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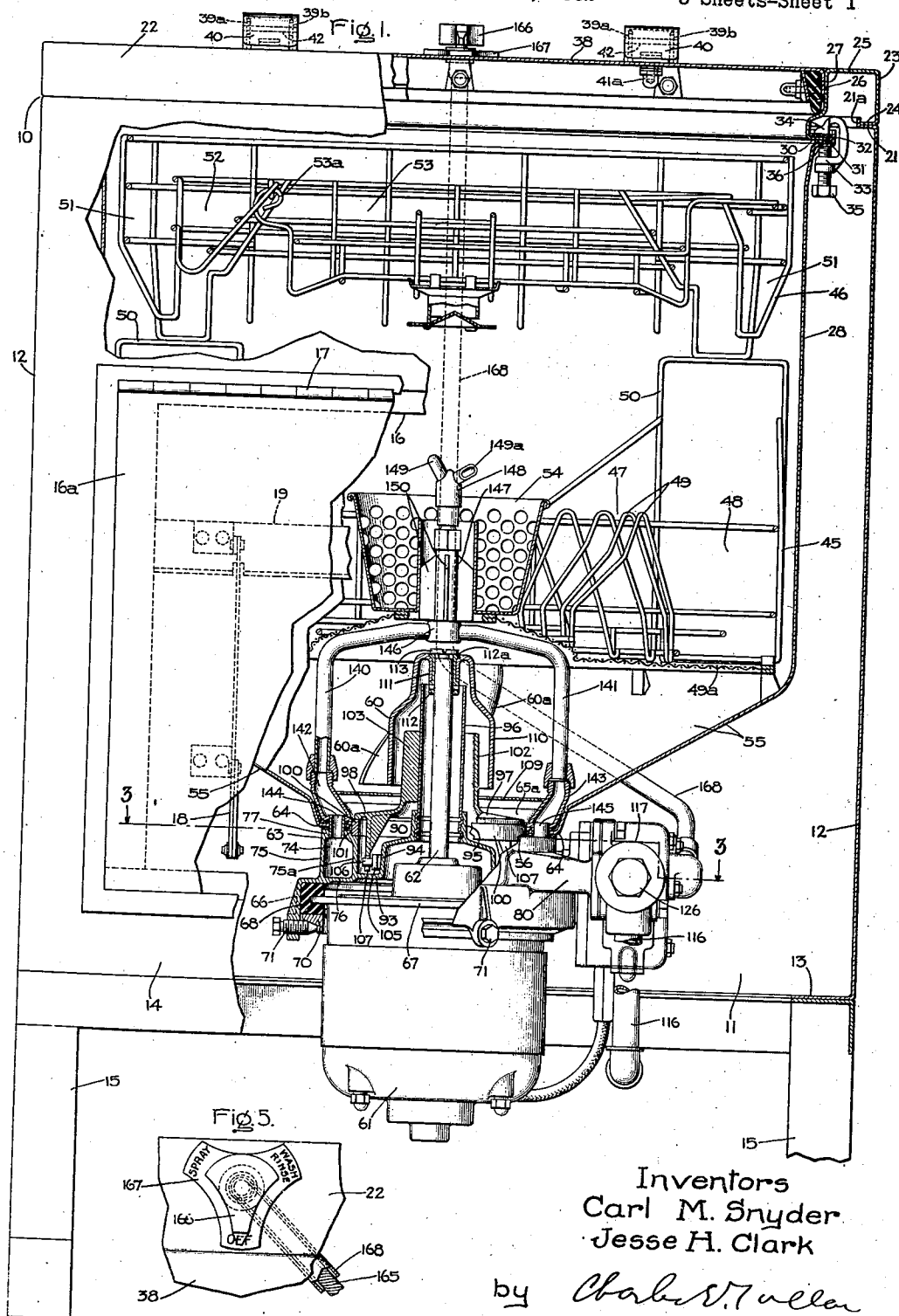
C. M. SNYDER ET AL

1,995,332

WASHING APPARATUS

Filed April 29, 1932

3 Sheets-Sheet 1



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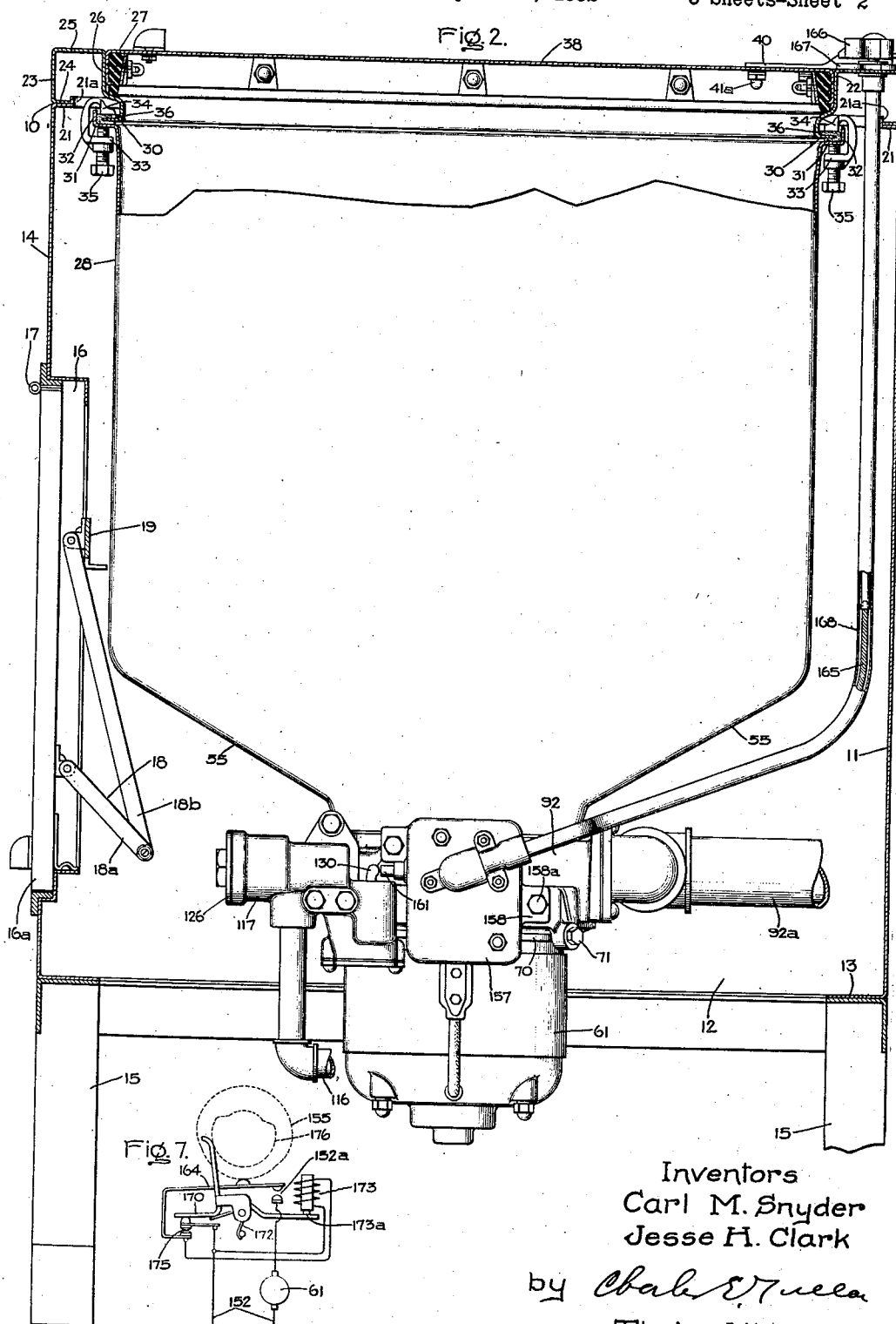
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WASHING APPARATUS

