May 21, 1935. E. S. STODDARD 2,002,300

DISHWASHING MACHINE

Filed March 5, 1929 5 Sheets-Sheet 1

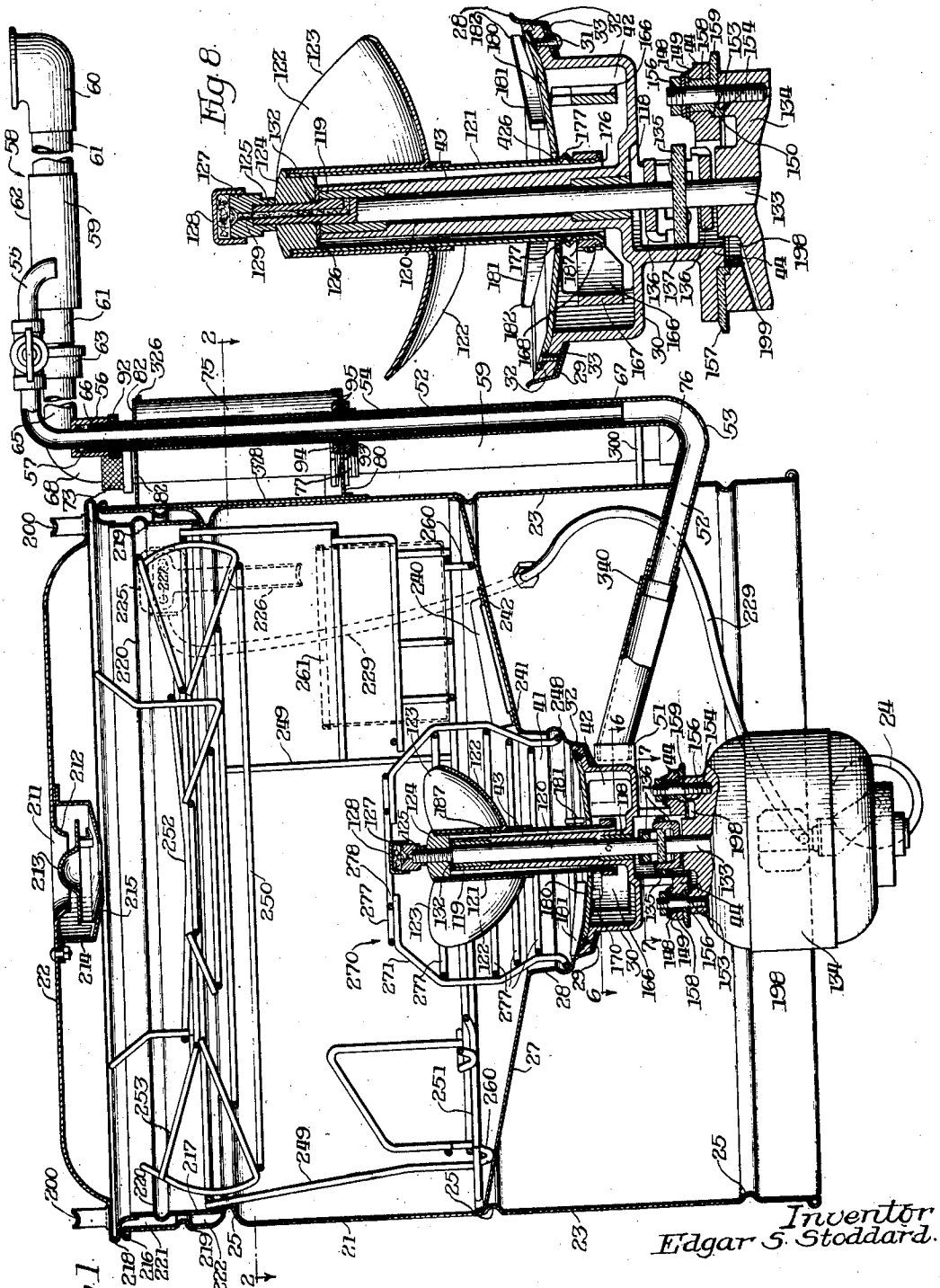


Fig 1

