

June 23, 1942.

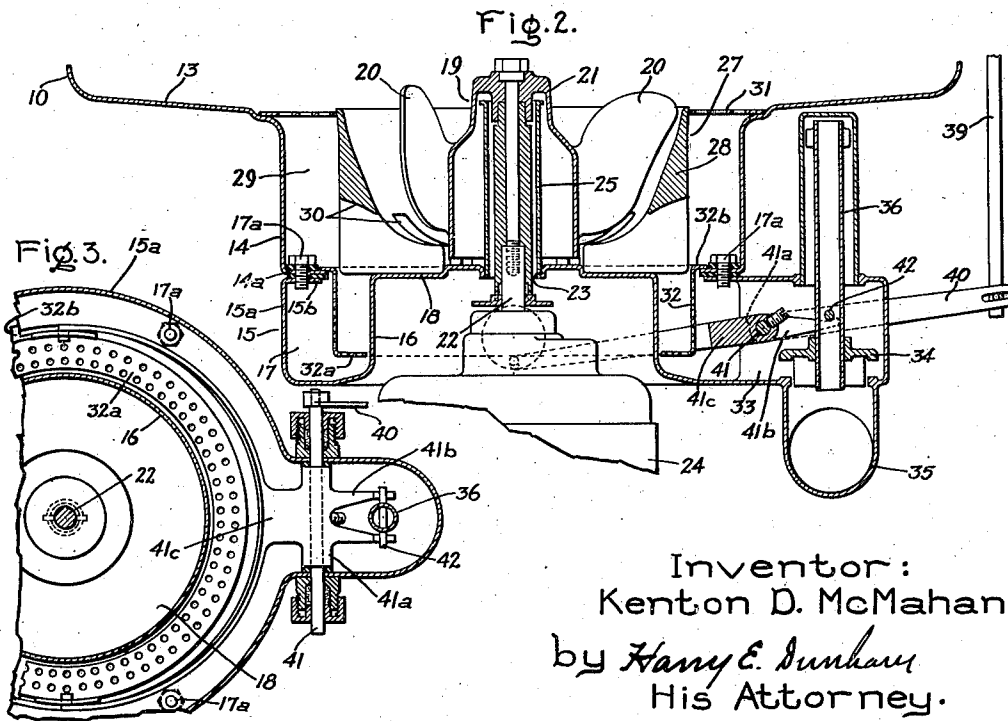
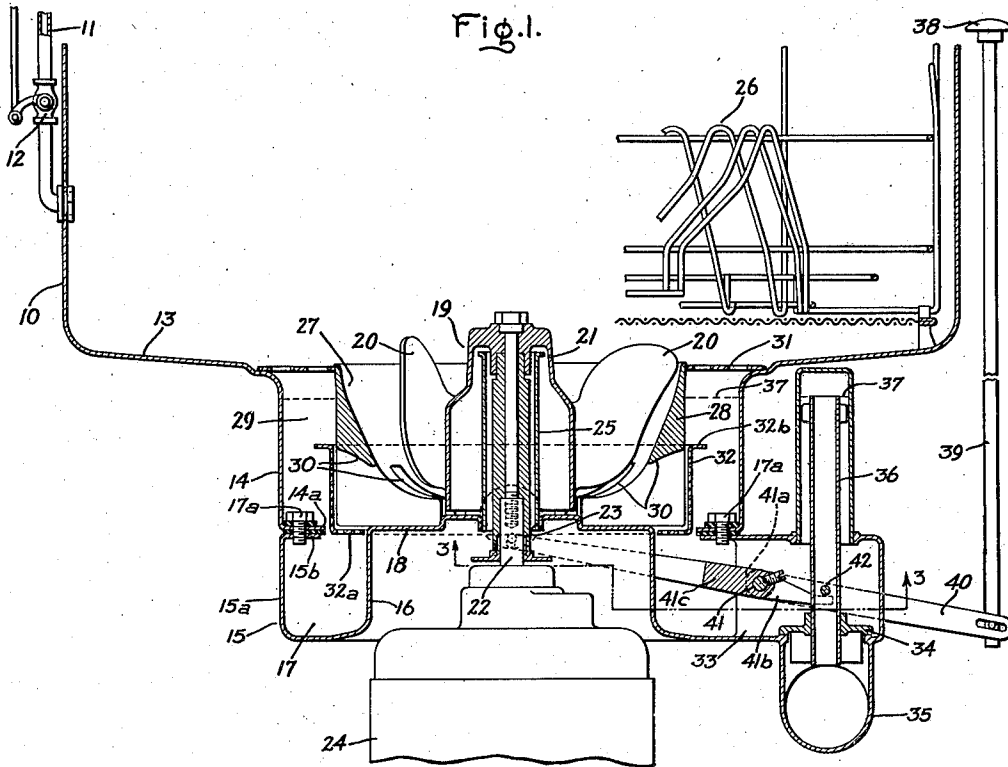
K. D. McMAHAN

2,287,628

WASHING APPARATUS

Filed Oct. 26, 1939

2 Sheets-Sheet 1



Inventor:
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June 23, 1942.