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3 Sheets-Sheet 2



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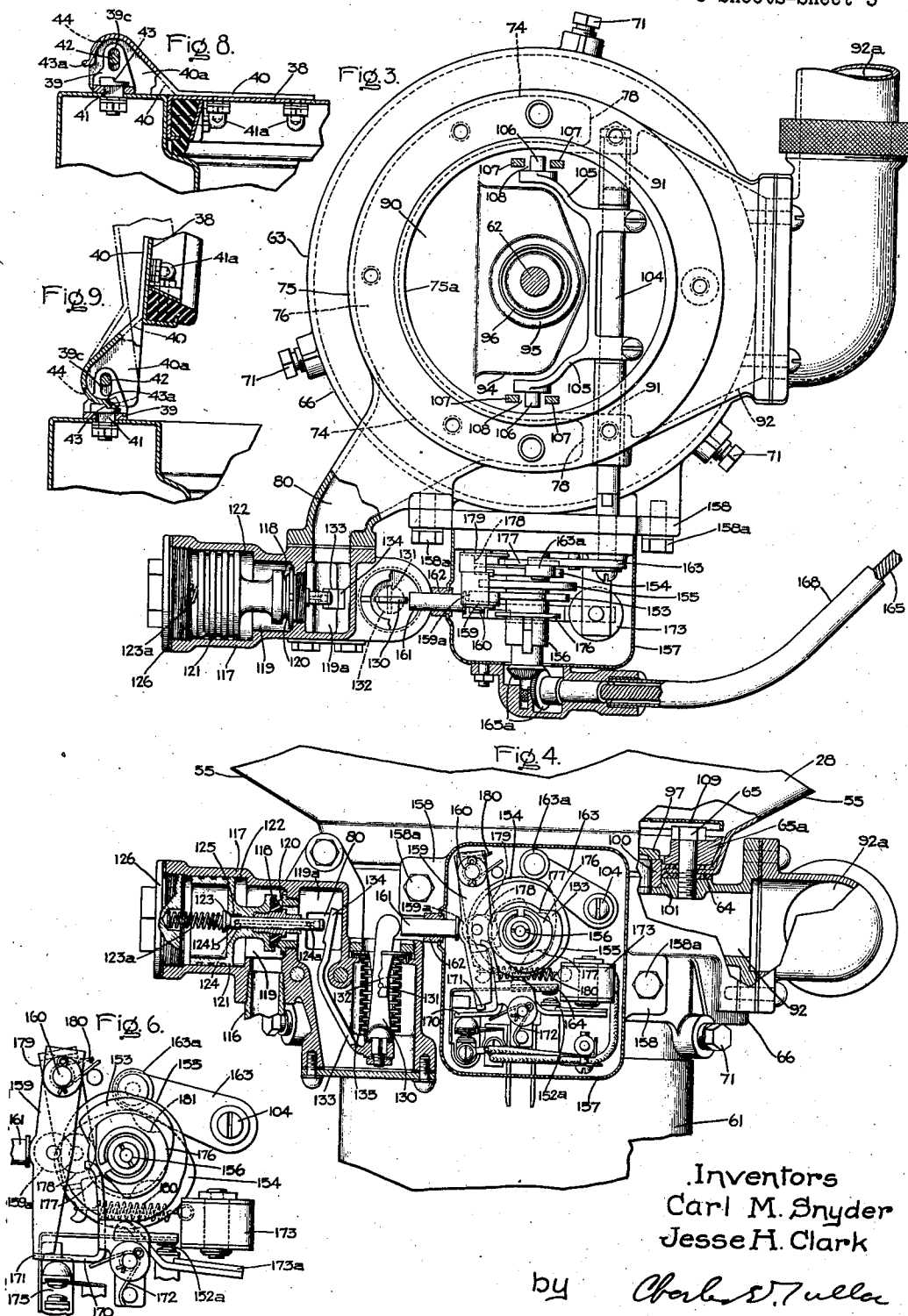
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WASHING APPARATUS

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

1,995,332

WASHING APPARATUS

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Cicero, Ill., assignors to Walker Dishwasher
Corporation, Chicago, Ill., a corporation of
Delaware

Application April 29, 1932, Serial No. 608,248

15 Claims. (Cl. 141—9)

Our invention relates to washing apparatus, more particularly to apparatus for washing dishes, and has for its object the provision of improved apparatus of this character.

5 More specifically, our invention relates to dishwashing apparatus wherein a cleansing fluid, such as water, is circulated or hurled through the washing chamber or vat by suitable power driven means, such as a motor driven impeller.

10 In one of its aspects, our invention contemplates the provision of improved washing apparatus whereby suitable cleansing steps, such as rinsing and washing operations, can be effected in a simple, reliable and efficient manner.

15 In another aspect, our invention contemplates the provision of improved means for automatically supplying the washing chamber or vat with a predetermined quantity of cleansing water for the washing operation so that the most efficient cleansing action will be effected.

20 In carrying our invention into effect in one form thereof, we provide a washing vat or chamber for receiving the dishes and utensils to be cleansed, and a suitable cleansing fluid, such as water. Arranged within the vat is a dish-supporting rack and also suitable power driven means arranged to circulate the cleansing water admitted to the vat either in spray form through the rack to effect a rinsing action on the dishes supported therein or to hurl it through the rack with considerable force to effect a more positive washing action on the dishes. The water circulating means is so arranged that either of these cleansing operations can be effected when water is being admitted to the vat by controlling the position of a drain valve provided for the vat so that when the drain valve is open, the water supplied to the vat will merely be sprayed through the rack to effect a rinsing action, whereas when the valve is closed so as to allow the water to accumulate within the vat, the water circulating means will engage the accumulated water so as to hurl it forcibly through the rack to effect a more positive washing action.

45 In order to supply the washing chamber or vat with the proper quantity of cleansing fluid for the washing operation, suitable means are provided for controlling the source of water supply in accordance with the load imposed upon the water circulating means and hence, in accordance with the load imposed upon the motor provided to operate the fluid circulating means.

50 This control means in one form of our invention comprises valve means arranged to control the water supply source, and means for locking

the valve means in position to allow water to flow into the vat until the load imposed upon the motor by the fluid circulating means attains a predetermined magnitude, whereupon the valve means is released to shut off the water supply.