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DISHWASHING MACHINE

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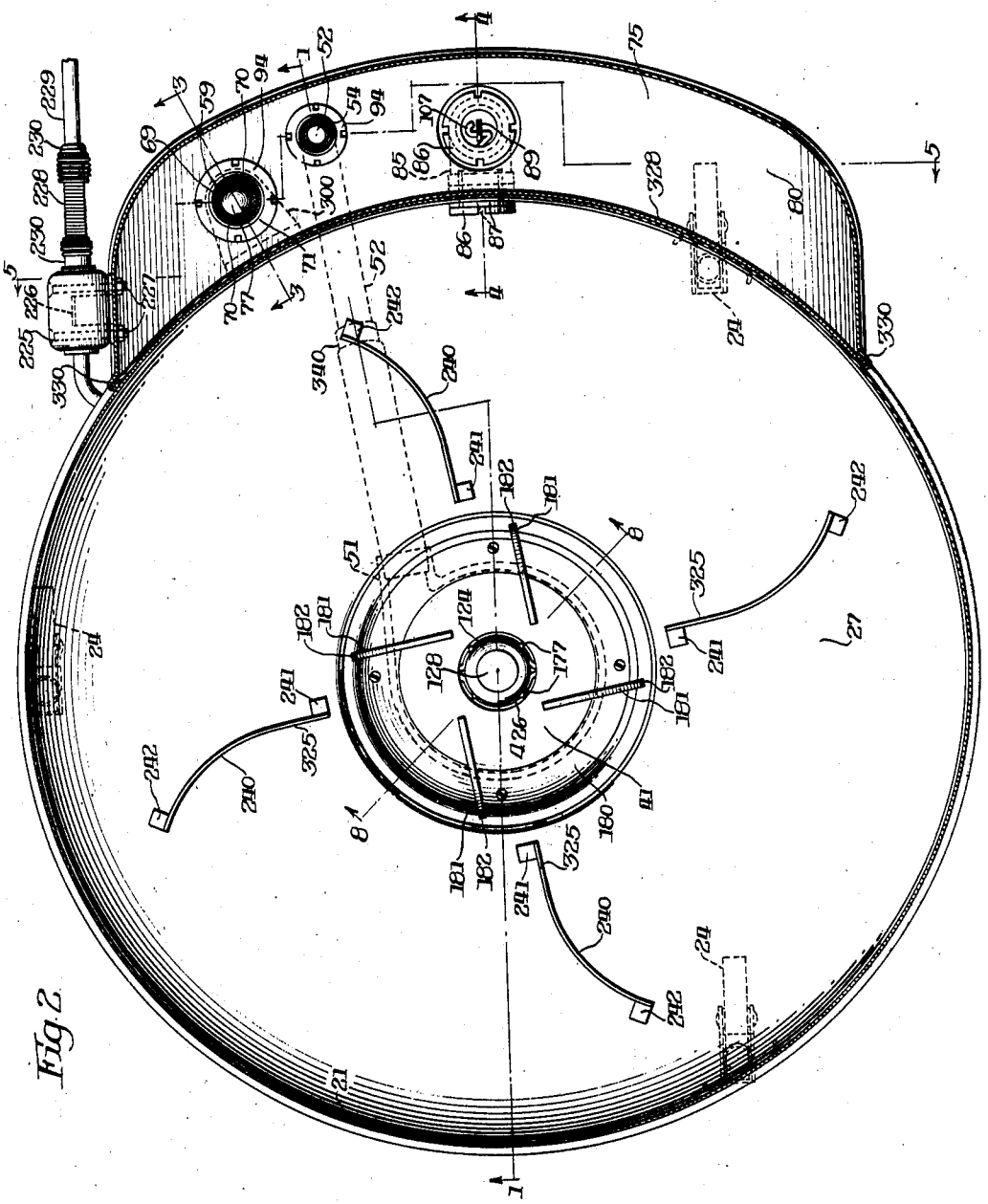