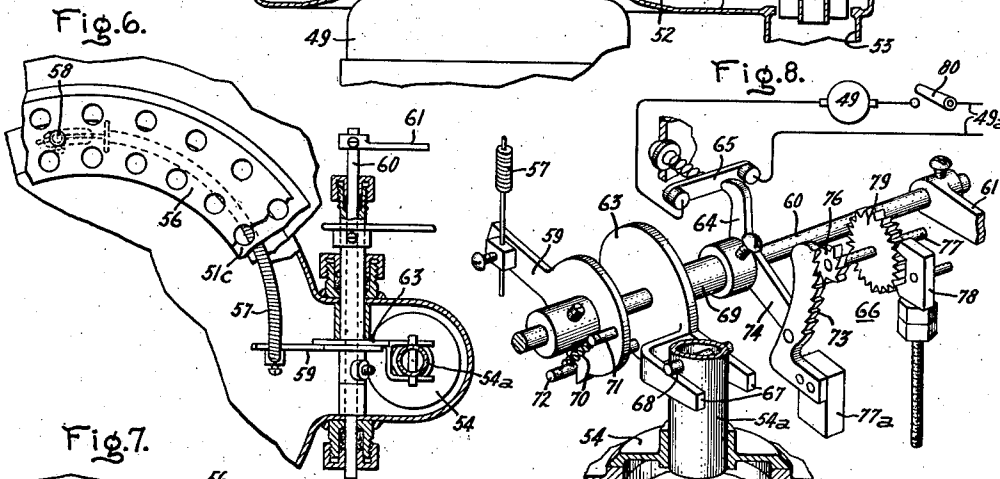
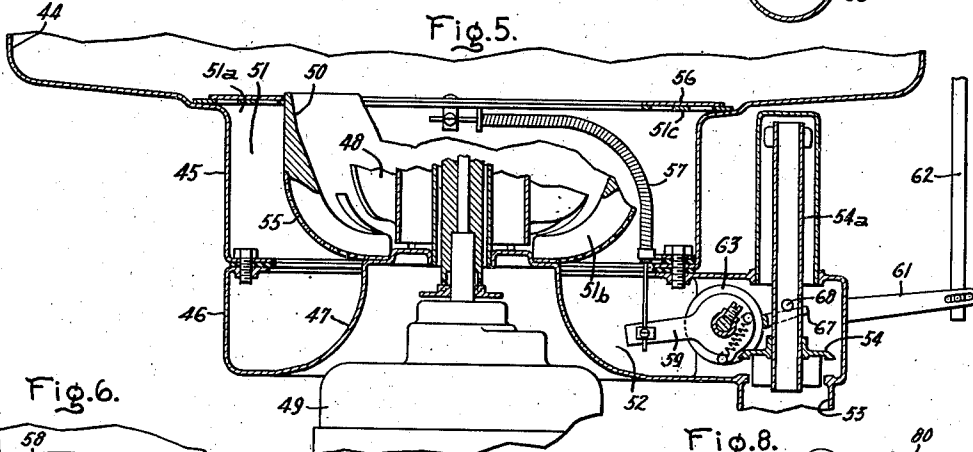
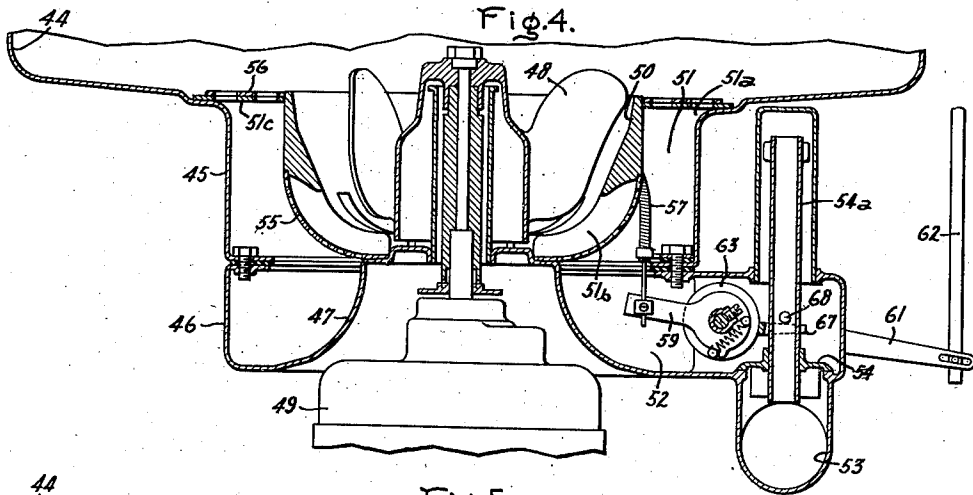
K. D. McMAHAN

