March 26, 1935. C. M. SNYDER ET AL 1,995,331

WASHING APPARATUS

Filed Jan. 16, 1932 3 Sheets-Sheet 1

Fig. 1.

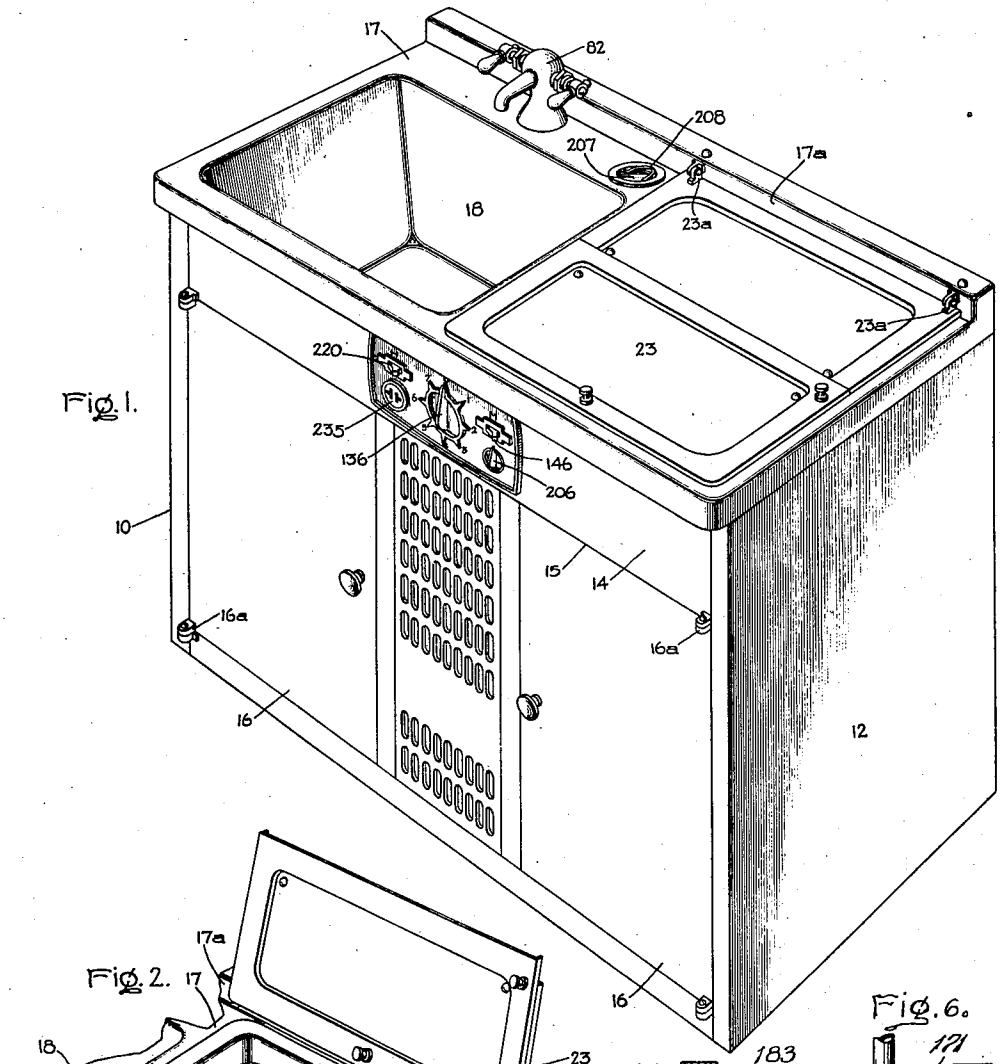

Fig. 2.

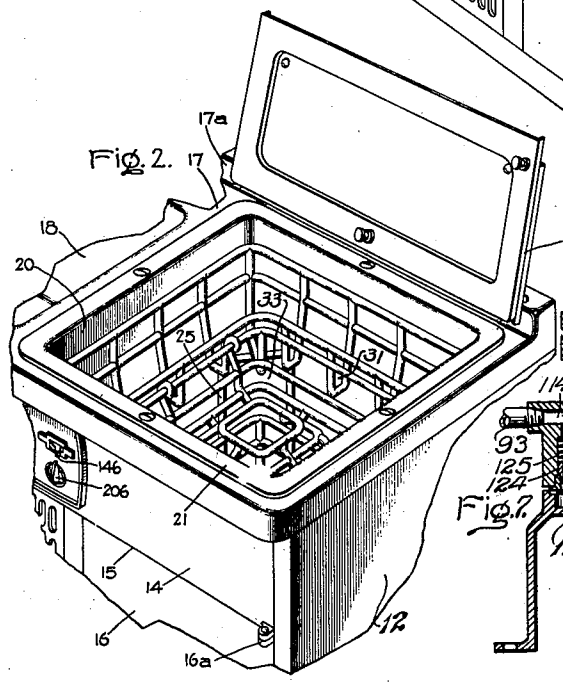

Fig. 6.

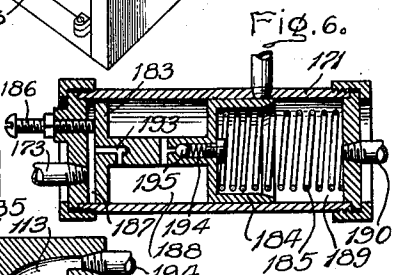

Fig. 7.

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WASHING APPARATUS

Filed Jan. 16, 1932 3 Sheets-Sheet 2

Fig. 3.

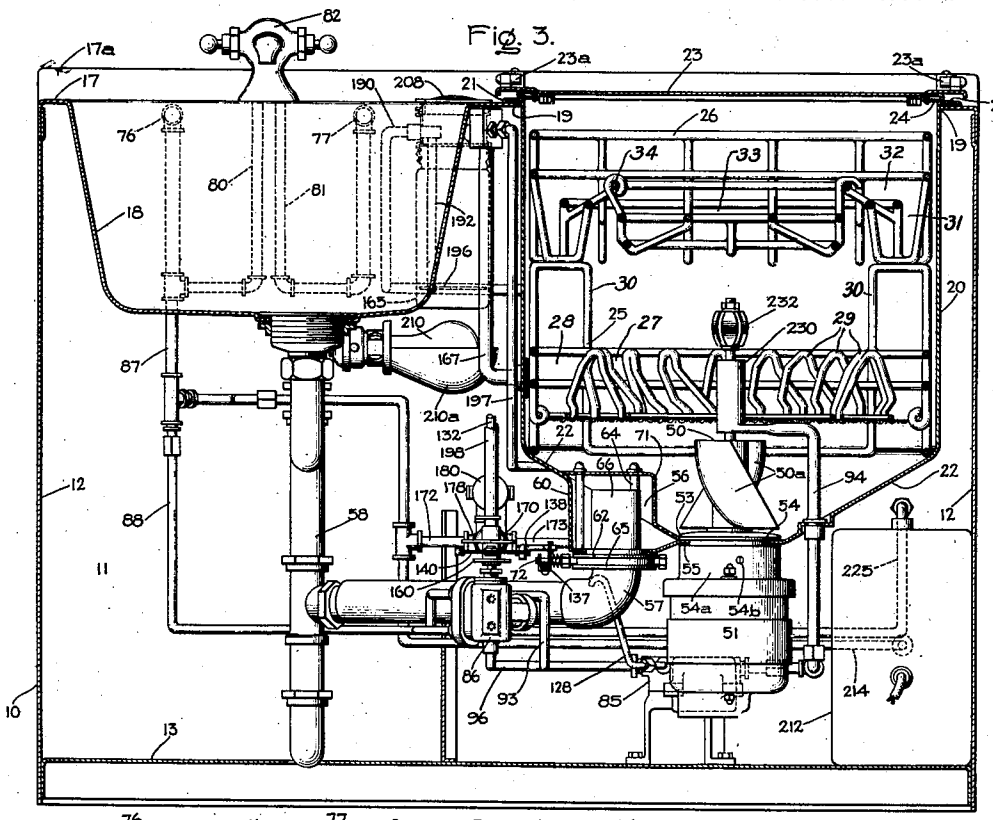
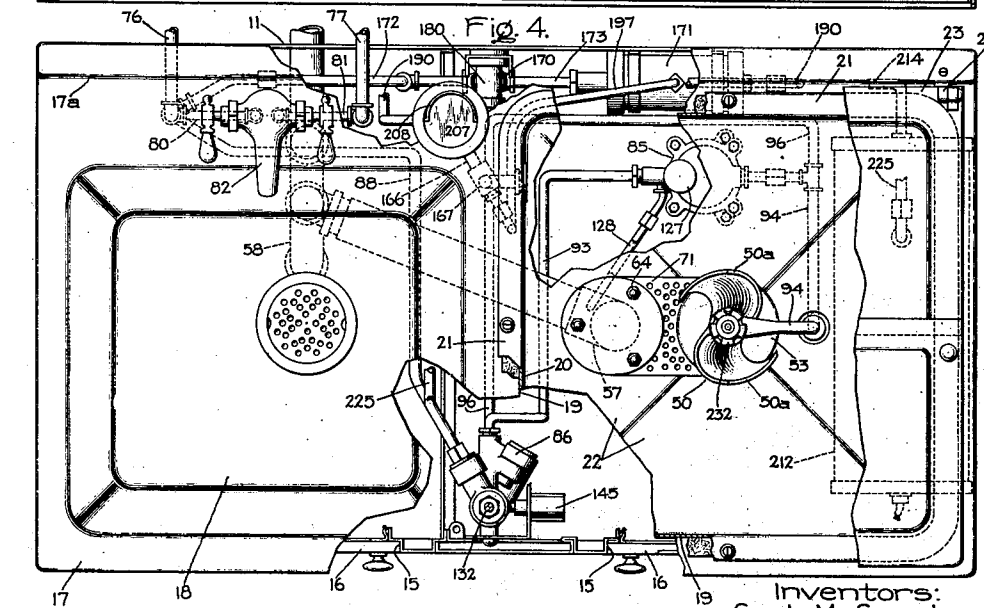


Fig. 4.