Fig 2

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DISHWASHING MACHINE

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Fig. 3

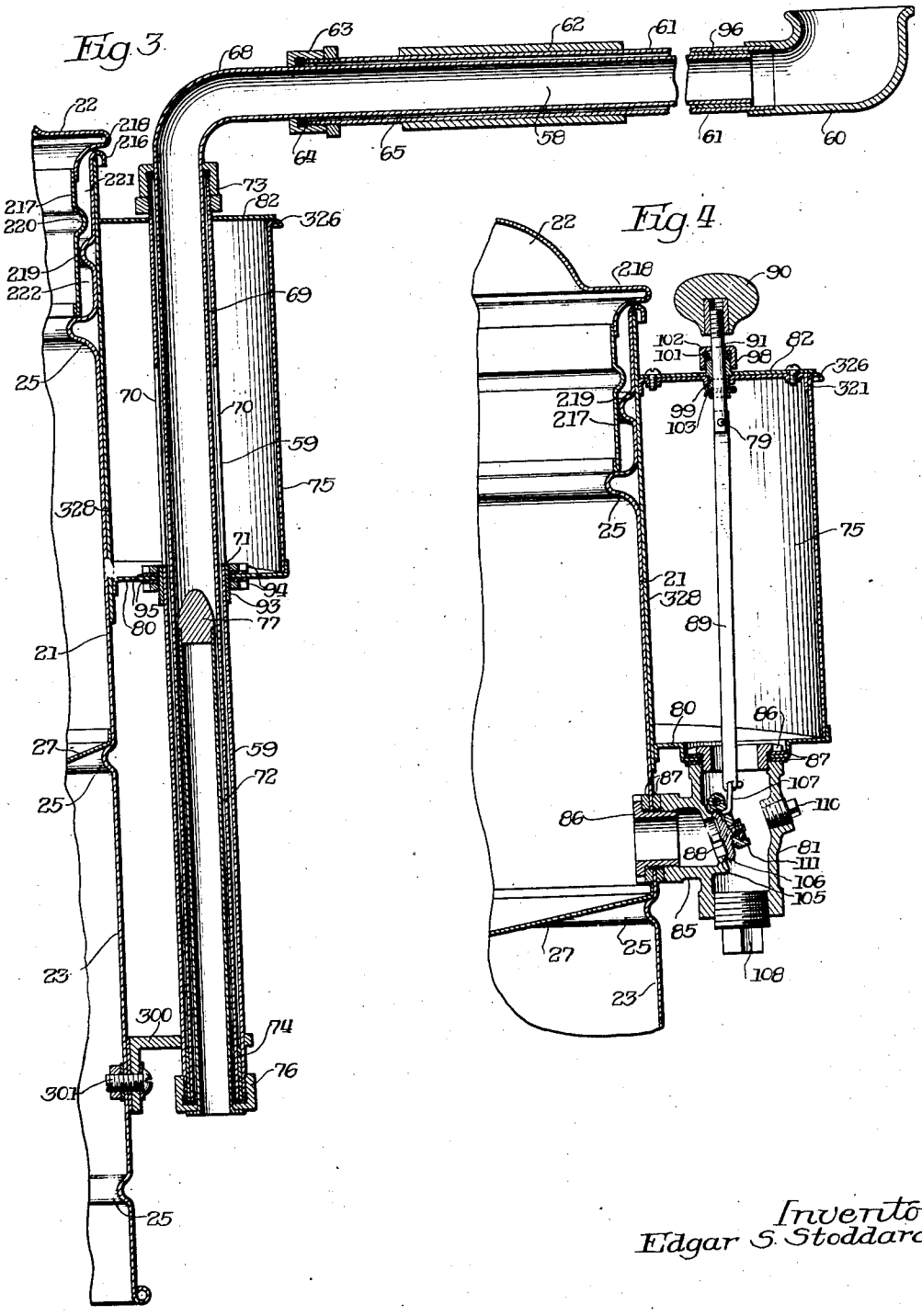


Fig. 4

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DISHWASHING MACHINE

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Fig. 5.