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WASHING APPARATUS

Filed Oct. 26, 1939

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,287,628

WASHING APPARATUS

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Application October 26, 1939, Serial No. 301,415

14 Claims. (Cl. 141—9)

This invention relates to washing apparatus, more particularly to washing apparatus having a vat or chamber wherein a washing liquid is circulated to effect a cleansing action by a suitable liquid circulating device, and it contemplates the provision in a device of this character of means for screening the cleansing liquid as it flows to the circulating device for recirculation.

More specifically, this invention relates to dishwashing apparatus wherein a cleansing liquid such as hot water is circulated or hurled upwardly in the washing vat by suitable power driven means, such as a motor driven impeller located in the lower portion of the vat. In devices of this character, a suitable quantity of water is placed in the vat and is circulated by the impeller over and over again against the dishes and articles to be cleansed. It has been found in certain cases that food particles may be deposited on the backs of plates, on the tops of glasses and cups, and on other surfaces of utensils which are not subjected to the main force of the projected liquid, and remain there through the washing operation.

This invention contemplates the provision of a suitable screen or filter positioned within the vat in the path of the cleansing liquid returning to the impeller for recirculation to intercept the food particles and thereby prevent the circulation of the particles by the impeller.

This invention further contemplates the provision of a self-cleansing screen or filter, and more specifically it contemplates the provision of a screen that is arranged so that in the washing operation the liquid flows to the impeller for recirculation through the screen in one direction, and when the vat is drained the liquid draining from the vat flows through the screen in the opposite direction so as to flush and cleanse the screen. In this manner the food particles and dirt which have collected on one side of the screen while the machine is being operated to wash the dishes is washed or flushed from this side of the screen by the liquid when it is drained from the vat. In one form of this invention the screen is movable from the position it occupies during the washing operation into such a position that when the vat is drained substantially all of the cleansing liquid is caused to pass through the screen on its way to the drain; and the draining liquid passes through the screen in a direction opposite to the direction of flow of the liquid that passes through the screen on its way to the impeller for recirculation. Moreover, in this form, suitable means are provided for op-

erating the screen into its first position where it screens the liquid flowing to the impeller for recirculation when the drain valve provided for the vat is closed, and for moving it to its second position where it is flushed by the draining liquid when the drain valve is opened.

In another form of this invention, the screen is stationary, and suitable means are provided for directing the liquid through the screen in such a direction as to flush the screen during the draining operation. The liquid directing means is operated responsively to the operation of the drain valve to open to permit the liquid to drain.

For a more complete understanding of this invention, reference should be had to the accompanying drawings in which Fig. 1 is a fragmentary sectional view in elevation of dishwashing apparatus embodying this invention; Fig. 2 is a view similar to Fig. 1 but illustrating certain of the elements of the washing apparatus in different operative positions; Fig. 3 is a view taken along line 3—3 of Fig. 1 and looking in the direction of the arrows; Fig. 4 is a fragmentary sectional view in elevation of dishwashing apparatus of modified form arranged in accordance with this invention; Fig. 5 is a view similar to Fig. 4 but illustrating certain of the elements of the washing apparatus in different operative positions; Fig. 6 is a fragmentary horizontal sectional view taken through a portion of the washing apparatus shown in Figs. 4 and 5; Fig. 7 is a fragmentary view similar to Fig. 6 but illustrating certain of the elements in different operative positions; and Fig. 8 is a fragmentary perspective view illustrating certain elements of the washing apparatus shown in Figs. 4—7.

Referring more specifically to Figs. 1 to 3 inclusive, this invention has been shown in one form in connection with dishwashing apparatus comprising an upright cylindrical washing vat or chamber 10 for receiving dishes and other utensils to be cleansed, and also some suitable washing liquid, such as hot cleansing water. The vat 10 may have any suitable shape; thus it may be square in horizontal cross section or cylindrical or it may have any other suitable shape. In the form shown in the drawing, the vat is cylindrical in horizontal cross section. The cleansing liquid is supplied to the vat 10 through any suitable inlet conduit 11 which is controlled by a valve 12.