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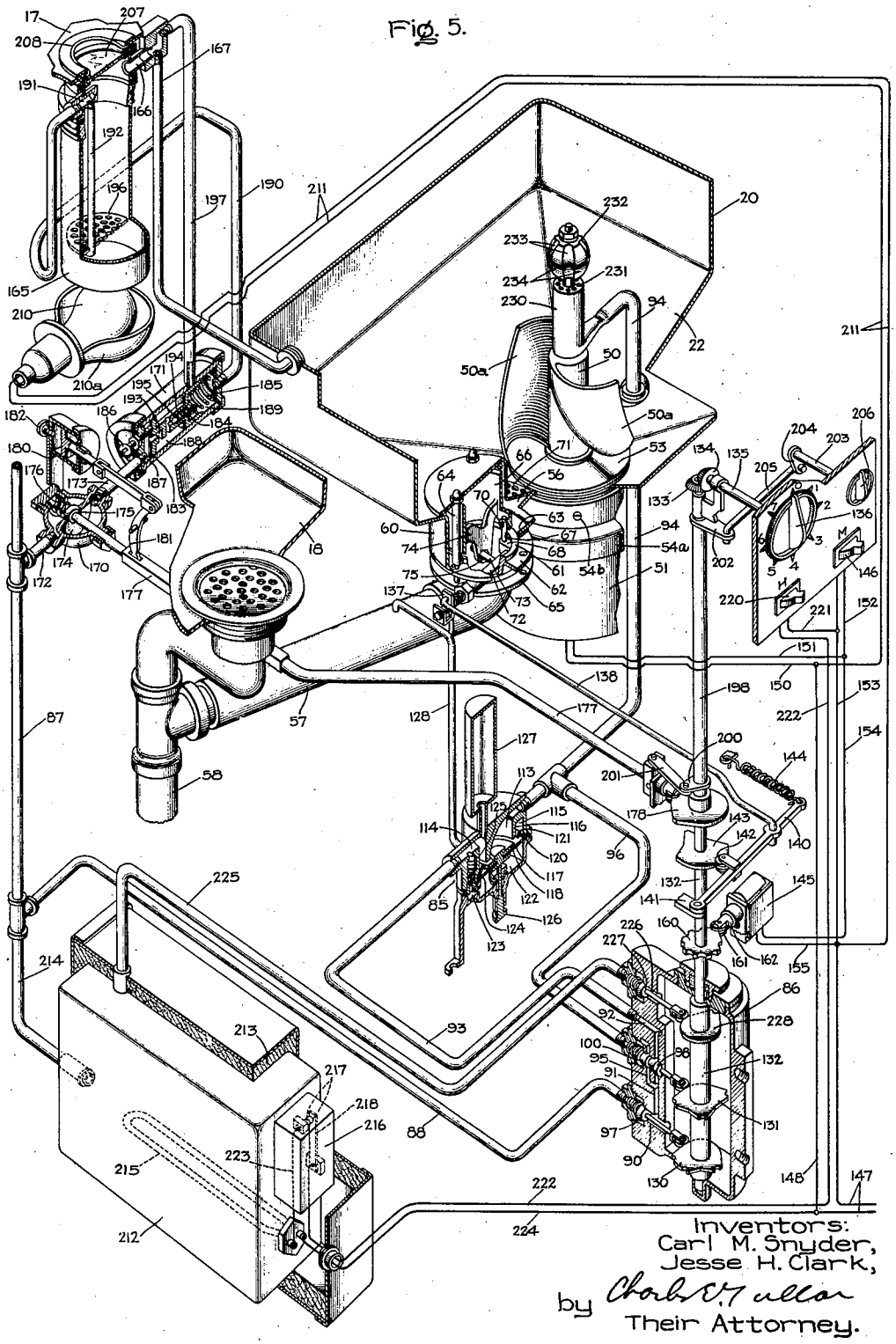
Filed Jan. 16, 1932 3 Sheets-Sheet 3

Fig. 5.



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UNITED STATES PATENT OFFICE

1,995,331

WASHING APPARATUS

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Application January 16, 1932, Serial No. 587,014

26 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 whereby a plurality of cleansing operations including rinsing and washing operations can be effected in a comparatively simple and efficient manner, and further, the provision of washing apparatus of this character having an improved construction and appearance.

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 cleansing fluid, such as water. Arranged within the vat is a dish supporting rack and also suitable power driving means arranged to engage the cleansing water admitted to the vat either to throw it 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 operation on the dishes. The water engaging means is so arranged that either of these cleansing operations can be effected merely by controlling the position of a drain valve provided for the vat. Preferably, the arrangement will be such that when the drain valve is open the water circulating means will engage the water supplied to the vat so as to hurl it in spray form through the rack, whereas when the valve is closed, thereby allowing the water fed to the vat to collect therein, the water circulating means will engage the accumulated water so as to hurl it forcibly through the rack to effect the more positive washing action.

Preferably, a plurality of sources of water supply will be provided, the water of the respective sources having different temperatures. It is contemplated that water of a lower temperature will be used for certain preliminary washing and rinsing cleansing operations, whereas water of a higher temperature will be used for a final cleansing operation, such as a final rinse. For the washing operations proper and also for the final rinse, it is preferable to provide the vat with a predetermined quantity of water from the water sources. For this purpose, a fluid measuring device communicating with the water sources and with the vat is provided. For the preliminary rinsing operations, means is provided for supplying water to the vat independently of the measuring device.

Suitable means comprising a manually operable control member is provided for controlling the operation of the drain valve and the sources of water supply whereby washing and rinsing operations can be effected in a predetermined sequence so as to provide a predetermined cleansing cycle including alternate rinsing and washing operations, or any one of the cleansing operations can be effected selectively independently of the remaining operations of the cycle.

We further provide means for supplying the vat with a suitable detergent responsively to the operation of the control member so that a predetermined quantity of the detergent is automatically supplied to the vat for a preselected washing operation. Control means is also provided for the detergent supply means so that detergent can be supplied for any one or all of the cleansing operations, as desired, independently of the automatic control.

In order to increase the utility and appearance of the apparatus, we provide the vat and its control apparatus with an enclosing casing, doors being provided whereby access can be had to the interior thereof. The top wall of the casing is provided with an opening through which access can be had to the vat. This wall is also provided with a depressed portion defining a sink so that the apparatus can be used jointly as an ordinary kitchen sink or as a mechanical dishwasher.

For a more complete understanding of our invention, reference should be had to the accompanying drawings in which Fig. 1 is a perspective view illustrating dishwashing apparatus embodying our invention; Fig. 2 is a fragmentary perspective view of a portion of the apparatus of Fig. 1 and illustrating the cover of the dishwashing vat shown in its open position; Fig. 3 is a vertical sectional view illustrating the dish washing apparatus of Fig. 1; Fig. 4 is a plan view of the dishwashing apparatus of Fig. 1, portions being broken away so as to illustrate certain structural details; Fig. 5 is a diagrammatic perspective view of the dishwashing apparatus of Fig. 1 illustrating operating and controlling mechanisms therefor arranged in accordance with our invention; Fig. 6 is an enlarged sectional view of a portion of the washing apparatus shown in Figs. 1–5 inclusive; and Fig. 7 is an enlarged sectional view of still another portion of the dishwashing apparatus of Figs. 1–5 inclusive.

Referring to the drawings, we have shown our invention in one form as applied to dishwashing apparatus comprising both a sink and a mechanical dishwashing mechanism. As shown in the drawings, the dishwashing apparatus arranged in accordance with our invention comprises a casing 10 having a rear wall 11, end walls 12, a bot-

tom wall 13 and a front wall 14 provided with openings 15 normally closed by doors 16. These doors are provided with suitable hinges 16*a* whereby they can be swung on vertical axes to their open and closed positions. The walls, as shown are suitably shaped and joined together to define a substantially rectangular casing. The walls as well as the doors are formed from a suitable sheet material, such as steel, preparably enameled, and are secured in any suitable manner as by welding.

The top wall 17 of the casing, preferably formed of one sheet of metal, is provided in one end portion with a depressed portion 18 defining a sink. The remaining portion of the top plate extends laterally from the sink and is provided with an opening 19, preferably of square shape, adapted to receive the washing chamber or vat 20 of the washing machine. Preferably the rear of the top plate 17 will be shaped to define a back ledge 17*a*.

The vat 20 is formed of some suitable material, such as sheet metal, shaped to define a relatively deep chamber, square in cross section. The vat 20 is provided at the upper edge portion of its vertical walls with an outwardly projecting flange 21 which rests upon the top plate 17 whereby the vat is supported in a vertical position in the casing 10. The bottom wall of the vat 20 is provided with a plurality (four) of inclined portions 22 which slope downwardly toward the center of the bottom. A removable cover member 23 is provided for the vat 20, this cover, as shown, being provided with a rubber sealing member 24 arranged to rest on the ledge 21 of the vat.