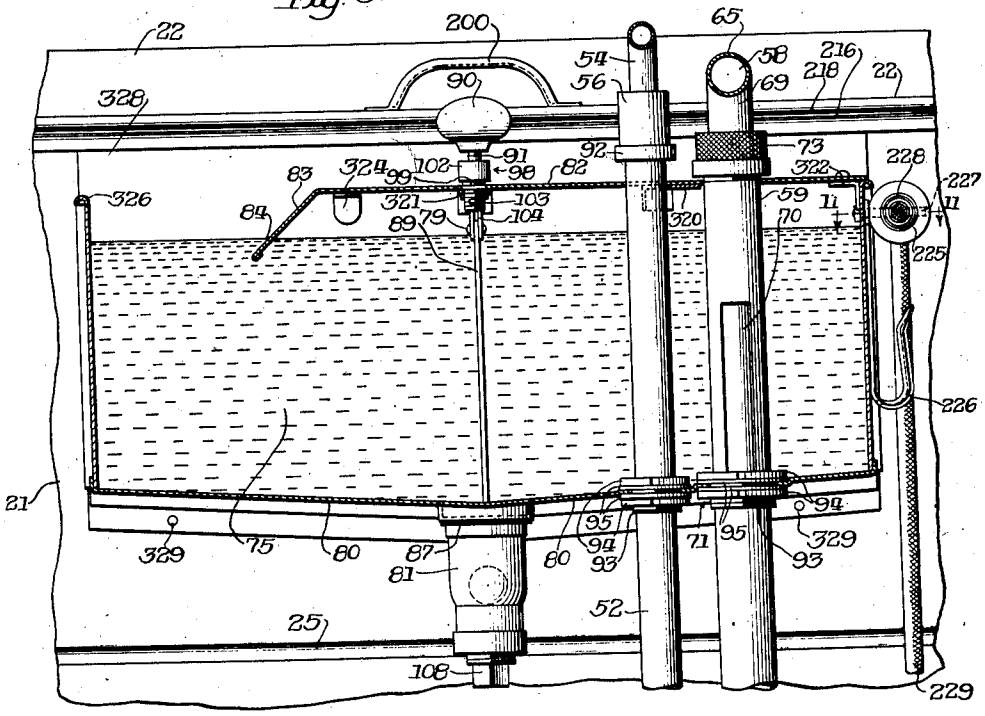


Fig. 6.

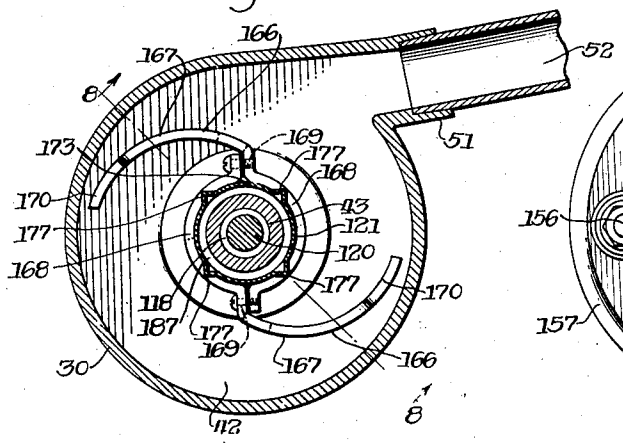
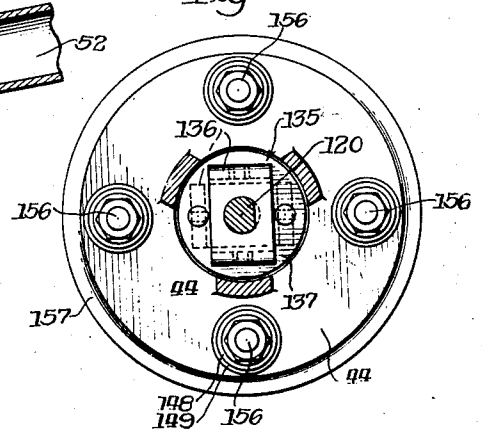


Fig. 7.



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DISHWASHING MACHINE

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Fig. 9.