The vat 10 is provided with a downwardly tapered bottom wall 13 which merges into a depending extension 14 which may have any suit-

able shape; in the form shown in the drawing the extension 14 is cylindrical.

The extension 14 is closed by a bottom closure member 15 which has a cylindrical side wall 15a, and a central reentrant wall 16 defining an annular passageway 17 which will be utilized as a drain passageway for the vat. The bottom and top edges of the extension 14 and the wall 15a are provided with horizontal flanges 14a and 15b respectively which are secured together by screws 17a, as shown.

The upper end of the reentrant section or wall 16 merges into a substantially horizontal wall 18 which closes the bottom of the vat at the center.

Positioned above the wall 18 and substantially in the central vertical axis of the vat 10 is a suitable liquid distributing or circulating device 19 in the form of an impeller. As shown, the impeller is provided with suitable water distributing vanes or blades 20 which are mounted upon a suitable skirt or apron 21. The skirt 21 tapers inwardly at its upper end where it is secured to the upper end of a driving shaft 22. The driving shaft, as shown, extends downwardly through a central opening 23 in the wall 18 to the exterior of the vat where it is connected with an electric driving motor 24. The central opening 23 is sealed by a tubular member 25 extending upwardly within the apron 21 of the impeller 19, as shown, and having its lower end sealed with a fluid-tight connection with the wall 18.

Positioned above the impeller 19 is a suitable open-work tray or rack 26 for supporting dishes and other utensils to be cleansed. This rack may have any suitable construction, but preferably will be arranged as is the lower tray 11 described and claimed in the United States patent to Forrest A. Walker No. 2,035,625, dated March 31, 1936. It will be understood that the vat also will be provided with an upper tray, such as the upper tray 10 of this patent.

It will be understood that if a body of cleansing liquid be placed in the vat 10, the impeller blades 20 will engage this liquid to hurl it upwardly and outwardly through the tray 26 and also through an upper tray, if an upper tray be used, so as to violently force or hurl the body of water over the surfaces of the dishes, glasses, silverware and other utensils placed in the trays. The liquid that is hurled upwardly gravitates downwardly to the lower portion of the vat where it is again engaged by the blades 20 and recirculated upwardly through the trays. This action continues as long as the impeller is operated and as long as the body of liquid is retained in the vat.

The water that gravitates to the lower portion of the vat is guided to the impeller by means of a suitable flange-like member 27 located in the lower portion of the vat around the impeller, as shown. This member 27 is provided with an upright wall 28 around the impeller and spaced from the cylindrical side walls of the depending member 14 so as to define with these walls a passageway 29. This passageway 29 functions to collect the water gravitating down the sides of the vat and into the depending member 14. This water is directed into the lower section of the impeller 19 through passageways 30 formed in the member 27 below the wall section 28. Preferably, the inner surface of the wall 28 and the wall sections between the passageways 30 will have a contour somewhat similar to the contour of the path swept by the outer vertical edges of

the impeller, as shown in the drawings. The entrance to the passageway 29 from the vat is covered by a perforated metallic member 31 having relatively large holes in it. This plate is provided to prevent spoons or other small articles from falling down into the passageway 29.

It will be understood that in the washing operation food particles flushed from the dishes and other utensils will flow down into the passageway 29 with the liquid that gravitates downwardly for recirculation by the impeller, and the particles, if permitted to flow to the impeller would be recirculated with the cleansing liquid, and at times become deposited on the backs of plates and the like, on the tops of glasses, and other surfaces that are comparatively removed from the direct action of the projected water. Many of these food particles would likely remain where deposited during the entire washing action, and therefore, the dishes and other utensils would not be completely clean at the end of the washing operation.

To obviate this objection, I have provided a suitable filter or screen 32 positioned in the passageway 29 over the entrance to the passageways 30. As shown, this screen completely covers the entrance ports to the passageways 30. In the particular machine shown in the drawings, the lower outer edge of the baffle 27 projects somewhat over the drain passageway 17, and the screen therefor is provided with an inwardly extending horizontal section 32a to close the lower horizontal parts of the ports opening to the passageways 30, as shown. The screen, it will be observed, is constructed and arranged to cover completely the entire port areas of the passageways 30 so that all of the water flowing to the impeller for recirculation is screened, the food particles and other dirt collecting on the outer wall of the screen during the washing operation.