The cover 23, as clearly shown in Figs. 1 and 2 is formed of two sections of substantially the same size hinged together at substantially the center line of the vat, and also to the ledge 17*a* by means of hinges 23*a* so that when the cover is raised to open the vat the hinged sections may be folded upon each other as they are swung on the hinges 23*a*. This arrangement, it will be observed, reduces the size of the cover when open to substantially one-half of its size when closed. This is of particular advantage in case the washing apparatus be placed below a window in that the cover when open will not cut off any substantial amount of light from the window.

Preferably, the vat 20 and also its cover 23 will be formed from a suitable rust resisting steel which will be plated or enameled.

Suitable utensil supporting open-work baskets or racks 25 and 26 are removably supported in the lower and upper portions of the vat 20.

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.

Briefly, the racks are of open-work form, the general contours of both racks being substantially square so as to fit in the square vat 20. The lower rack 25 is formed with two compartments 27 and 28, the latter surrounding the compartment 27. The inner compartment is provided with a number of inverted, distorted U-shaped bracket members 29, arranged in a circle and spaced apart substantially uniformly. These brackets are arranged to support platters, plates, saucers and the like. The outer compartment 28 is adapted to receive such utensils as soup plates, platters and serving dishes. The lower rack is further provided with handle members 30 whereby the rack may be conveniently removed from the vat 20 and replaced therein. These members 30 also serve to support the upper rack 26.

This upper rack, as shown (Figs. 2 and 3) rests on the members 30 of the lower rack 26. The upper rack is provided with a plurality of compartments. As shown, a relatively deep compartment 31 is provided for small flat pieces; a compartment 32 is provided for cups and glasses; and a central compartment 33 is provided for cups, glasses and the like.

The central compartment 33 is arranged with a hinge 34 (Fig. 3) 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.

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

In the lower portion of the vat 20 is a suitable impeller 50 arranged to rotate on an axis substantially coaxial with the vertical axis of the vat. The impeller 50 is operated by an electric motor 51 mounted below the bottom wall of the vat and having its shaft operably connected with the impeller in any suitable manner. The motor 51 is supported through the bottom wall of the vat by means of a bushing 53. This bushing as shown rests on the bottom wall and has a portion extending through a central opening 54 provided in the wall, the motor being secured to this depending portion by means of a frame 54*a* secured to the bushing by means of radial studs 54*b*. A suitable water-tight joint 55 is provided between the bushing 53 and the opening provided in the bottom wall of the vat.

The impeller is provided with blades 50*a* 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 in an efficient manner through the dish-supporting trays 25 and 26 by rotary motion of the impeller. The impeller will be formed from suitable material, such as cast aluminum or pressed steel.

A drainage outlet 56, preferably screened, is provided in the bottom of the vat and preferably is arranged as close to the central opening 54 as is practical. Communicating with the outlet opening is a drainage conduit 57 which terminates in a drainage conduit 58 provided for the sink 18.

The metal of the bottom wall, as shown (Figs. 3 and 5), is pressed downwardly or otherwise suitably formed to define a drainage valve housing 60 which has a valve seat 61 (Fig. 5) communicating with the drainage conduit 57. The valve seat 61 is formed with a flange 62 which is fitted beneath and rests against an inturned flange 63 formed on the housing 60. The flange 62 is secured by bolts 64 to the flange 63 and to a cooperating flange 65 provided on the drainage conduit 57. Suitable watertight packing is interposed between the flanges 62 and 63.

Cooperating with the valve seat 61 is a tubular valve 66 positioned vertically within the valve housing and arranged for vertical opening and closing movements therein. Preferably and as shown, the lower end of the valve which engages the valve seat will be tapered somewhat, the valve seat, of course, being given a corresponding shape so as to interfit with the tapered valve. Suitable upright pin-like guide members 67 secured to suitable lugs 68 formed integrally with the seat member 61 are provided for the valve 66, the valve as shown (Fig. 5) being provided

with apertured lugs 70 for receiving the guide pins.

The upper edge of the tubular valve extends somewhat above the valve seat 61 and thereby provides an overflow passage for the cleansing fluid or other liquid introduced into the vat 20. A suitable screen 71, as shown, is arranged over the opening in the vat communicating with the valve housing and is secured by means of the bolts 64.

A suitable valve operating member is provided, this member, as shown, comprising a horizontally disposed operating shaft 72 having a portion arranged within the valve housing 60. This shaft is provided with a crank arm or pin 73 cooperating with a member 74 formed integrally with or otherwise secured to the valve and provided with an aperture 75 for receiving the crank pin 73 whereby the valve can be raised and lowered by proper rotation of the shaft 72. The shaft 72 protrudes from the valve housing where it is attached to a suitable operating member, as will be described in greater detail hereinafter.

The washing apparatus is provided with a hot water supply conduit 76 and a cold water supply conduit 77. Communicating with these conduits are conduits 80 and 81 which terminate in a hot and cold water faucet 82 provided for the sink 18.

Suitable means are provided for introducing measured quantities of hot water into the vat. For this purpose a fluid metering valve 85 is provided. The supply of hot water to the metering valve is controlled by means of a fluid distribution valve 86 which also provides for the admission of hot water to the vat independently of the metering valve. As shown, a pipe or conduit 87 communicates with the hot water supply conduit 76 and by a branch conduit 88 communicates with the distributing valve 86. The conduit 88 communicates with a transverse passageway 90 arranged in one wall of the valve 86 which in turn communicates with the interior of the valve housing and also with a vertical passageway 91. This passageway 91 communicates with a transverse passageway 92 which in its turn communicates with a conduit 93. This latter conduit communicates with the metering valve 85. The valve 85 communicates with the interior of the vat 20 by means of a conduit 94. The passageway 91 also communicates with a passageway 95 which in turn communicates with a conduit 96. This conduit 96 is connected with the conduit 94 whereby the metering valve 85 is by-passed. The passageway 90 is controlled by a valve 97, while the passageway 91 is controlled by a valve 98. The passageway 95 is controlled by a valve 100 operated with the valve 98 so that when the valve 98 is open the valve 100 is closed and vice versa.

It will be observed by reason of the foregoing arrangement that when the valves 97 and 98 are in position to open their respective passageways 90 and 91, hot water can flow from the supply conduit through the conduit 87, the conduit 88, the passageways 90 and 91, the passageway 92 and thence directly into the conduit 93 to the metering valve 85, and that as long as the passageways 90 and 91 are maintained open hot water can continue to flow to the metering valve.

The metering valve allows a predetermined quantity of water to flow through it, whereupon it operates to cut off the flow of water to the vat. As shown, the metering valve comprises a valve chamber 113 with which the conduit 93 communicates by means of a passageway 114. The passageway 114 communicates with an annular passageway 115 defined by a cylindrical member 116 depending from the upper of the walls defining the chamber 113. This annular passageway in turn communicates with the chamber 113.

Arranged below the mouth of the passageway 115 is a diaphragm 117 and carried by this diaphragm is a valve member 118 arranged to cooperate with the lower edge of the cylindrical portion 116, this edge serving in the capacity of a valve seat for the valve 118.

Also arranged above the diaphragm 117 is a ring-shaped member 120 provided with a circular tongue 121 which cooperates with the cylinder 116 to define a circular orifice at the mouth of the chamber 115 where it communicates with the chamber 113.

The passageway 114 also communicates with a chamber 122 arranged beneath the diaphragm 117 by means of a passageway 123; within this passageway is a valve 124. This valve is biased to its closed position by means of a spring 125, the valve being movable in a downward direction to its closed position and in an upward direction to its open position. The valve, as clearly shown in Figs. 5 and 7, is provided with a longitudinal passageway therethrough providing communication between the passageway 114 and the chamber 122 even though the valve be closed.

Arranged in the chamber 122 is an adjustable stop member 126 for limiting the downward movement of the diaphragm 117.

A closed air chamber 127 communicates with the chamber 115 as clearly shown in Figs. 5 and 7.

The operation of the metering valve is as follows: Assuming that the valves 97 and 98 are open so as to provide communication between the inlet pipe 88 and the conduit 93, and that the valve 100 is closed to close the conduit 95, then hot water will flow through the valve 86 and to the metering valve where it will flow through the passageway 114 to the annular chamber 115 and thence to the chamber 113 from whence it will flow to the vat 20 through the conduit 94.

It will be observed that the restricted opening between the chambers 115 and 113 defined by the cylinder 116 and the tongue 121 results in a static back pressure which is applied to the under surface of the diaphragm 117 through the opening provided in the valve 124. This pressure gradually builds up in the chamber 122 at a rate determined by the size of the opening through the valve 124 until it eventually becomes sufficiently great to overcome the pressure acting on the upper surface of the diaphragm. As a result of this, the diaphragm moves the valve 118 upwardly to engage the cylinder 116 and thereby cut off the flow of water to the vat. It will be understood that the unit pressure of the water above the diaphragm 117 will be somewhat less than is the unit static pressure below the diaphragm at the time the valve closes. This is because the back pressure in the chamber 115 and hence in the passageway 114 is greater than is the pressure in the chamber 113 at the discharge side of the nozzle defined by the cylinder 116 and the tongue 121.

It will be understood that the air chamber 127 operates to prevent water hammer in the system when the valve 118 closes.