5 Suitable means comprising a manually operable control member are provided for controlling the operation of the fluid supply and drain valves, the locking means and the motor, whereby the washing or the rinsing actions can be effected selectively at will merely by operating the control member to preselected controlling positions.

10 For a more complete understanding of our invention, reference should be had to the accompanying drawings in which Fig. 1 is a front elevation of dishwashing apparatus embodying our invention, portions being broken away so as to illustrate certain structural details; Fig. 2 is a side elevation, mainly in section, of the dishwashing apparatus of Fig. 1, portions being broken away so as to illustrate certain structural details; Fig. 3 is a sectional view taken through the line 3—3 of Fig. 1 taken at a right angle to Fig. 1 and having portions removed so as to illustrate certain details of construction; Fig. 4 is a fragmentary view in elevation of a portion of the apparatus, parts being broken away and parts shown in section so as to illustrate certain structural details; Fig. 5 is a plan view illustrating a control member used in the dishwashing apparatus of Figs. 1 and 2; Fig. 6 is a fragmentary view illustrating certain details of construction; Fig. 7 is a diagrammatic view illustrating certain details of control mechanism used in the dishwashing apparatus; Fig. 8 is a fragmentary view, mainly in section, illustrating a hinge structure used in the dishwashing apparatus; and Fig. 9 is a view similar to Fig. 8 but showing certain parts in different operative positions.

40 Referring to the drawings, we have shown our invention in one form as applied to dishwashing apparatus comprising a casing 10 having a rear wall 11, end walls 12, a bottom wall 13 and a front wall 14. These walls, as shown, are suitably shaped and joined together to define a substantially rectangular casing. The walls are formed from a suitable sheet material, such as steel, preferably enameled, and may be formed integrally as one sheet, or formed separately and secured together in any suitable manner, as by welding.

45 The walls, as shown, are supported in an elevated position upon suitable legs 15.

50 The front wall 14 is provided with an opening 16 closed by a door 16a. The door 16a is provided

at its upper edge with a suitable hinge 17, whereby it can be swung on a horizontal axis to its open and closed positions. The door is supported in its open, horizontal position by means of braces 18 of any suitable well known construction. These braces, as shown, are formed of a pair of links 18a and 18b pivotally secured together, the links 18a being pivotally secured to the door, while the links 18b are pivotally secured to a brace 19 supported by the front wall of the casing. When in its horizontal open position the door may be used as a shelf.

The back wall 11, the end walls 12 and the front wall 14 are provided at their upper edges with in-turned flanges 21 which in turn are provided at their inner edges with upturned flanges 21a.

Supported upon the flanges 21 is a top casing member 22. The casing member 22 is provided with vertically arranged side walls 23 which terminate at their lower ends in in-turned flanges 24 having a width substantially equal to that of the flanges 21 and which rest upon these flanges. The member 22 also comprises horizontal top wall portions 25 joined together to form a rectangle having the contour of the casing 10. Inner side walls 26 depend from the top walls 25.

The top walls 25, together with the inner side walls 26, define an opening 27, preferably of substantially square shape, adapted to receive a washing chamber or vat 28 of the washing apparatus. The vat is formed of some suitable material, such as sheet metal, shaped to define a relatively deep chamber, square in cross-section. The inner side walls 26 of the top member 22 are arranged to support the vat in a substantially vertical position within the casing 10. As shown, the lower ends of the side walls 26 are in-turned somewhat and then flange outwardly to define a horizontal ledge 30. Cooperating with this ledge is a similarly out-turned ledge 31 provided on and about the upper edge of the vat. This latter ledge terminates at its outer edge in an up-turned flange member 32 which embraces the ledge 30 provided on the member 22 and is spaced somewhat from it.

The ledge 31 of the vat is clamped to the ledge 30 of the supporting member 22 by means of a plurality of U-shaped clamping members 33, each of which is provided with an upper relatively long jaw 34 resting upon the ledge 30 and a lower jaw defined by an adjustable bolt or screw 35 engaging the lower surface of the ledge 31. As will be readily understood, the clamping members 33 can be caused to grip the cooperating flanges 30 and 31 with any desired degree of pressure by adjusting the screws 35. If desired, and it is usually preferable to do so, a suitable sealing member 36, such as a rubber gasket, will be interposed between the flanges 30 and 31 and likewise between the upper flange 30 and the cooperating jaw member 34. This member 36 may be and, as shown, is formed of a single piece of material which is given a substantially U-shape, one leg of which is inserted between two ledges, while its other leg is inserted between the ledge 30 and the jaws 34. The bend of the U, as shown, lies in the space between the ledge 30 and the flange 32.

A removable cover member 38 is provided for the vat 28, this cover, as shown, being provided with suitable hinge means securing it to the supporting member 22.

This hinge means is arranged to support the cover 38 in its open position. As shown, the hinge means comprises a pair of hinges each of which

consists of a pair of pivotally connected hinge members 39 and 40. The hinge member 39 of each pair is secured to the top casing member 22 by means of a bolt 41, while the member 40 is secured to the cover 38 by means of bolts 41a. The member 39, as shown, comprises a pair of spaced upright hinge lugs 39a and 39b (Fig. 1) that are provided with aligned vertically elongated apertures 39c, as shown in Figs. 8 and 9. These apertures receive a hinge pin 42 which functions to pivotally secure the members 39 and 40. The opposite ends of this pin are passed through the apertures 39c from which they project. The projecting ends are received in apertures provided for them in ears 40a provided on the member 40. The pin is secured intermediate its ends to the member 40 by means of a spring clip member (not shown) secured to the member 40 and received by a recess (not shown) provided in the pin. To remove the pin it is merely necessary to move the spring clip from the detent and withdraw the pin laterally.

The heads of the bolts 41 are provided with ledges or catches 43 which serve to lock the cover in a vertical open position. The hinge members 40, as shown, are provided at their rear ends with projections 43a arranged to engage the latches 43, as shown in Fig. 9, to secure the cover. When the cover is moved from its closed position shown in Fig. 8 to its open position shown in Fig. 9, it is first moved to a substantially vertical position and then is lifted bodily upwardly by the cam motion and then swung in the opening direction so as to allow the projections 43a to move to the front of the catch 43. The cover is then lowered and allowed to assume its dotted line position shown in Fig. 9. If there is some obstruction back of the cover preventing this movement, the cover nevertheless will be supported in its substantially vertical position by the locking means. The cover is stopped in its dotted line position by means of a stop edge 44 arranged on the member 40 to engage the lugs 39a and 39b.

Preferably the vat 28 and also its cover member 38 will be formed from a suitable rust-resisting steel which will be plated or enameled.

Suitable supporting open-work baskets or racks 45 and 46 are removably supported in the lower and upper portions of the vat 28.

While any suitable dish and utensil supporting racks may be used, we prefer to use racks arranged substantially in accordance with those described and claimed in the copending application of Forrest A. Walker, Serial No. 621,042, filed July 6, 1932 and assigned to the same assignee as this invention.