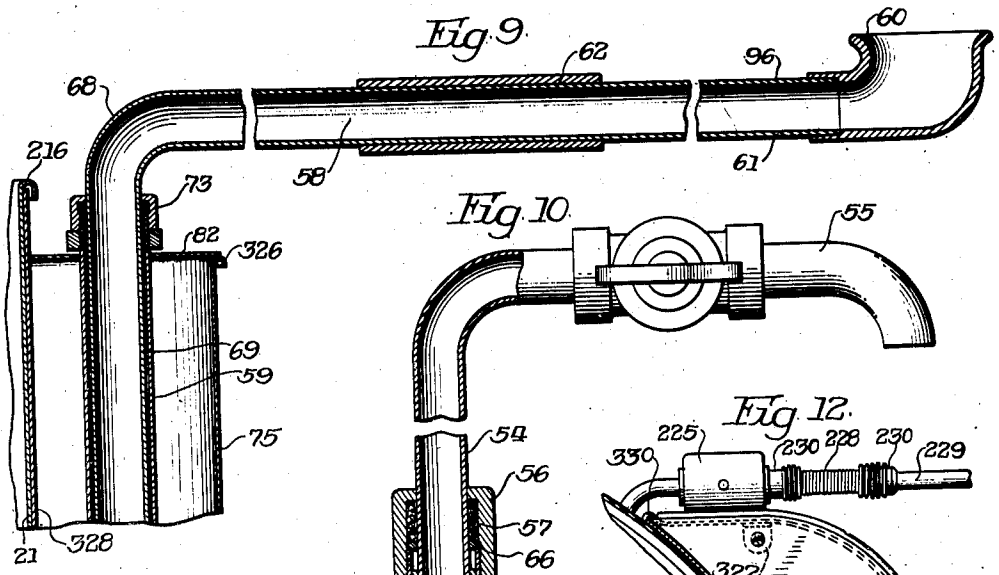


Fig. 10.

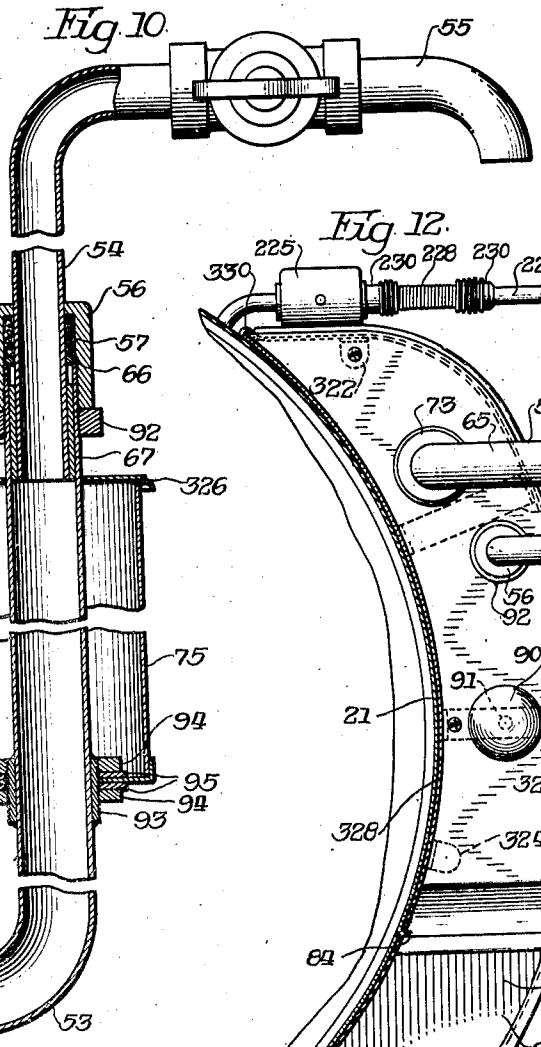
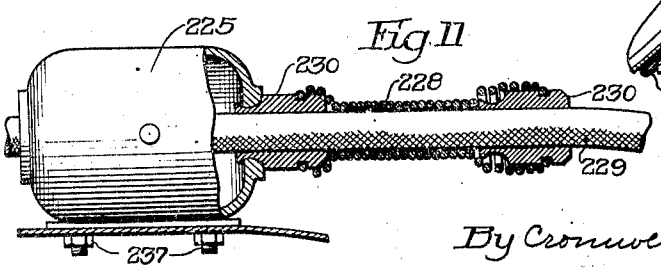


Fig. 12.

Fig. 11.



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2,002,300

UNITED STATES PATENT OFFICE

2,002,300

DISHWASHING MACHINE

Edgar S. Stoddard, Berwyn, Ill., assignor to The Conover Company, Chicago, Ill., a corporation of Illinois

Application March 5, 1929, Serial No. 344,112

6 Claims. (Cl. 141—9)

This invention relates to improvements in washing machines, especially to dishwashing machines of the portable type.

An object of this invention is to provide a portable washing machine which may be readily stored in limited spaces when not in use.

Another object of this invention is to provide a washing machine to which may be added wash and rinse liquids and from which waste liquids may be removed in a very convenient manner without removal of the cover and without stopping the machine.

A further object of this invention is to provide a domestic washing machine which may be readily moved about and which is adapted to cooperate with an ordinary household sink in obtaining a supply of wash and rinse liquids and in discharging its waste liquids.

A still further object of this invention is to provide a washing machine in which the liquid level may be readily determined and controlled.

Another object of this invention is to provide an electrical washing machine, the propelling or circulating member of which is directly connected to an inferiorly disposed motor and also to provide insulated, centered, lubricated and watertight connections between said washing machine and said motor.