The valve 118 will remain closed until the pressure acting on the under surface of the diaphragm 117 is relieved. In order to relieve this

pressure it is necessary to close the valve 97 and to move the valves 98 and 100 to such positions that communication is established between the conduits 93 and 96. When these valves have thus been operated, the static pressure of the water in the passageway 114 is released. As a result, the static pressure acting on the upper end of the valve 124 in the passageway 123 will be released, whereby the static pressure created in the chamber 122 by the diaphragm 117 in attempting to return to its neutral or initial position will overcome the force of the spring 125 acting on the valve 124, whereupon the valve will be opened. The valve 124 in opening establishes communication between the chamber 122 and a conduit 128 communicating with the drain conduit 57, thereby providing for a rapid release of pressure from the chamber 122 and a quick opening movement of the valve 124, which will return to its initial open position. It will be understood that the conduit 128 communicates with the passageway 123 at such a point that when the valve 124 is closed communication with the drain 57 will be cut off.

The metering valve is then in condition to measure another quantity of water to be supplied to the vat 20.

By adjusting the stop 126, it will be observed that the position of the diaphragm 117 and hence that of the valve 118 can be changed. This adjustment varies the necessary movement of the diaphragm to close the valve 118 and consequently varies the amount of hot water allowed to flow to the vat before the valve is closed.

To by-pass the metering valve and to supply hot water directly to the vat 20, the valve 98 is moved to close the conduit 91 leading to the passageway 92 and the valve 100 is moved to open the conduit 95 whereby hot water can flow directly from the conduit 88, through the passageways 90, 91 and 95 to the conduit 96 and thence through the conduit 94 to the vat 20.

The valves 97, 98 and 100 are operated by means of cams 130 and 131 arranged within the valve 86 and mounted on an operating shaft 132 which, as shown, is mounted to rotate on an axis substantially coaxial with the vertical axis of the chamber of the valve 86. The shaft 132 protrudes from the valve casing and extends upwardly in the casing 10 to a point adjacent the top thereof where suitable operating means are provided. This operating means, as shown, comprises a pair of cooperating bevel gears 133 and 134 arranged at right angles to each other and providing a mechanical connection between the vertical shaft 132 and a horizontally arranged operating shaft 135.

This shaft 135 protrudes from the front wall of the casing 10 and to its protruding end is secured an operating member 136. Obviously when the member 136 is rotated, rotary motion will be imparted to the shaft 132 and to the cams mounted thereon.

It will be understood that the cams 130 and 131 will be arranged to effect a predetermined sequence of operation of the valves 97, 98 and 100 when the knob 136 is rotated. It is contemplated that the knob 136 will be rotated in a clockwise direction, as viewed in the figures, to effect proper operation of the cams.

The drain valve 66 provided for the vat 20 is also operated by the shaft 132. For this purpose, the valve operating shaft 72 is provided on its protruding end with a crank arm 137 rigidly secured to the shaft and connected to an operating rod 138 which in turn is attached to an operating lever 140. The operating lever 140 is pivoted to a fixed member 141 and is secured to the rod 138 at a point intermediate its ends. Intermediate the pivoted end of the lever and the point of attachment of the lever with the rod 138 is arranged a suitable cam follower 142 which cooperates with a cam 143 secured to the operating shaft 132. The arm 140 is biased in a counterclockwise direction by means of a spring 144 whereby the follower 142 is caused to bear against the cam surface of the member 143. This cam 143 is given such a shape that the valve will be opened and closed at predetermined positions of the cam and hence at predetermined positions of the shaft 132.

The shaft 132 is also utilized to control the energization of the impeller operating motor 51. For this purpose a suitable control switch 145 is provided for the motor 51. It will be observed that this switch is included in the energizing circuit provided for the motor 51, together with a suitable manually operable switch 146. The switches 145 and 146 are connected in parallel so that the motor can be controlled by either one of these switches. The motor energizing circuit extends from the lower conductor of a suitable source of electrical supply 147 and thence through a conductor 148 and a conductor 150 to one side of the motor armature, thence through the motor armature, a conductor 151 and a conductor 152 to one side of the manually operable switch 146 and from the other side of this switch by means of a conductor 153 to the upper conductor of the supply source 147. The conductor 151 leading from the motor armature circuit is also connected with a conductor 154 which in turn is connected to one side of the control switch 145, the other side of this switch being connected by means of a conductor 155 to the conductor 153 leading to the upper conductor of the supply source 147. It will be observed that by reason of the foregoing connections either of the switches 145 or 146 may be used to control the energizing circuit of the impeller motor 51.

The switch 145 is controlled by means of a cam 160 secured to the shaft 132 and engaging a follower 161 attached to the switch operating member 162. The cam 160 is arranged to close the switch 145 to effect an energization of the motor 51 and then to allow the switch to open to effect a deenergization of the motor at predetermined positions of the shaft 132.

Means are provided for injecting a suitable detergent into the washing vat 20 at the proper time during the washing cycle. This injecting means preferably is controlled in accordance with the operation of the control knob 136.

The detergent injecting means comprises a suitable container 165 in which the cleansing material will be placed, preferably in liquid form. Thus, this liquid detergent may be formed of a solution of any suitable cleansing material in water. The upper end of this supply cylinder communicates with the washing vat by means of a passageway 166 formed at the upper end of the cylinder, and a conduit 167 connecting the passageway 166 with the vat. A predetermined amount of the solution in the cylinder 165 is caused to flow into the vat by causing a predetermined quantity of water to flow into the lower end of the container. This introduction of water into the lower end of the container forces the solution in the upper portion of the container to

flow through the passageway 166 and conduit 167 into the vat 20.

To provide this ejecting water for the cylinder 165 water is supplied from the hot water conduit 76 and is controlled by a valve 170 and a measuring device 171. As shown, the valve 170 is connected with the main 76 through the medium of the conduit 87 and a conduit 172 connected therewith and with the valve 170. The valve 170 is connected with the measuring device 171 by means of a conduit 173.

The valve 170, as shown, (Fig. 5) is provided with a transverse partition 174 in which is arranged a valve seat normally closed by a valve member 175 so as to close communication between the conduits 172 and 173. The valve 175 is normally biased to its closed position by means of a compression spring 176. The valve is opened against the force of this spring by means of an operating rod 177 which as shown is actuated by means of a cam 178 arranged to be operated by the cam shaft 132. The valve operating rod 177 is further controlled by means of a dash pot 180 mechanically connected to the rod through the medium of a pivotally mounted lever 181. The dash pot serves to retard and time the closing of the valve 175 by the action of its spring 176 after the rod 177 has been actuated by the cam 178 to open the valve and has been released by the cam to allow the valve to close. The retarding action of the dash pot is controlled by an adjustable screw valve 182. By reason of the foregoing arrangement it will be observed that it is merely necessary to move the rod 177 to open the valve after which the rod 177 may be released, the valve being held in its open position for a predetermined interval of time by the dash pot 180.

The measuring device 171 comprises a cylinder in which a piston provided with two heads 183 and 184 is arranged to reciprocate. This piston is normally biased to one end of the cylinder, the left-hand end, as shown in Figs. 5 and 6, by means of a compression spring 185 interposed between the piston 184 and the adjacent cylinder head. The movement of the piston toward the left is limited by an adjusting screw 186 defining a stop. It will be observed that the double-headed piston defines three chambers 187, 188 and 189 in the cylinder. The chamber 187 communicates with the conduit 173, while the chamber 189 communicates with the detergent cylinder 165 by means of a conduit 190. This conduit, it will be observed, communicates with the lower end of the cylinder 165 by means of a passageway 191 formed in the upper end of the cylinder and a conduit 192 communicating at its upper end with the passageway 191 and opening into the lower portion of the cylinder. The chambers 187 and 188 are in constant communication by means of a passageway 193 provided in the piston 183. A normally closed passageway 194 is arranged between the chambers 188 and 189. This passageway is normally closed by a spring closed valve 195, closing in the direction of the chamber 188.

Arranged transversely of the detergent cylinder 165 above the opening of the conduit 192 is arranged a suitable screen 196. This screen serves to spread or diffuse the water admitted by the conduit 192 through the lower portions of the detergent material within the cylinder. This diffusion of the water admitted is particularly useful if the detergent include a solid material dissolved in water because it spreads the incoming water over the entire lower surface of any of the solid material which might have gravitated to the bottom of the container 165.

The above described detergent injecting apparatus operates as follows:

Let it be assumed that the valve 170, the conduit 173, the chambers 187, 188 and 189 of the measuring device 171, and the conduit 190 are full of water, and let it be further assumed that the rod 177 has been moved toward the left to open the valve 175 by the operation of the cam 178. In this operation it is assumed that the cam has been so operated that after moving the rod to open the valve it has been moved to such a position that the valve can thereafter be closed by the operation of the spring 176 at a predetermined rate as controlled by the dash pot 180.

When the valve 175 has been opened water under pressure will be admitted to the chamber 187 and thereby force the double-headed piston toward the right against the force applied by the spring 185. This causes a predetermined quantity of the water in the chamber 189 to be forced up through the conduit 190 and into the lower end of cylinder 165 through the passageway 191 and the conduit 192. This operation, as has been explained above, forces a predetermined quantity of the detergent from the upper portion of the cylinder 165 into the vat through the passageway 166 and the conduit 167.