Briefly, these racks are of open-work form, the general contours of both racks being substantially square so as to fit in the square vat 28. The lower rack 45 is formed in two compartments 47 and 48, the latter surrounding the compartment 47. The inner compartment is provided with a number of inverted, distorted, U-shaped bracket members 49, arranged in a circle and spaced apart substantially uniformly. These brackets are arranged to support platters, plates, saucers and the like. The outer compartment 48 is adapted to receive such utensils as soup plates, platters and serving dishes. The bottom of the rack 45 preferably will be covered by a screen 49a, as shown. This lower rack is further provided with handle members 50 whereby the rack may be conveniently removed from the vat 28 and replaced therein. These members 50 also serve to support the upper rack 46.

The upper rack is provided with a plurality of

compartments. As shown, a relatively deep compartment 51 is provided for small flat pieces; a compartment 52 is provided for cups and glasses; and a central compartment 53 is provided for cups, glasses and the like. This central compartment 53 is provided with a hinge 53a, so that it can be swung to an open position to provide access to the lower rack without removing the upper rack from the vat.

10 Preferably, the wires forming both racks 45 and 46 will be covered with a suitable somewhat resilient material, such as rubber.

15 Arranged within the compartment 47 of the lower rack is a tray or basket 54 arranged to receive knives, forks, etc. This basket, as shown, is supported above the screen 49a.

20 The bottom wall of the vat 28 is provided with a plurality (four) of inclined portions 55 which slope downwardly toward the center of the bottom of the vat and terminate in an opening 56 arranged centrally of the vat.

25 In the lower portion of the vat 28 above the opening 56 is a suitable impeller 60 arranged to rotate on an axis substantially coaxial with the vertical axis of the vat and with the axis of the central opening 56. The impeller 60 is operated by an electric motor 61 mounted below the bottom wall of the vat and having its shaft extending through the opening 56 and operably connected with the impeller.

30 The motor 61 is supported in the bottom wall of the vat by means of a bushing or supporting frame 63. The four bottom walls 55 of the vat terminate in a circular in-turned flange 64. As shown, the bushing 63 is secured to the flange 64 by means of a plurality of bolts 65 (Fig. 4) which are passed through suitable apertures provided for them in the flange and a clamping ring member 65a supported on the upper side of the flange 64. The bushing 63, as shown, is provided with a depending skirt 66 of enlarged diameter. This skirt serves to secure and support the motor 61. As shown, the upper portion of the motor frame is provided with an outwardly projecting flange 67. This flange is received by a member 68 formed of some suitable resilient material, such as rubber. This resilient member, as shown (Fig. 1), has a plurality of spaced enlarged sections of substantially U-shape joined by U-sections of somewhat smaller dimensions, the two legs of the U members being arranged to grip tightly the opposite sides of the flange 67. The resilient member 68 is retained within the skirt 66 by means of a clamping or pressure ring 70 which in turn is secured to the skirt by means of a plurality of radially disposed set-screws 71 engaging the clamping member, as clearly shown in Fig. 1. Suitable water-tight sealing means or gaskets will be provided between the flange 64 and the frame 63 and ring 65a.

70 The frame 63, in addition to serving as a support for the impeller driving motor 61, has several additional functions: It serves to convey fresh cleansing water to suitable water distributing and circulating means in the vat 28, and further, serves to conduct the soiled water from the vat to a suitable drain. The frame 63, as shown, is provided with a passageway or conduit 74. This passageway is defined by an outer wall 75 of the frame, an inner wall 75a spaced from the outer wall, a bottom wall 76 joining the inner and outer walls at the bottom, a top wall 77 joining the inner and outer walls at the top and end walls 78 (Fig. 3). This passageway 74, as shown (Fig. 3) extends along the periphery of one side of

the frame through an angle somewhat greater than 180°.

Communicating with this conduit 74 is a conduit 80 which, as will be pointed out in greater detail hereinafter, communicates with a suitable source of fresh water supply.

The frame 63 is further provided with an internal chamber 90, one side of which is defined by the inner wall 75a of the chamber 74. Opposite this wall the chamber is provided with a relatively long opening 91 (Fig. 3) that communicates with a conduit 92, which in turn communicates with a drain passageway 92a.

15 The chamber 90 is provided with a bottom wall 93 which is provided with a central reentrant portion 94. This reentrant portion, as shown in Fig. 1, projects upwardly for some distance into the chamber 90 in a substantially vertical direction and then slopes inwardly toward the motor shaft 62, finally terminating in a vertically arranged portion 95 of relatively small diameter. This bushing 95, as shown, serves to support and secure a sleeve 96 in a substantially vertical position.

25 Surrounding this sleeve 96 is a valve 97 arranged to control communication between the vat 28 and the drain chamber 90. This valve 97 is provided with a closure portion 98 that cooperates with the valve seat 100. This seat, as shown in Fig. 1, rests in a ledge or recess 101 provided for it in the frame 63. The valve is further provided with a sleeve 102 extending vertically upwardly from the closure portion and arranged in concentric and spaced relation with the sleeve 96. The space between the members 96 and 102 communicates directly with the drain chamber 90 and functions as an overflow passageway for the cleansing fluid or other liquid introduced into the vat 28.

30 The valve is arranged to move vertically between its closed and open positions and is guided in its movement on the sleeve 96 by means of a plurality of guide members 103 projecting inwardly from the sleeve 102 and arranged to slidably engage the outer surface of the sleeve 96.

35 A suitable valve operating member is provided, this member, as shown, comprising a horizontally disposed operating shaft 104 having a portion arranged within the drain chamber 90. This shaft is provided with crank arms 105 which carry outwardly projecting pins 106 cooperating with arms 107 depending from the valve 97 and provided with apertures 108 for receiving the pins 106, whereby the valve can be raised and lowered by rotating the shaft 104. The shaft 104 protrudes from the chamber 90, the protruding portion being operably associated with suitable operating mechanism, as will be described in greater detail hereinafter.

40 Arranged above the drain chamber 90 and valve 97 is a suitable strainer 109.

45 The impeller 60 is provided with blades 60a which may have any suitable shape, the important feature being that the blades be given a shape such that a cleansing fluid placed in the lower portion of the vat will be thrown upwardly and outwardly through the racks 45 and 46 in an efficient manner by rotary motion of the impeller. The blades 60a of the impeller are mounted on an apron-like member 110 which, as shown, is provided with an enlarged skirt that is arranged exteriorly of the valve sleeve 102 and spaced from it sufficiently to eliminate any possible interference by the valve to the rotation of the impeller or by the impeller to the operation of the valve.

The skirt 110 tapers inwardly at its upper end where it is secured to the motor shaft 62. As shown, the upper end of the skirt is provided with a reentrant portion 111 that surrounds and closely fits a bushing 112 secured to the motor shaft. The upper end of this bushing is provided with a flange 112a which, as shown in Fig. 1, is received in a suitable recess provided for it in the upper end of the impeller. This bushing is secured to the shaft 62 by means of a screw 113 threaded into an aperture (not shown) provided for it in the motor shaft.

The frame 63 including the inlet passageway 80, the drain chamber 90 and conduit 92, the tubular valve 97 surrounding the shaft 62 and arranged to control the drain port, the sleeve 96 and the arrangement of the apron-like skirt of the impeller 110 surrounding the sleeve and drain valve form no part of this invention, but are described and claimed in the copending application of Karl K. Huppman, Serial No. 657,781, filed February 21, 1933, and assigned to the same assignee as this invention.

