned in alignment relative to each other and so that the valve members are limitedly slidable on the element hubs in an axial direction; means connecting said elements and valve members to effect rotary movement thereof in unison; means connecting the shaft and elements to effect rotary movement thereof in unison; an integral projection extending laterally from each of the valve members; cam means on the inside of said unit casing adapted to be engaged by the tips of the valve member projections at the end of the rotary movement of the valve members in either direction, which cam means is adapted to effect sliding movement of the valve members on the hubs of the elements during the final increment of rotary movement of the valve members, thereby to sealingly press the latter against their seating surfaces; and means adapted to impart rotary movement to the shaft so that the aligned apertures of the valve members will effect opening of the inlet and outlet ports of one of said chambers while the valve member portions opposite to said apertures will effect closing of the inlet and outlet ports of the other chamber.

GEORGE L. MACNEILL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,042,203	Dahl	Oct. 22, 1912
1,068,743	Dahl	July 29, 1913
1,187,046	De Lamarter	June 13, 1916
1,721,233	Royle	July 16, 1929
2,173,492	Lidiak	Sept. 19, 1939
2,237,684	Moore	Apr. 8, 1941
2,365,074	Harvuot	Dec. 12, 1944

FOREIGN PATENTS

Number	Country	Date
207,588	Great Britain	Nov. 26, 1923
699,915	Germany	Dec. 11, 1940