As the double-headed piston is moved toward the right to force the detergent from the cylinder 165, the piston 184 will uncover the port of a conduit 197, which as shown communicates with the passageway 166 in the detergent cylinder 165. This will allow water to flow from the chamber 188 through the conduit 197 and into the passageway 166 of the detergent cylinder. This water thus admitted to the passageway will serve to flush the passageway and conduit 167 of the detergent which has been carried therein by the previous admission of water to the lower end of the cylinder 165. It will be understood that water can be forced upwardly from the chamber 188 to the conduit 197 by reason of the fact that the chamber 188 is in constant communication with the chamber 187 through the conduit 193.

While the above operation has been taking place, the valve 175 will have been gradually moving toward its closed position and after a predetermined interval of time, as determined by the setting of the dash-pot 180, the valve will be closed so as to cut off communication between the supply conduit 172 and the conduit 173 leading to the measuring device 171 and thereby relieve the water pressure acting on the piston 183. As a result of this operation, the double-headed piston will be moved toward the left under the action of the spring 185. As the piston is moved toward the left, the water which is in the chamber 187 will be forced through the conduit 193 to the intermediate chamber 188 and water from this chamber will be forced through the passageway 194 past the valve 195 in to the chamber 189. In effect therefore the water in the chamber 187 will be transferred to the chamber 189. As the piston 184 moves toward the left it will close the port of the conduit 197.

We have also provided suitable means for operating the detergent injecting apparatus independently of the operation of the control knob 136 and the cam 178. For this purpose, we have arranged a suitable hollow shaft member 198 about the shaft 132. At the lower end of this

shaft we have arranged a crank arm 200 which is operatively connected with the valve actuating rod 177 through the medium of a link 201 whereby when the shaft 198 is rotated, motion will be imparted to the rod 177. At the upper end of this shaft 198 is arranged a second crank arm 202 which is operated by means of a manually controlled shaft 203. As shown, the shaft 203 is provided with a crank arm 204 which is mechanically connected with the crank 202 by means of a link 205. The shaft 203 protrudes from the front wall of the casing when a suitable operating knob 206 is provided. It will be obvious that by reason of the foregoing arrangement when the knob 206 is rotated in a clockwise direction, as viewed in Fig. 5, motion will be imparted to the rod 177 to open the valve 175 and that when this knob is returned to its neutral position shown in the figure, the rod 177 will be returned to allow the valve to close.

We further use the detergent containing cylinder 165 as a signal means whereby the attendant is informed that the energizing motor 51 of the machine is energized and that the machine is ready to be used or is being used.

For this purpose the cylinder 165 preferably will be formed of some suitable transparent material, such as glass, and will be provided with a transparent cover member 207. It will be observed that this cover is pressed into the top of casing 17 and is removable from the cylinder by means of a handle 208 to facilitate the addition of detergent when necessary. Beneath the cylinder 165 is arranged a suitable incandescent lamp 210 provided with a reflector 210*a* arranged to reflect light rays from the lamp upwardly through the glass cylinder 165 and its glass top 207. Preferably, the detergent solution within the container will be given some suitable color, such as orange, which when illuminated will of course appear as an orange color on the glass 207. The lamp 210 is connected in parallel with the motor energizing circuit so that when the motor is energized the lamp likewise will be energized and when the motor is deenergized the lamp also will be deenergized. It will be observed that the lamp 210 is connected in parallel with the motor circuit by means of suitable conductors 211. It will also be observed that these conductors are so arranged that the lamp will be controlled either by the automatically operated switch 145 or the manually controlled switch 146.

We have found it to be desirable at times to introduce into the vat water of a temperature somewhat higher than is the temperature of the water in the source 76 so as to effect certain cleansing actions upon the utensils placed in the baskets 25 and 26. For this purpose, we have provided a suitable heater 212 which comprises a container, as shown, covered with a suitable insulating material 213, such as rock wool. The heater 212 is connected with the hot water source of supply 76 by means of a conduit 214.

The hot water supplied to the heater 212 is heated to a higher temperature by means of a suitable immersion heating unit 215 which may have any suitable construction, but preferably will be arranged in accordance with the heating element described and claimed in U. S. Patent No. 1,522,992, granted to C. C. Abbott, dated January 13, 1925.

The heating element is controlled by means of a suitable temperature responsive element 216 which operates to control the element to maintain a substantially constant temperature in the water in the heater. Briefly, this thermostat comprises a pair of contacts 217 which are opened and closed by a suitable bimetallic thermostat bar 218 arranged to close the circuit when the temperature of the water in the heater is below a predetermined value and to open the circuit when this temperature has arrived at a predetermined high value.

The energizing circuit for the heating element 215 and its thermostat 216 is controlled by means of a suitable manually operable switch 220 accessible to the attendant at the front wall of the casing 10. The energizing circuit for the heating element, it will be observed, includes the upper conductor of the electrical supply source 147, the conductor 153, a conductor 221, the switch 220 and a conductor 222 which is connected with the bimetallic bar 218. From this bar the circuit is traced through the thermostat contacts 217, the conductor 223, the heating element 215, and thence through a conductor 224 with the lower conductor of the supply source 147.

The heater 212 communicates with the vat through a conduit 225 which communicates with a passageway 226 arranged in the distribution valve 86. This passageway 226 is normally closed by a valve 227 which is actuated to its open position by means of a cam 228 arranged on the shaft 132. It will be observed that the passageway 226 communicates with the interior of the housing of the valve 86 from where it communicates through the passageways 90, 91 and 92 with the conduit 93 which leads to the metering device 85. It will be understood that by reason of these connections the vat can be supplied with a predetermined quantity of the highly heated water from the heater 212.

The supply conduit 94 for the vat 20 communicates with a nozzle member 230 arranged substantially coaxial with the axis of the vat. This member is formed as a hollow cylinder and is provided in its upper surface between its inner and outer walls with a number of outlets 231 arranged in a circle about the axis of the cylinder. As shown, the cylinder communicates at its lower end with the conduit 94. The supply conduit 94 positioned laterally of the impeller, and the conduit member 230 connected with it above the impeller are arranged in substantially the same manner that the supply conduits are 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. This specific arrangement of conduits is claimed in this copending application, and not in the instant application.

The impeller shaft is extended upwardly through the nozzle member and to its upper end is attached a suitable spray device 232.

This spray device, as shown, is formed as an ellipsoid with its long axis vertical. Arranged on the surface of the ellipsoid are a number of vertically arranged spaced grooves 233. These grooves in effect provide a number of relatively short radially extending blades 234. It is the function of these blades to engage the water issuing from the apertures 231 and to hurl it as a spray through the racks 25 and 26 and over and about the dishes and utensils supported therein.

As has been pointed out in a previous portion of the specification, whether or not the washing action proper is effected by the impeller 50 de-

pends upon the position of the drain valve 66. As long as this valve remains open, the water supplied to the vat will be acted on by the member 232 so as to be hurled as a spray to rinse the dishes in the racks and thence will pass to the lower portion of the vat and out to the drain. However, when the drain valve is closed, the water falling from the spray device 232 will collect in the bottom of the vat where the impeller 50 is rotating at a high rate of speed. The water thus accumulated in the vat will be hurled upwardly and outwardly by the action of the impeller through the racks 25 and 26 with considerable force so as to effect the more positive washing action on the dishes.

It will be understood that the cams 130, 131, 143, 160, 178 and 228 will be so arranged upon the operating shaft 132 and the lifts of these cams will be so arranged that when the shaft is rotated in the predetermined direction, which as has been pointed out, is the clock-wise direction, as viewed in the figures, 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 machine. This cycle will include a preliminary rinsing, a first washing operation, a second washing operation and a final rinsing operation. Detergent will be automatically supplied to the vat for one of these operations, viz., the first washing operation. And the highly heated water from the source 212 will be admitted for one of the operations, viz., the final rinsing operation.

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 or baskets 25 and 26.

Preferably, the heater switch 220 will have been closed at some time previous to the time at which it is desired to use the machine so as to provide a quantity of highly heated water in the tank 212. Under the initial conditions, the control knob 136 will be in its zero position, as shown in Fig. 5, the drain valve 66 will be held in its open position by means of the cam 143, and the motor 51 will be deenergized, the switch 145 being held in its open position by means of the cam 160. It will be understood, of course, that the switch 146 also will be in its open position. In order to effect the preliminary rinsing operation, the control knob 136 will be moved to its position No. 1, indicated in Fig. 5. When the control knob 136 is thus moved to position No. 1, the cam shaft 132 will be rotated to bring the cam 130 to such a position that the valve 97 will be moved to its open position to open the passageway 90 to the conduit 88. The cam 131 will be moved to such a position that the valve 100 will be opened to connect the conduit 96 with the passageway 91 and the valve 98 will be closed to shut off the passageway 92 from the passageway 91. This operation, as has been previously described, will allow hot water to flow from the hot water supply main to the distributing valve 86 and thence through the conduit 94 to the vat where it will emerge in streams from the nozzle 230.

The above operation of the cam shaft 132 also will have rotated the motor controlling cam 160 to allow the switch 145 to close thereby effecting the energization of the impeller motor 51. In response to this, the impeller motor will operate the impeller 50 and also the spray device 232 at a high speed. As the water issues from the nozzle 230 it will be engaged by the device 232 and sprayed with considerable force through the dish supporting baskets 25 and 26.

The above described operation of the cam shaft 132 will not effect any controlling action on the drain valve and so it will still be held in its open position by its cam 143 so that the spraying water, together with any food soil particles removed from the dishes, will pass directly into the drain.

It will be understood that 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. It also performs the function of removing cold water which may lie in the hot water supply line. It also serves to raise the temperature of the vat and apparatus arranged therein in order to eliminate excessive cooling of the hot water supplied by the subsequent washing operation proper.