The impeller preferably will be formed as a single piece and may be made from any suitable material, such as cast aluminum, or pressed steel.

The washing apparatus is provided with a suitable source of cleansing fluid supply, such as hot water, which is directed to the washing apparatus through a conduit 116. This conduit communicates with the conduit 80 and hence with the fluid supply chamber 74 through a suitable control valve 117. As shown, this valve comprises a closure member 118 that cooperates with a valve seat 120 which controls communication between the conduit 116 and the conduit 80. The valve seat divides the valve housing into two chambers 119 and 119a, the former communicating with the inlet 116 and the latter with the conduit 80.

A piston 121 is connected with the valve member 118 to operate it to and from its seat 120. This piston is arranged to reciprocate in a cylinder 122.

It will be observed that the inlet 116 communicates with the valve chamber at a point between the piston 121 and the valve seat 120. The pressure of the fluid introduced from this source 116 to the valve chamber is used to control the piston 121 to operate the valve 118 to and from its seat 120. This control is effected by means of a pilot valve 123 arranged axially of the piston and valve, and further arranged to provide communication between the chamber on the left of the piston as viewed in Figs. 3 and 4 and the chamber 119a of the valve housing. The piston 121 is so arranged in the cylinder 122 that fluid may leak from the source 116 past the piston to the chamber on the left side of the piston. The pilot valve is controlled to release this pressure so that the pressure acting upon the right-hand side of the piston can force the piston toward the left, thereby opening the valve 118.

For this purpose, the pilot valve is provided with a passageway 124 which terminates in an aperture 124a in its right-hand end in the chamber 119a, and which terminates at its left-hand end in an aperture 124b that normally is located in a chamber 125 closed by the pilot valve. This latter aperture is closed when the valve is seated, but when the valve is opened communicates directly with the cylinder chamber 122 on the left of the piston, thereby placing this chamber in communication with the chamber 119a to relieve the pressure on the left side of the piston.

The pilot valve 123 is normally biased to its closed position by means of a compression spring 123a which is interposed between the valve and the cylinder head 126.

It will be observed by reason of the foregoing arrangement that when the pilot valve is moved toward the left to uncover the port 124b, the chamber on the left side of the piston will be placed in communication with the chamber 119a, whereby the pressure on the left side of the piston is relieved. As this pressure is relieved the pressure acting on the right-hand side of the piston forces the piston to the left, thereby opening the valve. If the pilot valve is then allowed to move to its closed position, water will leak past the piston to the left side thereof and build up a pressure which eventually will overcome that acting on the right side of the piston, due to the differences in areas of these two sides, and, as a result, the piston will be moved toward the right to close the valve 118.

The pilot valve 123 is actuated to its open position by means of a lever 130 pivotally mounted in the chamber 119a on a suitable pin 131 provided for it in the chamber. The pin 131 is supported by a sleeve 132 which is supported in a vertical position by the walls of the chamber 119a. The lever 130 is mechanically connected at its lower end to the pilot valve by means of an arm 133 which is rigidly secured to the lower end of the lever and is provided with a head or hammer 134 arranged so that when the lever 130 is moved in a counter-clockwise direction, as viewed in Fig. 4, the hammer will engage the pilot valve to move it to its open position. The lever 130 is normally biased to a vertical inoperative position, shown in Fig. 4, by means of a resilient member 135 having the form of an elastic metallic bellows. The bellows, as shown, is mounted in a vertical position in the chamber 119a and is secured at its upper end to the housing of the chamber. At its lower end the bellows is secured to the lever 133. It will be understood that when the lever 130 is actuated in a counter-clockwise direction to effect the opening of the pilot valve 123 the bellows 135 will exert a force upon the lever tending to return it to its neutral position, as shown in Fig. 4.

It will be observed by reason of the foregoing arrangement that when the lever 130 is moved in a counter-clockwise direction, the valve 118 will be opened so as to establish communication between the inlet supply source 116 and the conduit 80 communicating with the supply chamber 74. The lever 130 is operated to effect the opening of the valve by means of suitable mechanism which will be described in detail hereinafter.

The supply chamber 74 communicates with the vat 28 through a suitable spray device which, as shown (Fig. 1), comprises a pair of upright conduits 140 and 141 disposed substantially 180° apart so as to be positioned on opposite sides of the impeller 60. These members are secured at their lower ends to upright coupling members 142 and 143 supported by the ring member 65a and which are in communication with the supply chamber 74 through nipples 144 and 145. The conduits 140 and 141 at their upper ends are turned inwardly toward each other at nearly right angles to the vertical portions and terminate in a chamber 146 arranged substantially in the vertical axis of the vat 28. Communicating with the chamber 146 is an upright conduit 147, and mounted for rotation on the upper end of this conduit and in fluid communication with it is a

suitable spinner or spray device 148. This spray device 148 as shown is provided with a pair of reaction nozzles 149 and 149a. These nozzles are arranged at different angles to the vertical, whereby the water issuing from them is directed through different paths which sweep through substantially the entire upper portion of the vat and through the racks 45 and 46.

The conduit 147 is provided on its exterior with a plurality of radially disposed supporting fins 150 which, as shown, slidably receive and guide the basket or tray 54 to its position of rest above the screen 49a, and function to secure the tray in a vertical position, as shown in Fig. 1. One of the fins is provided with a projection (not shown) which engages the basket to support it.

The particular fluid supply means comprising the conduits 140 and 141, the chamber 146, the conduit 147 and the spray device 148 is described and claimed in the copending application of Jesse H. Clark, Serial No. 653,243, filed January 24, 1933, and assigned to the same assignee as this invention.

The impeller driving motor 61 is provided with a suitable source of electrical supply 152 controlled by a switch 152a.

The inlet valve operating mechanism, the drain valve operating mechanism and the motor switch are controlled by cams 153, 154 and 155. These cams are provided with a common operating shaft 156 that is mounted for rotation in a suitable casing or housing 157. The shaft and housing are supported by a plate 158 which in turn is secured to the bushing 63 by means of bolts 158a.

The inlet valve cam 153 operates a lever 159 which is provided with a follower 159a that engages the cam. The lever 159 is pivotally mounted at its upper end upon a stud shaft 160. This shaft in turn is supported by the plate 158. The lever 159 operates the lever 130 through a pin 161 which is mounted to reciprocate in a bushing 162 provided for it in one wall of the housing 157.

The drain valve cam 154 operates a crank arm 163 which is operably connected to the drain valve shaft 104. As shown, the crank arm 163 is provided with a follower 163a riding on the cam 154.

The cam 155 engages the movable contact arm 164 of the motor switch 152a.

The shaft 156 is mechanically connected with a flexible operating shaft 165 through suitable bevel gears 165a. The shaft 165 extends upwardly at the rear side of the casing 10 and protrudes from the top member 22 to the exterior of the casing. A manually operable operating member or knob 166 is attached to the protruding end portion of the shaft 165 so that when the operating knob is turned, rotary motion will be imparted to the cam shaft 156 and to the cams mounted thereon. Cooperating with the knob 166 is a suitable fixed index member 167 indicating certain controlling positions for the knob, namely, an "Off" position, and "Wash-Rinse" and "Spray" positions. Preferably the flexible shaft 165 will be covered by a suitable protective casing 168.