Many other objects will appear during the course of the following specification, among the more important ones of which are to provide a self-cleansing machine, an improved moisture tight cover, an improved impeller and baffle system cooperating therewith, an improved ejector and baffle-system cooperating therewith, an improved jointure between the tank and pump well so that possibility of rust formation within the interior of the tank shall be greatly reduced, improved heat insulation, improved bearing construction, and an improved support.

Although this invention is broadly directed to improvements in connection with all dishwashing machines, it is especially directed to improvements to be used in connection with the centrifugal spray projector-type of washing machine, which is described and shown in the Patent 1,679,465 dated August 7, 1928, and copending applications Serial Nos. 193,414 and 262,652, filed May 23, 1927, and March 19, 1928, respectively, the former having matured into Patent No. 1,943,636, dated January 16, 1934.

The functioning of this type of machine depends upon the operation of a small unencased screw-like impeller with spiraloid blades, which impeller rotates at a high velocity of the order of 1,000 to 2,000 R. P. M. in the lower part of the tank of the machine. Only the lower part of this impeller is immersed in the shallow liquid pool in the lower part of the tank. The shallow liquid pool in the lower part of the machine is maintained in relatively quiescent condition during the operation of the machine. As it turns, the impeller elevates the liquid from its lower immersed curved surfaces to its upper trough-shaped, concave projectors which throw the cleansing liquid at a tremendous velocity directly upon, or into, the objects to be cleansed. Since there are no baffles or deflectors to break the force of the projected liquid, the total force of the projected mass of liquid is effective for cleansing purposes. Although the velocity of the cleansing liquid is very high, the volume of cleansing liquid is very small, and as a result a very effective cleansing is obtained with a minimum and most efficient use of power, soap and water. The projected mass of liquid at the same time keeps the interior of the tank of the machine clean and causes all the food particles and other solid matter to collect at the bottom of the casing from whence they may be readily removed. In the operation of this unencased impeller, it is important that only the lower portion of the impeller be immersed in water since if the impeller be totally immersed, it will not cause an efficient cleansing action. In view of the fact that the dishes and other objects are kept out of contact with the body of liquid contained in the bottom of the tank, and the cleansing is solely due to contact with the projected mass of liquid, it is important that the proper operating conditions be maintained for producing such a cleansing action.

The following drawings illustrate one embodiment of the invention as applied to the centrifugal spray projector-type of dishwashing machines, to which the invention is by no means restricted.

Figure 1 represents a vertical sectional view of the washing machine upon the line 1—1 of Figure 2;

Figure 2 represents a sectional top view of the tank of the washing machine upon the line 2—2 of Figure 1;

Figures 3, 4 and 5 represent fragmentary vertical side views showing details of construction of the measuring tank and liquid inlet conduit upon the lines 3—3, 4—4 and 5—5 of Figure 2 respectively;

Figures 6, 7 and 8 represent sectional views upon the lines 6—6 and 7—7 of Figure 1 and 8—8

of Figure 2, respectively, and they show the construction of the pump well and chambers in greater detail;

Figure 9 is an illustration of a modified swinging inlet conduit;

Figure 10 represents a sectional view of a typical telescoping tube construction and a typical liquid tight attachment of a conduit to a liquid containing can;

Figure 11 is a sectional view of the operating switch and its accessories; and

Figure 12 is a top view of the measuring tank illustrating its cover construction.

The washing machine (see Figures 1 and 2) is composed of a vertical cylindrical tank **21** which is provided with a cover. The lower portion of the tank is extended downwardly so as to provide a depending circular apron **23**. On the lower edge of this apron **23** are three symmetrically positioned swivel rollers **24** by means of which the washing machine can be readily moved from place to place. The tank and apron casing is provided with three strengthening ribs **25**, the middle rib **25** also serving to locate the bottom of the tank. It is also provided with a centrally draining bottom **27** which may take the shape of an inverted frustum of a cone. The bottom **27** is attached to the side of the tank above the bead **25** by welding, soldering or some other water tight connection. The rim of the removed apexial portion of said bottom **27** is provided with a depending circular portion **28** which connects the tank with the combined pump well and journal casting. The tank of the machine may also be square, rectangular or polygonal in horizontal cross section. The bottom may be changed so as to drain to one side of the tank, if desired. In case it is desired to be able to move the dish racks into the tank of the machine from the side, the impeller can be placed adjacent to the side of corner removed from the entrance.