The above rinsing operation will continue as long as the control knob 136 remains in its position No. 1. To effect the first washing operation, the control knob 136 is moved to its position No. 2. In this position of the knob the cam 130 will still hold the valve 97 in its open position. When the knob was moved to its position No. 2, the cam 131 will have been moved to such a position that the valve 100 will have been allowed to close the passage 95, and the valve 98 will have been opened to provide communication between the vertical passageway 91 and the transverse passageway 92. This operation, as has been explained, allows hot water to pass from the supply conduit 88 through the valve 86 to the metering device 85. The metering device, as has been explained heretofore, will allow a predetermined quantity of hot water to flow through it to the vat. It is to be understood that the metering device will have been adjusted so as to allow the proper amount of water to be supplied to the vat to effect the most efficient cleansing operation on the utensils supported in the vat. The cam 160 will still operate to maintain the switch 145 closed whereby the impeller motor 51 will continue to operate the impeller and spray device. The cam 143 for controlling the drain valve will have been moved to such a position that the drain valve will have been allowed to close. It will be observed, therefore, that by moving the knob 136 from its position No. 1 to its position No. 2, the drain valve will have been closed and a predetermined quantity of hot water will have been supplied to the vat and allowed to accumulate therein. This water will be picked up continuously by the impeller 50 and hurled with considerable force upwardly and outwardly against the utensils in the dish supporting racks 25 and 26.

The knob 136 in being moved from its position No. 1 to its position No. 2 will have brought the detergent injector cam 178 to such a position that the valve 175 will have been opened to allow sufficient hot water to pass through the measuring device 171 to operate it whereby a predetermined amount of water will have been supplied to the container 165. This operation, as has been previously described in detail, causes a predetermined quantity of the detergent in the cylinder 165 to pass to the washing vat 20. It will be understood that as the knob 136 was being moved from its position No. 1 to its position No. 2, the cam 178 will have been moved to and through its operative position, whereby when the knob 136 reached its position No. 2 the valve 175 will have been allowed to close. The valve 175 after having been

opened will be moved to its closed position at a predetermined rate, as controlled by the dash pot 180, and eventually will be closed so as to prevent a continued supply of the detergent to the vat.

It will be understood that the dash pot will be so timed that the metering device 171 will have sufficient opportunity to operate to eject detergent from the cylinder 165 before the valve 175 is closed. It will be understood that if it is desired, a greater quantity of detergent may be supplied during this washing operation by means of the manually controlled knob 206. This, at times, is desirable particularly where dishes are less cleanly than usual or where the food soil is more difficult to remove. It also provides for varying water conditions, it being understood that water of different degrees of hardness requires different amounts of detergent material to effect an efficient cleansing action.

The washing action effected by the impeller 50 will continue as long as the control knob 136 is maintained in its position No. 2.

When the control knob 136 is moved to its position No. 3 the cam 130 will be moved to such a position that the valve 97 will be allowed to close, thereby shutting off the hot water supply. The drain cam 143 will be moved to such a position that the drain will again be opened to allow the soiled water to drain from the vat. The cam 160 will still be in a position to maintain the motor switch 145 closed. The cam 131 will be moved to such a position as to slightly crack the valves 98 and 100, thereby opening the passageways 91 and 95 so as to allow pressure which is in the conduit 93 leading to the metering valve 85 to be released. This release of the pressure in the conduit 93, as has been explained heretofore, allows the metering valve 85 to condition itself for a subsequent metering operation.

As long as the control knob 136 remains in its position No. 3 the drain valve will remain open, the hot water supply will be cut off, and the motor 51 will continue to operate the impeller 50.

To effect the second washing operation, the control knob will be moved to its position No. 4. In moving the knob to this position the cam 143 will be moved to such a position that the drain valve 66 will be allowed to close, while the cam 130 will again operate to open the supply valve 97, thereby allowing hot water to flow into the conduits 90 and 91. The cam 131 will operate to open the valve 98 and close the valve 100 whereby hot water from the supply line can again pass to the metering valve where a predetermined quantity of the water will be measured and passed to the vat 20. The cam 160 will still maintain the energizing circuit of the motor 51 closed. The impeller, as before, will pick up the water supplied to the vat and hurl it upwardly and outwardly through the dish supporting baskets 25 and 26.

It will be understood that in this washing operation detergent will not be supplied automatically to the vat, but if the attendant believes that some detergent should be supplied he may readily do so by means of the manually controlled knob 206.

The second washing operation will continue as long as the control knob is maintained in its position No. 4.

To cause this second washing operation to cease and to continue the washing cycle, the attendant will move the control knob 136 to its position No. 5. As a result of this operation, the cam 143 will again be moved to open the drain valve 66 thereby allowing the soiled water to drain from the vat, while the cam 130 will be moved so as to allow the supply valve 97 to close. As in the preceding draining operation, the cam 131 will operate to slightly crack the valve 98 thereby relieving pressure in the metering valve supply line so as to permit it to condition itself for a subsequent metering operation. The cam 160, as before, will operate to maintain the energizing circuit for the impeller motor closed.

The device is then in condition for the final rinsing operation. To effect this rinsing operation the control knob 136 is moved to its position No. 6. In moving the knob to this position the cam 160 will be moved to another position in which it will continue to maintain the switch 145 closed to maintain the energizing circuit for the impeller motor. The cam 143 will operate to maintain the drain valve 66 in its open position. The cam 130 will still allow the valve 97 to remain in its closed position.

The cam 228, however, will be operated to hold the valve 227 in its open position thereby allowing highly heated water to flow from the heater 212 through the conduit 225 and into the interior of the valve 86 from where it will pass through the conduit 90, the conduit 91, the conduit 92 and thence through the conduit 93 to the metering valve. The metering valve will then operate to allow a predetermined quantity of this heated water to pass to the vat 20 through the conduit 94. It will be understood that when the knob 136 is moved to its position No. 6, the cam 131 will be operated to allow the valve 98 to open and the valve 100 to close. It will also be understood that the cam 130 will be moved to such a position that the supply valve 97 will still be held in its closed position so as to prevent the flow of water from the supply conduit 88.

This final rinsing operation, it will be observed, effects a clean rinsing action on the dishes with a measured quantity of highly heated water, this water being thrown over the utensils and dishes in the trays 25 and 26 by the action of the spray device 232.

This completes the cleansing cycle and the control knob 136 may be returned to its zero position. This operation moves the controlling cams to their initial positions so that the drain valve will be maintained in its open position, the motor 51 will be deenergized and the supplies of water through the distribution valve 86 will be shut off. The attendant may then open the heating circuit switch 220. It will be understood that during the entire washing cycle, the lamp 210 will have been energized so as to indicate to the attendant that the motor 51 is energized and that the cleansing cycle is in progress. It will also be understood that when the motor is deenergized the lamp will be deenergized whereby the visual signal at the glass 207 will disappear.

The switch 146 is supplied so that the motor can be deenergized by the attendant at any time during the cleansing cycle.

It will be understood, of course, that it is not necessary at all times to go completely through the above described cleansing cycle, but that the control knob 136 may be stopped at any of its controlling positions and from that position be returned to its neutral position. Thus, for example, the first and second controlling positions only of the knob 136 may be used. In other words, it may be sufficient merely to effect the preliminary rinsing and the first washing operations, or the knob may be moved to any one of its controlling positions to effect the corresponding

resulting cleansing operation independently of the other cleansing operations of the cycle.

It will be observed, therefore, that the control which we have provided for the dishwashing apparatus is very flexible in its operation in that any one or all of a number of cleansing operations may be effected as desired.

It will be observed that we have provided another position, No. 7, for the control knob 136. In this position of the control knob the impeller motor 51 is energized but there will be no flow of water through the system. This position of the knob 136 merely effects an "on" position and makes it possible to effect certain scouring operations. For example, the spray device may be removed from the upper end of the impeller shaft and in its place may be substituted suitable scouring devices, such as described and claimed in the copending application of Carl M. Snyder, Serial No. 503,534, filed December 19, 1930, and assigned to the same assignee, as this invention.

We have also provided a suitable convenient outlet 235 (Fig. 1) on the front wall of the dishwashing apparatus whereby suitable mixing devices and other auxiliary devices may be connected.

It will be observed (Fig. 1) that the control knobs 136 and 206, the switches 146 and 220, and also the outlet 235 are positioned on a panel so as to be arranged substantially close to each other, whereby convenience of operation is facilitated. It will also be observed that the control panel is arranged on the upper portion of the front wall of the casing 10 so as to be readily accessible to the attendant.

It is to be noted that the casing 12 provided for the dishwashing machine and sink presents a very pleasing appearance, and moreover, that the provision of a sink and mechanical machine in a single cabinet adds to the utility of the apparatus in that it can be used as an ordinary kitchen sink or as a mechanical washer.

Also, it is to be noted, that any unused space in the cabinet may be utilized as a storage space for various articles commonly used in the kitchen.