The annular drain passageway 17 discharges into a drain passageway or duct 33 which also constitutes a valve chamber within which a drain valve 34 is placed. The drain valve 34 controls communication between the chamber 33 and a drain pipe 35 which leads to some suitable drain, such as the discharge drain of a sink (not shown). It will be understood that the valve will be closed during the washing action so that the cleansing water placed within the vat will be retained. When it is desired to drain the vat, the valve is moved from its closed position shown in Fig. 1 to its open position shown in Fig. 2. As shown, the valve is provided with a vertical tubular extension 36 open at the top and bottom. This tubular extension when the valve 34 is closed constitutes an overflow and determines the maximum liquid level in the vat which is indicated by the dotted line 37. The valve may be operated by any suitable means. In the form of the machine shown, it is operated manually by means of a control knob 38 which is attached to an operating rod 39. The rod 39 operates a pivoted lever 40 which is secured to a shaft 41. A lever 41a located in the valve chamber is secured to the shaft and has a forked end 41b that straddles the tube 36. The arms of the fork lie under and are arranged to engage the ends of a pin 42 which is inserted through the tube so that they will elevate the tube and valve when the lever 41a is rotated counterclockwise. This movement is imparted to the forked end by elevating the knob 38. When the knob 38 is depressed it will permit the valve to close.

When the valve 34 is opened and the liquid in

the vat therefore is free to flow to the drain 35, the screen 32 is automatically moved to such a position that the major portion of the liquid draining from the vat is caused to flow through the screen and in a direction opposite to that of the flow of the liquid to the impeller for recirculation. Therefore, the food particles and other soil that has collected on the outer surface of the screen during the washing operation will be flushed from this surface and into the drain during the draining operation. A suitable interlock is provided between the screen 32 and the valve 34 to effect this automatic movement of the screen. This interlock, as shown, comprises a forked extension 41c on the lever 41a. The ends of the arms of this extension are pivoted to opposite sides of the screen. By reason of this connection when the valve 34 is opened, the extension 41c will move the screen downwardly from its position shown in Fig. 1 to its position shown in Fig. 2. In this position the vertical wall of the screen and the horizontal section 32a are positioned over the entrance to the discharge passageway 33 so that the major portion of the liquid in the vat must flow through the screen to the drain passageway 33. Preferably, the upright wall of the screen will be provided with an outwardly extending flange section 32b which seats on the inwardly extending flange section 14a of the depending section 14 when the screen is lowered, as clearly shown in Fig. 2. When the drain valve is operated to its closed position for a washing operation, the screen 32 is returned to its elevated position where it covers the entrance to the passageways 30.

It will be observed that in the form of the invention shown in Figs. 1 to 3 I have provided a screen that normally is positioned in the path of movement of the cleansing liquid that is recirculated by the impeller so as to screen out food soil particles from the liquid that is circulated; and moreover, that the screen is moved to a position over the drain port when the drain valve is opened so that liquid draining from the vat flushes the screen to clean it.

In the form of this invention shown in Figs. 4-8 inclusive, the screen remains stationary, and suitable means are provided for directing the liquid draining from the vat through the screen in a direction opposite to the flow of the liquid through the screen when it gravitates to the impeller for recirculation during the washing operation.

As shown, there is provided a vat 44 and a depending centrally arranged wall 45 which is closed at the bottom by a member 46 having a reentrant bottom wall 47. Positioned within the lower section of the vat, that is, within the depending wall 45 is an impeller 48 driven by a suitable electric motor 49. This motor is energized from a suitable source of electrical supply 49a (Fig. 8). Surrounding the impeller 48 is a circular wall 50 defining with the depending wall 45 an annular passageway 51 surrounding the impeller. The passageway 51 has its entrance opening 51a at the top and its discharge opening 51b at the bottom. The entrance opening is covered by a perforated member 51c. The passageway 51 at the bottom communicates with a drain channel 52 which drains into a channel 53, the communication between the two channels 52 and 53 being controlled by a drain valve 54. This valve is provided with an overflow tube 54a. It will be observed that thus far the apparatus

of the second form is substantially the same as the first form.