The depending portion **28** (see Figures 1 and 8) is adapted to be joined to the pump well casting **30** by means of a spun portion **29**. This portion is attached to the outer wall of the casting **30** by the screws **31**. Between the spun portion **29** and the projecting edge **32** of the casting, is clamped the circular gasket **33**. This will insure a waterproof joint between the journal casting **30** and the body of the tank **21**. By the external attachment of the spinning **29** to the external surface of the pump casting **30**, the raw edges of the sheet metal tank **21** are positioned outside of the moisture zone, and greatly reduce the possibilities of rust formation within the washing chamber.

The depending portion **28** forms an upper chamber **41**. The casting **30** contains a lower chamber **42**, a tubular bearing support member **43** and a lower flange **44** for attachment with the motor (see Figure 8). The lower chamber **42** is provided with a tubular projection **51** which leads to the liquid discharge conduit **52**. The liquid discharge conduit **52** is contained in the elbow **53**, the telescoping tubes **54**, **54***a* and the spigot **55**. The area of the liquid discharge conduit is made as large as possible at the point where it leaves the chamber **42** and it is then caused to decrease gradually as indicated at **340**. The reasons for this are that it is desirable that the liquid being discharged encounter as little resistance as possible in leaving the chamber **42** and at the same time that the volume of the discharge conduit should be as small as possible so that it will contain only a small amount of liquid when the discharge operation is completed.

The upper end of the outer tube **54***a* is threaded and is adapted to receive the nut **56**. Within the nut **56** is the packing material **57** and the packing washer **66** (see Figure 10), the compression on which may be suitably varied, so as to obtain a substantially liquid tight connection between the telescoping tubes **54** and **54***a*. This variation in compression also controls the ease of sliding the pipes **54** and **54***a* in relation to each other due to the increase or decrease of the friction of the packing upon the inner tube. This acts as a frictional clutch to grip the inner pipe **54** and maintain it in an adjusted position. The inner tube **54** is adapted to be moved upwardly or downwardly and also turned around so as to cooperate with the basin of a domestic household sink or other suitable elevated place of liquid disposal. Attached to the inner tube **54**, adjacent the bottom thereof, is an enlargement **67** which is adapted to slide upon the inner wall of the tube **54***a*. When the inner tube **54** is slid upwardly from within the outer tube **54***a*, this enlargement **67** acts as a stop member by striking the shoulders of the washer **66**, preventing further upward movement of the tube **54**. The inner tube **54** may be telescoped downwardly within the outer tube **54***a* until the bottom of tube **54** or the enlargement **67** strikes the elbow **53**. Fitted to the external portion of the outer tube **54**, and in contact with the lower edge of the stuffing nut **56**, is the locking device or nut **92** which prevents the packing gland from loosening in operation.

The outer vertical tube **54***a* is adapted to pass through the tank **75** and is supported in the bottom thereof by a liquid tight connection (see Figures 5 and 10). This water tight connection is formed in the following manner. The threaded sleeve **93** is provided with an upper nut **94**, which is soldered thereto. The combination is then placed upon the outer tube **54***a*, so that it will cooperate with the bottom of the measuring tank **80**, from which it will be separated by the upper packing washer **95**. It is permanently fastened in this position by a welded or soldered joint or other water-tight connection. The lower portion of the threaded sleeve **93** will project down through the bottom **80** and will be fitted with the lower packing washer **95** and the nut **94**.

The inlet conduit **58** (see Figures 1, 3 and 5) is partly contained in a horizontal swinging arm which is adapted to extend away from the tank **21** so as to cooperate with the faucets of a domestic household sink and which is also adapted to be placed over the cover **82** of the measuring tank **75** when the machine is not being utilized. The inlet conduit **58** is also partly contained in the telescoping tubes **59** which extend up along the side of the tank (see Figure 3).