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. A dishwashing machine comprising a vat, a dish-supporting rack in said vat, an impeller in said vat arranged to engage fluid accumulated in said vat so as to continuously hurl it through said rack, a motor connected to said impeller to operate it, a source of fluid supply for said vat, a nozzle spray device in said vat arranged to hurl fluid supplied to it through said rack in spray form, conduit means between said source of supply and said nozzle spray device, means controlling said conduit means including a fluid metering device arranged to measure a predetermined quantity of fluid to be supplied to said vat from said source, a drain valve for said vat and means controlling the operation of said motor, said fluid supply controlling means and said drain valve to operate said members in a predetermined cycle of operation wherein in at least one operative step said metering device functions to measure a predetermined quantity of fluid for said vat when said drain valve is operated to close to accumulate said fluid in said vat and while said impeller is operating so as to effect a washing action, and in at least one other operative step, said fluid supply controlling means is operated to supply fluid to said vat and said drain valve is operated to open so as to effect a rinsing action.

2. A dishwashing machine comprising a vat, a dish-supporting rack in said vat, a fluid circulating impeller in said vat, a motor for operating said impeller, a fluid supply source for said vat, a spray device in said vat arranged to hurl fluid supplied to it through said rack in spray form, a conduit from said source communicating with said spray device, valve means controlling the flow of fluid from said source to said vat including fluid measuring means between said source of supply and said vat for measuring a predetermined quantity of fluid for said vat, said valve means arranged to supply fluid to said vat independently of the operation of said fluid measuring means to measure a predetermined quantity of fluid, a drain valve for said vat, a common control member for said motor, said supply valve means and said drain valve selectively operable to a plurality of controlling positions so as to operate said members in a predetermined cycle of operation wherein in at least one controlling position of said control member, said fluid supply valve means is controlled so that said measuring means measures a predetermined quantity of fluid for said vat while said motor is controlled to operate said impeller and said drain valve is operated to close to cause said fluid to accumulate in said vat, said motor being controlled to operate said impeller as long as said control member is in said controlling position to circulate said accumulated fluid in said vat, and in at least one other controlling position of said control member, said fluid supply valve means is controlled to supply fluid from said source to said vat continuously while said control member is in said other position, and said drain valve is operated to open to permit said fluid to drain from said vat.

3. A dishwashing machine comprising a vat, a dish-supporting rack in said vat, an impeller for circulating a cleansing fluid in said vat through said dish-supporting rack, a motor for operating said impeller, means for supplying cleansing fluid to said vat, a spray device in said vat arranged to receive fluid from said supplying means so as to spray said fluid through said rack, means controlling said fluid supply means including measuring means arranged to supply a predetermined quantity of cleansing fluid to said vat for a washing operation by the operation of said impeller, a drain valve for said vat; and a common manually operable control member for said motor, said drain valve and said fluid supply means arranged to operate said members in a predetermined cycle wherein in one operating step said fluid supply controlling means is operated to supply said vat with a predetermined quantity of cleansing fluid through said spray device to effect a rinsing action on the dishes in said rack while said drain valve is open to allow said fluid to drain from said vat, and in another operative step said fluid supply means is operated 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, and said motor is operated to operate said impeller to circulate said accumulated fluid continuously during said last mentioned operative step.

4. A dishwashing machine comprising a vat, a dish supporting rack in said vat, means for circulating a cleansing fluid through said rack, a source of cleansing fluid supply, fluid measuring means between said supply source and said vat for measuring and delivering a predetermined quantity of cleansing fluid from said source to said vat and means independent of said fluid measuring means for supplying cleansing fluid from said source to said vat.

5. A dishwashing machine comprising a vat, a dish supporting rack in said vat, means for circulating a cleansing fluid supplied to said vat through said rack, a spray device for spraying a cleansing fluid through said rack, drainage means for said vat, a source of fluid supply for said vat, fluid measuring means communicating with said source, and said vat through said spray device, conduit means by-passing said fluid measuring means and communicating with said vat through said fluid spray device and valve means controlling the admission of fluid from said source to said measuring means and said by-passing conduit.

6. A dishwashing machine comprising a vat, a source of fluid supply for said vat, a fluid measuring device, conduits between said source of supply and said measuring device and between said measuring device and said vat, conduits between said fluid source and said vat, a drain valve for said vat, valve means controlling the conduits between said source and said measuring device and between said source and said vat, cam means controlling said valve means, cam means controlling said drain valve and a common operating shaft for both of said cam means.

7. A dishwashing machine comprising a vat, a source of water supply for said vat, a second source of water supply for said vat having a different temperature than the water of said first source, a fluid measuring device connected between both of said sources of supply and said vat, valve means controlling said sources of supply, means controlling said valve means to selectively connect said sources of supply with said vat through said fluid measuring device and means for connecting one of said sources of supply with said vat independently of said fluid measuring device.

8. A dishwashing machine comprising a vat, a dish supporting rack in said vat, means for circulating a cleansing fluid through said rack, a source of water supply for said vat, measuring means for supplying a predetermined quantity of said water to said vat, conduit means between said source and said measuring means and between said measuring means and said vat, conduit means between said source of supply and said vat by-passing said measuring means, a second source of water supply for said vat having a higher temperature than the temperature of the water in said first source of supply, conduit means between said second source of water supply and said fluid measuring means, and valve means controlling said sources of water supply arranged to selectively admit water from said sources to said measuring means so that predetermined quantities are supplied to said vat and from said first source to said by-passing conduit means.

9. A dishwashing machine comprising a vat, a dish supporting rack in said vat, means for circulating a cleansing fluid through said rack to effect a washing operation on the dishes supported therein, means for spraying a cleansing fluid through said rack to effect a rinsing operation on the dishes supported therein, a source of fluid supply, means connected with said source for measuring a predetermined quantity of fluid from said source and delivering it to said vat for said washing operations and means for delivering fluid from said source to said spraying means independently of said measuring device for said rinsing operations.

10. A dishwashing machine comprising a vat, a dish supporting rack in said vat, means in said vat arranged to hurl a cleansing fluid through said rack to effect a cleansing action on the dishes supported therein, a source of fluid supply, a second source of fluid supply having a temperature substantially higher than the temperature of the fluid in said first source, a fluid measuring device, conduit means connecting said measuring device with said sources of fluid supply, conduit means between said measuring device and said vat, conduit means between said first source of fluid supply and said vat, valves controlling said latter conduit means and said conduit means between said sources and said measuring device, a drain valve for said vat arranged to provide for the accumulation of fluid in said vat, cams controlling said controlling valves and said drain valve, a common operating shaft for said cams, said cams being arranged so that said control valves and said drain valve are operated in a predetermined sequence by the operation of said shaft and a control member for operating said shaft.

11. A dishwashing machine comprising a vat, a dish-supporting rack in said vat, a source of water supply for said vat, a spray device in said vat comprising an upright conduit and a nozzle member supported by said conduit arranged to spray water supplied to said conduit over the dishes in said rack, conduit means connecting said source of supply with said upright conduit, a drain valve for said vat arranged when closed to allow said water supplied to said vat through said spray device to accumulate in said vat, an impeller in said vat arranged to hurl said accumulated water through said rack to effect a washing action on the dishes supported therein, means controlling the supply of water to said vat including measuring means arranged to supply a predetermined quantity of water to said vat for a washing operation by the operation of said impeller, and means including a common operating member for operating said water supply controlling means and said drain valve to effect a predetermined sequence of operation of said means and said drain valve so as to effect a predetermined cleansing cycle wherein in one position of said control member, said drain valve is operated to open and said supply means is controlled to supply water to said vat so as to rinse said dishes, and in another position of said control member said supply means is controlled to supply a predetermined quantity of water to said vat and said drain valve is operated to close to allow said water to accumulate in said vat for circulation by said impeller to effect a washing action on said dishes and means for selectively operating said control member to its controlling positions.

12. A dishwashing machine comprising a vat, a dish supporting rack in said vat, a water supply conduit communicating with said vat, a spray device in said vat arranged to hurl the water supplied by said conduit through said rack in spray form to effect a rinsing action on the dishes sup-

ported 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 source of water supply for said vat, a measuring device interposed between said source and said supply conduit arranged to measure a predetermined quantity of water from said source and deliver it to said vat, a conduit between said source and said supply conduit by-passing said measuring device, valves in said conduits between said source of supply and said measuring device and said by-passing conduit respectively, and means for operating said conduit valves and said drain valve in a predetermined sequence so as to effect a predetermined cleansing cycle.

13. A dishwashing machine comprising a vat, a dish supporting rack in said vat, a fluid supply conduit communicating with said vat, a spray device in said vat arranged to hurl the water supplied by said conduit 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 source of water supply for said vat, a metering device interposed between said source and said supply conduit arranged to measure a predetermined quantity of water from said source and deliver it to said vat, a conduit between said source and said supply conduit by-passing said metering device, valves in said conduits between said source of supply and said metering device and said by-passing conduit respectively, cam means controlling said conduit valves and said drain valve and a common operating member for said cam means arranged so that said cams operate said valves in a predetermined sequence to effect a predetermined cleansing cycle including alternate washing and rinsing operations.

14. A dishwashing machine comprising a vat, a dish supporting rack in said vat, a fluid supply conduit communicating with said vat, a spray device in said vat arranged to hurl the water supplied by the conduit 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 source of water supply for said vat, a measuring device interposed between said source and said supply conduit arranged to measure a predetermined quantity of water from said source and deliver it to said vat, a conduit between said source and said supply conduit by-passing said measuring device, a second source of water supply having a temperature substantially higher than the temperature of the water of said first source, conduits between said second source and said measuring device, valves controlling said conduits between said sources of water supply and said measuring device and said by-passing conduit respectively, cam means controlling the operation of said conduit valves and said drain valve, a common operating member for said cam means arranged so that said cams operate said valves in a predetermined sequence to effect a predetermined cleansing cycle including alternate washing and rinsing operations, the water from said first source being by-passed about said measuring device for certain of said rinsing operations and the water from said second source being admitted for at least one of said rinsing operations, and a manually operable control member for said shaft.