In the form shown in Figs. 4-8, however, a screen 55 is provided which is stationary and is not movable as is the screen 32 of the first form. The screen 55, as shown, is placed over the discharge opening 51b of the passage 51 and thereby functions to screen the liquid gravitating down through the passageway 51 for recirculation by the impeller 48. Suitable means are provided for directing the liquid in the vat through the screen in the reverse direction when the liquid is drained. For this purpose, suitable means are provided for closing the entrance end 51a of the passageway 51 when the vat is to be drained. For this purpose, the perforated member 51c placed over the entrance end of the passageway 51 is covered by a rotatable member 56 provided with perforations which register with those in the member 51c, and which is arranged to be moved from the open position in which it is shown in Figs. 4 and 6 to a closed position as shown in Figs. 5 and 7 where it closes the perforations in the member 51c. This movement of the screen closure member 56 is effected by means of a flexible shaft 57 which is connected to the screen to impart a rotary motion to it. As shown, a flexible shaft has one end connected to the screen by means of a set screw device 58 and has its other end connected to an operating lever 59. It is to be noted that the screen cover 56 fits closely around the upper edge of the circular wall 50 so that it is guided by the wall to move in its circular path. The lever 59 is rigidly secured to an operating shaft 60 which extends outwardly through the housing about the valve 54 where a suitable operating lever 61 is rigidly attached to it. The lever 61 is provided with an operating rod 62 similar to the rod 39 of the first form of the invention. It will be observed that when the rod 62 is elevated it will move the lever 59 in a counter-clockwise direction, as viewed in Figs. 4 and 8, and thereby depress the shaft 57 to move the screen cover member 56 from its open position of Figs. 4 and 6 to its closed position of Figs. 5 and 7.

When the screen cover member is thus closed, the liquid flowing down the side walls of the vat will not be able to enter the passageway 51, but will flow in the top of the impeller and downwardly through it to the screen 51b. This direction of flow, of course, is opposite to the direction of flow of the liquid returning to the impeller for recirculation during the washing operation.

It is desirable that the screen cover member 56 be closed a moment or so before the drain valve 54 is opened, and it is further desirable that the drain valve 54 be opened and the impeller 48 be stopped at substantially the same instant. This delay in opening the drain valve and stopping the impeller permits the impeller 48 to pump substantially all of the liquid that is in the annular chamber 51 up into the vat so that this liquid also is caused to pass through the screen 51b in the following draining operation.

In order to provide this time delay in the opening of the drain valve 54 and in the deenergization of the motor 49, a suitable valve operating member 63 is provided for the drain valve 54, a suitable operating member 64 is provided for the motor switch 65, and a suitable time delay mechanism 66 is provided controlling the operation of these members 63 and 64. The switch 65 and timing mechanism 66 are located outside of the

drain valve housing. As shown, the member 63 is provided with a pair of arms 67 straddling the overflow tube 54a of the valve and positioned under a transverse pin 68 mounted in the tube. The member 63 and the switch operating arm 64 are rigidly secured to a sleeve 69 surrounding the shaft 60. The sleeve 69 is mechanically connected to the lever 59, and hence to the shaft 60, by means of a tension spring 70 having one end anchored to a pin 71 attached to the lever 59 and its opposite end secured to a pin 72 secured to the operating member 63. By reason of this connection when the rod 62 is elevated to close the screen closure member 56 the spring 70 is tensioned to bias the operating members 63 and 64 in a counter-clockwise direction, as viewed in Fig. 8. The motion of these members in this direction, however, is retarded by the timing means 66. The timing means 66 includes a ratchet 73 pivotally mounted upon an arm 74 rigidly secured to the operating member 64. The teeth of this ratchet engage the teeth of a ratchet wheel 76 mounted upon a shaft 77, and as shown, the teeth coacting between the ratchet 73 and the ratchet wheel 76 are so arranged that they are positively engaged when the lever 74 is elevated, but the member 74 may be depressed freely, the ratchet pivoting to provide for this freedom of movement with reference to the ratchet wheel 76. A weight 77a on the lower end of the ratchet biases the teeth of the ratchet into engagement with the ratchet wheel when the lever 74 is elevated. The movement of the ratchet 73 upwardly is controlled by means of a pendulously mounted escapement 78 which engages an escapement wheel 79 rigidly secured to the shaft 77.

It will be observed that after the screen plate 56 has been closed the spring 70 is tensioned to operate the members 63 and 64 in their valve opening and switch opening directions respectively, but this movement is timed by the escapement 78. In the specific apparatus shown, it requires but around a second to empty the passageway 51, and at the expiration of this time the drain valve 54 is opened, and the switch 65 for the motor 49 is opened to stop the impeller. When this happens all of the water above the impeller flows down through it and through the screen 51b to the drain 53. After the vat has been drained the rod 62b may be depressed to close the drain valve 54 and the switch 65. A manually operable switch 80 is provided for controlling the motor so that even though the switch 65 be closed the motor 49 may be deenergized by the switch 80.