It will be understood that the cams 153, 154 and 155 will be arranged to effect a predetermined sequence of operation of the inlet supply valve, the drain valve and the motor controlling switch when the knob 166 is rotated. It is contemplated that the knob 166 will be rotated in a clockwise

direction, as viewed in Fig. 5, to effect proper operation of the cams.

The cam shaft 156, and hence the knob 166, is utilized to control suitable auxiliary means for controlling the valve 118 so as to allow a predetermined quantity of cleansing water to be supplied to the vat for a predetermined cleansing operation, namely, the washing operation proper. The auxiliary control means comprises a pivotally mounted latch 170 arranged to engage and lock the arm 159 in its position to maintain the inlet valve 118 in its open position after the arm has been moved to this controlling position by the operation of its cam 153. As shown, the latch 170 is arranged to engage a suitable detent 171 provided on the lower end of the arm 159 to lock the arm in its valve opening controlling position. The latch 170 is biased to its latching position by means of a suitable spring 172, as clearly shown in Figs. 4, 6 and 7.

The latch 170 is arranged to be moved to its unlatching or releasing position by means of an electro-magnet 173. The armature 173a of this magnet 173 is arranged to rotate on the axis of the latch 170 and arranged so that when the magnet coil is energized sufficiently to attract the armature, the latter will engage the latch 170 to move it to its releasing position (Fig. 4).

The energizing coil for the electro-magnet 173 is included in series with the motor armature circuit under certain conditions of operation. A switch 175 is provided whereby this coil can be short-circuited (Fig. 6) under other conditions of operation.

It will be observed in view of the foregoing arrangement that the latch 170 will be released in accordance with the excitation of the coil of the electro-magnet, and that this excitation in turn will depend upon the motor load. This load in turn depends upon the amount of water which is allowed to accumulate in the vat 28. If the drain valve 97 is open at the same time that water is supplied to the vat, practically no water will accumulate. However, if this valve is closed at the same time that the inlet valve 118 is open, water will accumulate in the vat and the load imposed on the motor by the impeller will build up as more and more water is supplied. As this load gradually builds up, it is obvious that the pull exerted by the electro-magnet 173 will also build up. As the motor load increases, the pull exerted by the magnet will increase until eventually it will attain such a value that it will attract its armature 173a and thereby move the latch to release the arm 159. This, of course, allows the inlet valve to close so as to shut off the water supply.

When the latch is moved to its released position, it will engage the movable contact of the switch 175 to close the switch and thereby short-circuit the electro-magnetic device. This operation cuts the magnet coil out of the motor power circuit after the magnet has functioned to release the latch.

The latch 170 is further controlled by means of a cam 176 mounted on the shaft 156 so as to engage the latch under certain conditions of operation to prevent the latch from moving to its locking position.

The cam shaft 156 is further provided with a positioning cam 177 with which a suitable follower 178 cooperates. This follower, as shown (Fig. 6), is mounted upon a suitable lever arm 179 which is biased in a counter-clockwise direction by means of a spring 180 so as to cause the follower to engage its positioning cam. The posi-

tioning cam has three positioning detents 181 for the three controlling positions of the cam shaft, namely, the "Off", "Wash-Rinse" and "Spray" positions. These detents are positioned 120° apart.

It will be understood that the cams 153, 154, 155 and 176 will be so arranged upon the operating shaft 156 and the lifts of these cams will be so arranged that when the shaft is rotated in a predetermined direction, which is the clockwise direction, as viewed in Figs. 4, 5 and 6, the members controlled by these cams will be operated in a predetermined sequence so as to establish a predetermined cleansing cycle of operation of the washing apparatus. This cycle of operation will include rinsing and washing operations.

In the operation of the washing apparatus, it will be understood that the dishes and like utensils to be cleansed will be placed in their respective supporting trays 45 and 46. The attendant may use the door 16a as a shelf to assist in loading the vat.

Under the initial conditions, with the control knob 166 in its "Off" position, the controlling cams will be in such positions that the drain valve 97 will be open, the inlet valve 118 will be closed and the motor controlling switch 152a will be in its open position so that the motor will not be energized. The controlling cams and their associated controlled members are shown in their "Off" positions in Figs. 4 and 7.

In order to effect the rinsing operation, the control knob 166 will be moved in a clockwise direction through substantially 120° of motion to its position indicated "Spray" (Fig. 5). When the knob is moved to this position, the cam shaft will be turned through 120° of motion. This rotation of the cam shaft will bring the inlet valve cam 153 into such a position that the lever 159 will operate the lever 130 in a counterclockwise direction so as to open the pilot valve 123. This operation, as pointed out in detail above, effects the opening of the inlet valve 118. The cam 176 will be in position to maintain the latch 170 in its released position so that the latch cannot function to lock the valve 118 in its open position. The cam 154 controlling the drain valve will still operate to maintain the drain valve open. The cam 155 will be brought to such a position that it will close the motor switch 152a, thereby effecting the energization of the impeller motor. In response to this, the impeller motor will start up and will operate the impeller 60 at a relatively high speed. The water which is supplied to the spray device 148 from the supply source 116 will be hurled through the dish supporting racks 45, 46 and 54 and thence will pass to the drain 92a.

This operation effects a rinsing action on the utensils in the racks. This preliminary rinsing performs the important function of removing the larger particles of food soil from the dishes and the utensils and carrying them to the drain. When hot water is being used as the cleansing medium, as is usually the case, this rinsing step also performs the function of removing cold water which may lie in the hot water supply line, and further, serves to raise the temperature of the vat and apparatus arranged therein in order to eliminate excessive cooling of the hot water supplied for the subsequent washing operation proper.

The above described rinsing operation will continue as long as the control knob 166 remains in

its "Spray" position, that is, fresh water will continue to flow from the source 116 to the vat where it is sprayed over the dishes and then passed to the drain.

In order to effect the washing action proper, the control knob 166 is moved to its "Wash-Rinse" position 120° in advance of the "Spray" position. This operation of the control knob moves the cam shaft 156 through another 120° of motion. This movement of the cam shaft brings the cam 154 into such a position that the drain valve 97 is allowed to close, and brings the latch cam 176 to such a position that the latch is released and allowed to move to its locking position, shown in Fig. 6, whereby the lever arm 159 is locked in its position to maintain the inlet supply valve 118 open. The motor switch cam 155 will still be in such position that the motor switch 152a will remain closed; the motor, therefore, will continue to rotate the impeller. The fluid supply valve cam 153 will be moved to such a position that the lever 159 can be moved to its inner valve closing position (Fig. 4) to allow the fluid supply valve to close when the latch 170 is operated to release the lever.