15. A dishwashing machine comprising a vat, a dish supporting rack in said vat, a fluid supply conduit communicating with said vat, a spray device in said vat arranged to hurl the water supplied by said conduit 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 source of water supply for said vat, a measuring device interposed between said source and said supply conduit arranged to measure a predetermined quantity of water from said source and deliver it to said vat, a conduit between said source and said supply conduit by-passing said measuring device, a second source of water supply having a temperature substantially higher than the temperature of the water of said first source, a conduit between said second source and said measuring device, valves controlling said conduits between said sources of water supply and said measuring device and said by-passing conduit respectively, cam means controlling the operation of said conduit valves and said drain valve, and means controlling the operation of said cams including a manually operable control member having a plurality of controlling positions and arranged when said member is moved successively through said controlling positions to effect a predetermined cleansing cycle including alternate washing and rinsing operations, the water from said second source being admitted for at least one of said rinsing operations, and further arranged to be moved selectively to any one of said controlling positions to effect the corresponding step in said cleansing cycle without first being moved to its preceding controlling positions to effect the preceding steps in said cycle.

16. Dishwashing apparatus comprising a vat, a dish-supporting rack in said vat, a fluid supply conduit communicating with said vat, a spray device in said vat arranged to hurl the water supplied to said vat 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 source of water supply for said vat, a second source of water supply for said vat having a substantially higher temperature than the temperature of the water of said first source, a fluid metering device, means providing communication between both of said sources and said metering device and said metering device and said vat, means providing communication between one of said fluid sources and said vat by-passing said metering device, valve means controlling said conduits, means for controlling said valve means and said drain valve so that fluid is selectively admitted to said vat from said sources through said metering device and said by-passing conduit for predetermined

cleansing operations, and said drain valve is controlled to effect said predetermined cleansing operations, means controlled by said valve controlling means for admitting a detergent to said vat for at least one of said cleansing operations, and a control member for said controlling means selectively operable between a plurality of controlling positions so that said cleansing operations can be effected in a predetermined sequence or any one of said operations can be effected independently of the other of said cleansing operations.

17. A dishwashing machine comprising a vat, a source of cleansing fluid supply for said vat, a detergent source of supply for said vat, means controlling said source of fluid supply, means dependent upon the operation of said fluid controlling means for controlling said detergent source so as to admit a predetermined quantity of said detergent to said vat when said cleansing fluid is supplied to said vat and means for supplying detergent from said source to said vat independently of said fluid controlling means.

18. Dishwashing apparatus comprising a vat, a source of cleansing fluid supply for said vat, a source of detergent supply for said vat, cam means controlling the admission of fluid from its source to said vat, cam means controlling the admission of detergent from its source to said vat, a manually operable control member for controlling both of said fluid and detergent cam controlling means so as to simultaneously admit fluid and detergent to said vat in at least one position of said control member and in at least one other position of said control member to admit fresh fluid from said supply source to said vat independently of the operation of said detergent controlling means and a manually operable control member for controlling the admission of detergent to said vat arranged by operation thereof to supply detergent to said vat independently of said fluid supply controlling means.

19. A dishwashing machine comprising a vat, a source of cleansing fluid supply for said vat, a detergent source of supply for said vat, means controlling said source of fluid supply so as to admit a predetermined quantity of fluid from said source to said vat, means controlling said detergent source responsively to the operation of said fluid controlling means so as to admit a predetermined quantity of said detergent to said vat when said fluid controlling means operates to supply fluid to said vat, a common control member for operating said fluid and detergent controlling means to admit both fluid and detergent to said vat, means controlling said fluid source of supply to supply fluid to said vat independently of said detergent, and means controlling said detergent source of supply to supply detergent to said vat independently of said fluid.

20. A dishwashing machine comprising a vat, a source of cleansing fluid supply for said vat, a detergent source of supply for said vat, valve means controlling said source of fluid supply, a cam for operating said valve means, means controlling said detergent source of supply so as to measure a predetermined quantity of said detergent and supply it to said vat, a cam for operating said last named control means, a common operating shaft for said cams, means for operating said cam shaft to selected controlling positions wherein in at least one position of said shaft both cleansing fluid and detergent are supplied to said vat, and in at least one other position of said shaft cleansing fluid is admitted to said vat from said fluid supply source independently of the operation of said detergent controlling means, and means controlling said detergent source to admit detergent to said vat independently of the operation of said fluid controlling means.

21. A dishwashing machine comprising a vat, a source of cleansing fluid supply for said vat, a detergent source of supply for said vat, valve means controlling said source of fluid supply, a cam for operating said valve means, means controlling said detergent source of supply so as to measure a predetermined quantity of said detergent and supply it to said vat, a cam for operating said last-named control means, a common operating shaft for said cams, means for operating said cam shaft, and means for operating said detergent supply control means independently of its operating cam.

22. A dishwashing machine comprising a vat, a dish supporting rack in said vat, means for supplying water to said vat, means controlling said water supplying means including measuring means arranged to supply a predetermined quantity of water to said vat and for supplying water continuously to said vat independently of said fluid measuring means, a spray device in said vat arranged to hurl the water supplied to said vat 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, means for operating said water supply controlling means and said drain valve to effect a predetermined cleansing cycle including washing and rinsing operations wherein a predetermined quantity of water is supplied to said vat for at least one operation of said drain valve in its closed position for agitation by said impeller to effect a washing action, and water is supplied to said vat independently of said measuring means for at least one operation of said drain valve in its open position to effect a rinsing action, a source of detergent supply for said vat, means for measuring a predetermined quantity of said detergent and delivering it to said vat, and means dependent upon the operation of said operating means controlling said detergent measuring means so that a predetermined quantity of said detergent is supplied to said vat for at least one of said washing operations.

23. A dishwashing machine comprising a vat, 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 to said vat 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, valve means controlling the supply of water to said vat, means for operating said valve means and said drain valve so as to effect a predetermined cleansing cycle including washing and rinsing actions on said dishes, a source of detergent supply for said vat, means for measuring a predetermined quantity of said detergent and delivering it to said vat, means dependent upon the operation of said valve operating means controlling said detergent measuring means so

that a predetermined quantity of said detergent is supplied to said vat for at least one of said washing operations, and means for supplying detergent from its source to said vat independently of the operation of said fluid controlling means.

24. A dishwashing machine comprising a vat, a dish supporting rack in said vat, an impeller in said vat below said rack arranged to hurl a cleansing fluid upwardly and outwardly through said rack, a motor connected to operate said impeller, a switch controlling said motor, a source of fluid supply for said vat, a spray device in said vat arranged to receive fluid from said source so as to spray said fluid through said rack, valve means controlling said source of supply, a reservoir of detergent for said vat, means for supplying a predetermined quantity of detergent from said source to said vat, a drain valve for said vat and a common operating member for said switch, said valve means, said detergent supplying means and said drain valve arranged to operate said members in a predetermined cycle wherein in at least one step of operation fluid from said supply source and detergent are supplied substantially simultaneously to said vat while said drain valve is closed to allow said fluid and detergent to accumulate in said vat for agitation by said impeller to effect a washing action, and in at least another step of operation fluid is supplied from said supply source without said detergent while said drain valve is open so as to effect a rinsing action by said spray device.

25. A dishwashing machine comprising a vat, a dish supporting rack in said vat, a fluid supply conduit communicating with said vat, a spray device in said vat arranged to hurl the fluid supplied by said conduit 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 fluid supplied by said conduit to accumulate in said vat, an impeller in said vat below said rack arranged to hurl said accumulated water through said rack to effect a washing action on the dishes supported therein, a source of fluid supply for said vat, a measuring device interposed between said source and said supply conduit arranged to measure a predetermined quantity of water from said source and deliver it to said vat, a conduit between said source and said supply conduit bypassing said measuring device, a second source of water supply having a temperature substantially higher than the temperature of the water of said first source, conduits between said second source and said measuring device, valves controlling said conduits between said sources of water supply and said measuring device and said by-passing conduit, respectively, cam means controlling the operation of said conduit valves and said drain valve, a common operating member for said cam means arranged so that said cams operate said valve in a predetermined sequence to effect a predetermined cleansing cycle including alternate washing and rinsing operations, the water from said first source being by-passed about said measuring device for certain of said rinsing operations and the water from said second source being admitted for at least one of said rinsing operations, a manually operable control member for said shaft, a detergent source of supply for said vat, means for measuring a predetermined quantity of said detergent and delivering it from said source to said vat, cam means controlling said measuring means, said cam means being operably associated with said common operating member so that when it is being operated to effect said predetermined cleansing cycle, a predetermined quantity of said detergent is automatically admitted for one of said washing operations and means for supplying detergent from its source to said vat independently of the operation of said common operating member.

26. A dishwashing machine comprising a vat for receiving dishes to be cleansed and a cleansing fluid, a dish supporting rack in said vat, an impeller in said vat arranged to hurl a cleansing fluid through said rack, a motor mechanically connected to operate said impeller, a reservoir for receiving a detergent to be supplied to said vat, said reservoir being formed of a transparent material, a transparent cover for said reservoir, an incandescent lamp arranged to project light rays through said container and cover, an energizing circuit for said lamp and means for energizing said circuit when said motor is energized to operate said impeller.

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