While I have shown particular embodiments of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. Washing apparatus comprising a vat, a device in said vat for continuously circulating a body of cleansing liquid in said vat, a drain port for said vat, a drain valve for said port, a screen, operating means for actuating said drain valve to close and open said port, and means operable responsively to said actuating means operating when said drain valve is closed to cause the liquid to flow to said circulating device through said screen in one direction, and when said drain

valve is opened to cause the liquid to flow to said drain port through said screen in the opposite direction.

2. Washing apparatus comprising a vat, an impeller in the lower portion of said vat for projecting a body of liquid upwardly in said vat, the projected liquid gravitating to the lower portion of said vat for recirculation by said impeller, a passageway for directing said gravitating liquid to said impeller, a drain passageway for said vat, a valve controlling said drain passageway, a screen, operating means for actuating said drain valve to close said drain passageway and to open it, and means operable responsively to the operation of said operating means in actuating said drain valve to close said drain passageway for causing the liquid in said vat to flow from said first-named passageway to said impeller through said screen in one direction, and responsively to the operation of said operating means in actuating said drain valve to open said drain passageway to cause the liquid to flow to said drain passageway through said screen in the opposite direction.

3. Washing apparatus comprising a vat, a device in said vat for continuously circulating a body of cleansing liquid in said vat, a screen positioned in the path of the liquid returning to said circulating device, a drain port for said vat, and means for moving said screen over said drain port so that the body of liquid draining from said vat passes through said screen in a direction opposite to its flow through the screen when flowing to said circulating device for recirculation.

4. Washing apparatus comprising a vat, an impeller in the lower portion of said vat for projecting a body of liquid upwardly in said vat, the projected liquid gravitating to the lower portion of said vat for recirculation by said impeller, a vertically arranged passageway adjacent said impeller for directing said gravitating liquid to said impeller, a drain passageway for said vat, a screen, and means for moving said screen to a position to screen the liquid passing through said first-named passageway to said impeller and also to a position where the liquid passing to said drain must flow through said screen.

5. Washing apparatus comprising a vat, an impeller in the lower portion of said vat for projecting a body of liquid upwardly in said vat, the projected liquid gravitating to the lower portion of said vat for recirculation by said impeller, a passageway around said impeller constructed and arranged to collect said gravitating liquid and return it to said impeller, a drain passageway below said first passageway opening into said first passageway, a screen movably mounted in said passageways between two operative positions in the first of which the liquid passes through said screen in one direction to said impeller and in the second of which liquid draining from said vat passes through said screen in the opposite direction, and means for operating said screen between said two positions.

6. Washing apparatus comprising a vat, an impeller in the lower portion of said vat for projecting a body of liquid upwardly in said vat, the projected liquid gravitating to the lower portion of said vat for recirculation by said impeller, a baffle member surrounding said impeller defining with the walls of the vat a passageway surrounding said impeller position to receive the gravitating liquid, and said baffle member having an opening through it at the bottom connecting said

passageway with the impeller, an annular discharge passageway below said first named passageway having a discharge port positioned so that liquid flows into it in a direction opposite to the direction of liquid flow to said impeller through said opening, a screen covering said opening so as to screen the liquid flowing to said impeller, and means mounting said screen for movement to a position covering said discharge port.

7. Washing apparatus comprising a vat, an impeller in the lower portion of said vat for projecting a body of liquid upwardly in said vat, the projected liquid gravitating to the lower portion of said vat for recirculation by said impeller, a baffle member surrounding said impeller defining with the walls of the vat a passageway surrounding said impeller positioned to receive the gravitating liquid, and said baffle member having an opening through it at the bottom connecting said passageway with the impeller, an annular discharge passageway below said first-named passageway having a discharge port positioned so that liquid flows into it in a direction opposite to the direction of liquid flow to said impeller through said opening, a discharge duct into which said port empties, a drain valve controlling said duct, a screen covering said opening to screen the liquid flowing to said impeller, a member mounting said screen for movement from its position over said opening to a position covering said discharge port, and means operating said member to move the second to cover said discharge port when said drain valve is opened.

8. Washing apparatus comprising a vat, an impeller in the lower portion of said vat for projecting a body of liquid upwardly in said vat, the projected liquid gravitating to the lower portion of said vat for recirculation by said impeller, a passageway for directing said gravitating liquid to said impeller, a drain passageway for said vat, a drain valve controlling said drain passageway, a screen mounted in a position where it screens the liquid flowing through said first named passageway to said impeller, and a mechanical connection between said drain valve and screen operating when the drain valve is opened to move the screen to a position where it is flushed by the liquid that is conducted to said valve through said drain passageway, and operating to move the screen to its position where it screens the liquid flowing to said impeller when the drain valve is closed.