As pointed out above, in view of the fact that the drain valve 97 has been closed, the water which issues from the spray device 148 will accumulate in the lower portion of the vat, and as a result will impose an increasing load upon the impeller and hence upon its driving motor 61. When a predetermined quantity of water has been supplied to the vat, this load will have been built up to such a value that the electro-magnet 173 will be energized sufficiently to release the latch 170. This operation will allow the inlet valve 118 to close, thereby shutting off a further supply of water to the vat. This operation of the latch will also close the switch 175 to short-circuit the electromagnet 173.

It will be understood that the valve 118 will be controlled to allow a quantity of water to be supplied to the vat that will give the most efficient cleansing action on the dishes, the particular type of impeller 60 and the shape and proportions of the vat being taken into consideration.

The predetermined quantity of water which has thus been supplied to the vat and allowed to accumulate therein is picked up continuously by the impeller 60 so as to be hurled with considerable force upwardly and outwardly against the utensils in the dish-supporting racks 45, 46 and 54. This operation will continue until the control knob is moved from the "Rinse" position to the "Off" position.

This operation of the control knob moves the cams through 120° to their initial positions shown in Fig. 4, in which positions the motor switch will be allowed to open to effect the deenergization of the motor; the drain valve will be moved to its open position; and the inlet supply valve 118 will remain in its closed position.

It will be understood that it is not necessary to go completely through the above described cleansing cycle, but that the control knob 166 may be moved to and stopped at the "Spray" position so as to effect a rinsing action, and then returned to its "Off" position without going through the "Wash-Rinse" position, or it may be turned directly to the "Wash-Rinse" position without the preliminary spray. Moreover, the knob may be moved to "Off" or "Spray" from "Wash-Rinse". When the knob is moved directly from "Off" to "Wash-Rinse", the motor will operate but the inlet valve will not be opened. This is important

because the motor can be run for purposes of service or to operate a mixing device or some auxiliary device without cutting off the source of water supply to the washing apparatus. The control, therefore, is quite flexible in its operation.

If desired, the shaft 165 may be operated by means of a "program" or timing motor so that the apparatus will effect an automatic cycle of operation including rinsing and washing cleansing steps.

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

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

1. Washing apparatus comprising a vat adapted to contain a cleansing fluid, means for circulating said cleansing fluid in said vat, means for supplying cleansing fluid to said vat, a valve controlling said fluid supply means, means for locking said valve in a controlling position and means controlling said locking means responsively to a condition of operation of said fluid circulating means that varies as the load upon said fluid circulating means varies when the quantity of fluid in said vat is changed so as to release said valve to shut off the supply of fluid to said vat when said load attains a predetermined magnitude.

2. Dishwashing apparatus comprising a vat adapted to contain a cleansing fluid, means arranged to circulate said cleansing fluid in said vat, a motor connected to operate said fluid circulating means, means for supplying cleansing fluid to said vat, a valve controlling said fluid supply means, latching means arranged to lock said valve in its open position and control means for said latching means operably associated with said motor to respond to the load imposed thereon in operating said fluid circulating means so as to control said latching means to release said valve to shut off the supply of fluid to said vat when said load attains a predetermined magnitude.

3. Dishwashing apparatus comprising a vat adapted to contain a cleansing fluid, a dish supporting rack in said vat, an impeller in said vat arranged to circulate said cleansing fluid through said rack, a motor arranged to operate said impeller, means for supplying cleansing fluid to said vat, a valve controlling said fluid supply means, means for effecting the operation of said valve to its open position, latching means operably associated with said valve operating means so as to lock said valve in its open position, an electromagnetic device operably associated with said latching means to release said valve at a predetermined value in the excitation of said device and means controlling said excitation in accordance with the load imposed on said motor.

4. Dishwashing apparatus comprising a vat, means for supplying cleansing fluid to said vat, valve means controlling said fluid supply means, a member operably associated with said valve to effect its operation to the open position, a cam for operating said member, a latch operably associated with said member to lock said valve in its open position, means operably associated with said latch to release said valve and a cam operably associated with said latch to prevent its operation to lock said valve in its open position in

predetermined positions of said last-mentioned cam.

5. Dishwashing apparatus comprising a vat adapted to contain a cleansing fluid, power means for circulating said cleansing fluid in said vat, means for supplying cleansing fluid to said vat, a valve controlling said fluid supply means, a cam, an operable connection between said cam and said valve arranged so that the operation of said valve to its open position is effected by the operation of said cam, locking means operably associated with said operable connection for locking said valve in its open position, means dependent upon the load imposed on said power means for releasing said locking means, a cam operably associated with said locking means to prevent its functioning in predetermined positions of said last mentioned cam and a single means controlling the operation of said cams.

6. Dishwashing apparatus comprising a vat adapted to contain a cleansing fluid, means for circulating said cleansing fluid in said vat, a motor for operating said fluid circulating means, an electrical circuit for said motor, means for supplying cleansing fluid to said vat, a valve controlling said fluid supply means, means arranged to effect the operation of said valve to its open position, locking means arranged to hold said valve in said open position, an electromagnetic device arranged to release said locking means, means connecting said electromagnetic device in the motor circuit so that the energization of said device to release said locking means is dependent upon the load imposed on said motor and means for deenergizing said electromagnetic device when said locking means is released.

7. Dishwashing apparatus comprising a vat adapted to contain a cleansing fluid, means arranged to circulate said cleansing fluid in said vat, a motor connected to operate said fluid circulating means, an electrical circuit for said motor, a switch controlling said electrical circuit, means for supplying cleansing fluid to said vat, a valve controlling said fluid supply means, means arranged to effect the operation of said valve to its open position, a latch arranged to lock said valve in said open position, an electromagnetic device including an energizing coil operably associated with said latch to release it at a predetermined value in the excitation of said device, electrical connections between the energizing coil of said device and the electrical circuit of said motor so that said coil is excited in accordance with the motor load and a switch operated by said latch when it is operated to release said valve arranged to short-circuit the energized coil of said electromagnetic device.

8. Dishwashing apparatus comprising a vat adapted to contain a cleansing fluid, means for circulating said cleansing fluid in said vat, a motor connected to operate said fluid circulating means, means for supplying cleansing fluid to said vat, a valve controlling said fluid supply means, a cam, means operated by said cam arranged to effect the operation of said valve to its open position, a drain valve for said vat, a cam, means operated by said cam arranged to move said drain valve between its open and closed positions, a latch operably associated with said fluid supply valve to lock it in its open position, means dependent upon the motor load for operating said latch to release said valve, a cam operably associated with said latch to prevent its functioning to lock said valve, and a single control member controlling said cams so as to estab-

lish a predetermined sequence in the operation of the members controlled thereby, whereby in one position of said control member, said fluid supply and drain valves are open, but said latching means is rendered ineffective to lock said supply valve in its open position, and in another position of said member said drain valve is closed and said latch is rendered effective to lock said supply valve in its open position until said latch is released by its operating means in accordance with the motor load.

9. Dishwashing apparatus comprising a vat adapted to contain a cleansing fluid, means for circulating said cleansing fluid in said vat, a motor connected to operate said fluid circulating means, means for supplying cleansing fluid to said vat, a valve controlling said fluid supply means, a cam, means operated by said cam arranged to effect the operation of said valve to its open position, a drain valve for said vat, a cam, means operated by said last mentioned cam arranged to move said drain valve between its open and closed positions, a latch operably associated with said supply valve to lock it in its open position, means biasing said latch to its locking position, an electromagnetic device including an exciting coil arranged to operate said latch to its releasing position, a cam operably associated with said latch to prevent its functioning to lock said valve, an electrical circuit for said motor, a switch controlling said circuit, a cam arranged to operate said switch, electrical connections including the exciting coil of said electromagnetic device in the motor circuit so that said coil is excited in accordance with the motor load, a switch in said connections arranged when closed to short-circuit said coil, an operable connection between said last mentioned switch and said latch whereby the switch is closed when said latch is moved to release said supply valve, a common shaft for operating said cams in a predetermined sequence, a manually operable control member and an operable connection between said control member and said shaft.

10. A dishwashing machine comprising a vat adapted to contain a cleansing fluid, a dish supporting rack in said vat, means for supplying water to said vat, a spray device in said vat arranged to hurl the water supplied thereto through said rack in spray form to effect a rinsing action on the dishes supported therein, a drain valve for said vat arranged when closed to allow the water supplied to said vat to accumulate therein, an impeller in said vat arranged to hurl said accumulated water through said rack to effect a washing action on the dishes supported therein, a valve controlling said fluid supplying means, means for locking said supply valve in its open position, means for releasing said valve in accordance with the load imposed on said impeller when circulating the accumulated water through said vat, cam means arranged to effect the operation of said supply valve to its open position, cam means controlling the operation of said drain valve between its open and closed positions, a common operating shaft for operating said cams in a predetermined sequence and a cam on said shaft controlling the operation of said locking means to prevent the functioning thereof to lock said fluid supply valve in its open position when said drain valve is opened, but permitting said latching means to lock said valve in its open position when said drain valve is closed.

11. Dishwashing apparatus comprising a vat adapted to contain a cleansing fluid, a dish-sup-

porting rack in said vat, a reaction spray device in said vat arranged to hurl cleansing fluid supplied to it through said rack to effect a rinsing action on the dishes supported therein, means for supplying cleansing fluid to said vat through said reaction spray device, a drain valve for said vat arranged when closed to allow fluid supplied through said spray device to accumulate in said vat, an impeller in said vat arranged to hurl said accumulated fluid through said rack to effect a washing action on the dishes in said rack, a motor for driving said impeller, a controlling switch for said motor, a valve controlling said fluid supply means, cams controlling said fluid supply and drain valves and said switch, a common shaft for said cams and an operating member for said cam shaft, said cams arranged by operation of said operating member to effect a predetermined sequence of operation of said valves and said switch so as to effect a predetermined cleansing cycle wherein in one position of said operating member fluid is supplied to said vat through said reaction spray device while said drain valve is open so as to rinse said dishes and wherein in another controlling position of said member fluid is supplied to said vat while said drain valve is closed to allow said fluid to accumulate in said vat for circulation by said impeller to effect a washing action on said dishes and said motor is energized to drive said impeller.

12. Dishwashing apparatus comprising a vat, means in said vat arranged to circulate a cleansing fluid therethrough, a motor connected to operate said fluid circulating means, a switch controlling said motor, means for supplying cleansing fluid to said vat, a valve controlling said fluid supply means, a drain for said vat, a valve controlling said drain, a plurality of cams controlling said valves and said motor switch, a common operating shaft for said cams, a manually operable control member and a flexible driving shaft interposed between and mechanically connecting said control member and said cam shaft.

13. Dishwashing apparatus comprising a vat adapted to contain a cleansing fluid, a dish-supporting rack in said vat, a reaction spray device in said vat arranged to hurl cleansing fluid supplied to it through said rack to effect a rinsing action on the dishes supported therein, means for supplying cleansing fluid to said vat through said reaction spray device, a drain valve for said vat arranged when closed to allow fluid supplied through said spray device to accumulate in said vat, an impeller in said vat arranged to hurl said accumulated fluid through said rack to effect a washing action on the dishes in said rack, means for operating said impeller, valve means controlling said fluid supply means, means including a single manually operable control member controlling the operation of said last mentioned valve means and said drain valve arranged by operation of said control member to selective positions to effect a predetermined sequence of operation of said valve means and said drain valve so as to effect a predetermined cleansing cycle wherein in one position of said control member fluid is supplied to said vat through said reaction spray device while said drain valve is open so as to rinse said dishes, said fluid flowing continuously into said vat while said control member is in said one position, and in another controlling position of said member said fluid supply valve means is controlled to admit fluid to said vat while said drain valve is closed to allow said fluid to accumulate in said vat for

circulation by said impeller to effect a washing action on said dishes, and means controlled by said control member and operated responsively to the load imposed on said impeller operating means in driving said impeller to circulate said accumulated fluid in said vat controlling said fluid supply valve means to shut off the supply of fluid when said load attains a predetermined magnitude.

ply valve means is controlled to supply a predetermined quantity of fluid to said vat while said drain valve is closed to allow said fluid to accumulate in said vat for circulation by said impeller to effect a washing action on said dishes, and said impeller motor is energized to operate said impeller continuously while said control member is in said last mentioned controlling position.

10 14. Dishwashing apparatus comprising a vat adapted to contain a cleansing fluid, a dish-supporting rack in said vat, a reaction spray device in said vat arranged to hurl cleansing fluid supplied to it through said rack to effect a rinsing action on the dishes supported therein, means for supplying cleansing fluid to said vat through said reaction spray device, a drain valve for said vat arranged when closed to allow fluid supplied through said spray device to accumulate in said vat, an impeller in said vat arranged to hurl said accumulated fluid through said rack to effect a washing action on the dishes in said rack, a motor for operating said impeller, valve means controlling said fluid supply means and means including a common manually operable control member for controlling the operation of said last mentioned valve means, said motor and said drain valve arranged by operation of said control member to selective positions to effect a predetermined sequence of operation of said members so as to effect a predetermined cleansing cycle wherein in one position of said control member fluid is supplied to said vat through said reaction spray device while said drain valve is open so as to rinse said dishes, said fluid flowing continuously into said vat while said control member is in said one position, and in another controlling position of said member said fluid sup-

15 Dishwashing apparatus comprising a vat adapted to contain a cleansing fluid, a dish-supporting rack in said vat, a reaction spray device in said vat arranged to hurl cleansing fluid supplied to it through said rack to effect a rinsing action of the dishes supported therein, means for supplying cleansing fluid to said vat through said reaction spray device, a drain valve for said vat arranged when closed to allow fluid supplied through said spray device to accumulate in said vat, an impeller in said vat arranged to hurl said accumulated fluid through said rack to effect a washing action on the dishes supported in said rack, a motor for driving said impeller, a controlling switch for said motor, a valve controlling said fluid supply means, control means for said fluid supply and drain valves and said switch comprising a housing, means mounting said switch in said housing, a cam shaft within said housing, operating members for said fluid supply and drain valves entering said housing, cams on said shaft arranged to operate said members and said switch in a predetermined sequence, an operating shaft for said cam shaft, means mechanically connecting said operating shaft to said cam shaft, and an operating member for said operating shaft.

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