9. Washing apparatus comprising a vat, an impeller in the lower portion of said vat for projecting a body of liquid upwardly in said vat, the projected liquid gravitating to the lower portion of said vat for recirculation by said impeller, a vertically arranged passageway adjacent said impeller for directing said gravitating liquid to said impeller having an entrance opening adjacent the top of said impeller and a discharge opening adjacent the bottom of said impeller, a screen in said passageway at the discharge opening through which the liquid flowing to said impeller passes in one direction, a drain passageway connected with the lower portion of said first passageway, a valve controlling said drain passageway, operating means for actuating said valve to open said drain passageway, and means operated responsively to the operation of said operating means in opening said drain passageway for closing the entrance opening to said first-named passageway to thereby cause the liquid to flow through said screen in a direction op-

posite to that which it has when flowing through the screen for recirculation.

10. Washing apparatus comprising a vat, an impeller in the lower portion of said vat for projecting a body of liquid upwardly in said vat, the projected liquid gravitating to the lower portion of said vat for recirculation by said impeller, a vertically arranged passageway adjacent said impeller for directing said gravitating liquid to said impeller having an entrance opening adjacent the top of said impeller and a discharge opening adjacent the bottom of said impeller, a screen in said passageway at the discharge opening through which the liquid flowing to said impeller passes in one direction, a drain passageway connected with the lower portion of said first passageway, a valve controlling said drain passageway, an operating member, means operated by said member for closing the entrance opening of said passageway and thereby cause the liquid to flow out through said screen in a direction opposite to the direction of flow through the screen for recirculation by said impeller, and means controlled by said operating member for opening said drain valve a predetermined interval of time after said entrance opening has been closed.

11. Washing apparatus comprising a vat, an impeller in the lower portion of said vat for projecting a body of liquid upwardly in said vat, the projected liquid gravitating to the lower portion of said vat for recirculation by said impeller, a motor for driving said impeller, a vertically arranged passageway adjacent said impeller for directing said gravitating liquid to said impeller having an entrance opening adjacent the top of said impeller and a discharge opening adjacent the bottom of said impeller, a screen in said passageway at the discharge opening through which the liquid flowing to said impeller passes in one direction, a drain passageway connected with the lower portion of said first passageway, a valve controlling said drain passageway, an operating member, means operated by said member for closing the entrance opening of said passageway to thereby cause the liquid to flow out through said screen in a direction opposite to the direction of flow through the screen for recirculation by said impeller, and means controlled by said operating member for opening said drain valve and for stopping said motor a predetermined interval of time after said entrance opening has been closed.

12. Washing apparatus comprising a vat, a device in said vat for continuously circulating a body of cleansing liquid in said vat, a screen positioned in the path of said liquid returning to said circulating device, a drain port for said vat, a drain valve controlling said drain port, and means for moving said screen over said drain port when said drain valve is opened so that the body of liquid draining from said vat passes through said screen in a direction opposite to its flow through said screen when flowing to said circulating device for recirculation.

13. Washing apparatus comprising a vat, an impeller in the lower portion of said vat for projecting a body of liquid upwardly in said vat, the projected liquid gravitating to the lower portion of said vat for recirculation by said impeller, a passageway around said impeller having an entrance opening at the top and a discharge opening at the bottom for directing said gravitating liquid to the bottom of said impeller, a screen in said passageway at said discharge

opening through which the liquid flowing to said impeller passes in one direction, a drain passageway connected with the lower portion of said first passageway, a valve controlling said drain passageway, operating means for actuating said valve to open said drain passageway, and means operated responsively to the operation of said operating means in opening said drain passageway for closing the entrance opening to said first-named passageway to reverse the flow of liquid to said impeller and thereby cause it to flow through said screen in a direction opposite to that which it has when flowing through the screen for recirculation.

14. Washing apparatus comprising a vat, an impeller in the lower portion of said vat for projecting a body of liquid upwardly in said vat, the projected liquid gravitating to the lower portion of said vat for recirculation by said im-

5 peller, a passageway around said impeller having an entrance opening at the top and a discharge opening at the bottom for directing said gravitating liquid to said impeller, a screen in said passageway at said discharge opening through which the liquid flows to said impeller in one direction, a drain passageway connected with the lower portion of said first-named passageway, a valve controlling said drain passageway, operating means for actuating said valve to open said drain passageway, and means for closing the entrance opening to said first-named passageway to reverse the flow of liquid to said impeller and thereby cause it to flow through
10 said screen to said drain passageway in a direction opposite to that which it had when flowing through the screen for recirculation.

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