The inlet conduit is constructed in the following manner. The rotatable funnel **60** (see Figures 1 and 3) is adapted to cooperate with the faucets of an ordinary household sink. It is usually turned upwardly, as indicated, so as to receive the flow of liquid from a spigot or faucet. Attached to the funnel **60** is the horizontal tube **61** to which is attached the insulating fiber handle **62**, which may also be made of hard rubber, bakelite or other heat or electrical insulating material. The handle **62** is preferably shrunken upon the tubing **61**. To the end of the tube **61** is attached the nut **63** which is provided with a hollow portion **64** for containing suitable stuffing material. The construction and operation of this packing gland is the same as that shown and described in con-

nection with Figure 10. The tube 61 fits over and slides upon an inner tube 65. The inner tube 65 is provided with a stop 96 of similar construction as that shown in connection with the inner tube 54 (see Figure 10). The tube 65 continues into the elbow 68. The tube 61 is adapted to ride back and forth on the tube 65 so as to increase or decrease the distance between the funnel 60 and the elbow 68. If desired, the telescoping tubes 61 and 65 may be replaced by a single tube provided with an upwardly flared end as shown on Figure 9. The elbow 68 continues into the inner vertical tube 69 of telescoping tubes 59. Within the telescoping tubes 59 is a water tight filler or blocking means, in the form of a tube 72 to prevent accumulation of a large body of water below the bottom 80 of the measuring tank 75. In the preferred embodiment, this filler comprises a tube 72 which is sealed at the upper end by the plug 77 and is connected to the nut 76 to form a water tight fitting. The nut 76 is fastened to the external wall of the outer telescoping tube 59 forming a complete tubular water tight system. The sliding tube 69 is provided with a stop 74, with a packing gland 73 and with a water-tight connection 71 to the bottom 80 of the measuring tank 75 similar to the construction and operation shown and described in connection with Figure 10. The lower end of the telescoping tubes 59 are supported by the bracket 300 which is attached to the side of the tank by the screw 301 (see Figure 3).

When the machine is to be charged with the predetermined amount of wash or rinse liquid the inlet conduit is adjusted so that the funnel 61 is operatively positioned under a spigot or faucet. In this position the lower end of the tube 69 is raised above the measuring tank bottom 80 permitting an inflow of water into the measuring tank through the lower end of the tube 69 and through the vertical slots 70 in the walls of the outer telescoping tube 59 immediately above the tank bottom 80.

The measuring chamber 75 is provided with a centrally sloping bottom 80, to the lowermost portion of which is attached the conduit 81. The top of the tank is partially enclosed by the cover 82. This cover is provided with a downwardly bent portion 83 which has the marking 84. The marking 84 indicates the proper level to which the tank 75 should be filled, when the washing machine is to be charged with wash or rinse liquid. The top or cover of the measuring tank 75 is braced by the strips 320 and 321 and the angles 322 and 324 (see Figures 3, 4, 5 and 12). Strips 321 and 324 extend all the way across the top of the tank, while the angles merely support the sides of the cover adjacent to the ends of the cover. The strips 320 and 321 and the angles 322 and 324 are attached to or contacted with the sides and the cover of the measuring tank. The outer edge of the cover rests upon the bent-over portion or bead 326 at the top of the sides of the measuring tank. In order to permit the portion 83 to extend down into the tank, the edge of this portion is removed as indicated at 327. The sides 327 of the measuring tank are attached to a back plate 328, which is in turn attached to the main body of the tank. The back-plate 328 extends up to the upper bead of the main tank 21 and its lower edge is bolted to the tank 21 by the screws 329. The side edges of the tank are beaded over, and welded to, the sides of the back plate, as indicated at 330. The valve rod 91 and the inlet and outlet conduits pass through the cover of the measuring tank. The valve rod also passes through the bracing strip 321.

The conduit 81 fits into the lowermost portion of the tank bottom 80 and affords the means by which the liquid in the measuring tank 75 may be discharged at will into the main tank 21. The conduit 81 is provided with a horizontal portion 85. The conduit 81 is attached to the bottom of the measuring tank and to the side of the dishwashing tank respectively by the threaded fittings 86 and the joints are rendered water-tight by the packings 87, which fittings and packings are similar to those shown in Figure 10.

The conduit 81 is adapted to be opened or closed by the swinging valve 88 which is actuated by the link 89. This link is connected to the handle 90. The rod 91 passes through a frictional clutching device 98, comprising the threaded nipple 99, which is mounted in the cover support 100, and the friction medium 101, which is held in place and adjustment by the nut 102. The rod 91 is prevented from rotating by the pin 103 in the vertical slot 104 (also see Figure 5). The slot 104 further acts to limit the vertical movement of the vertical rod 89. The rod 89 is pivotally connected to the rod 91 by the pin 79. The valve 88 comprises the angular seat 105 and the cooperating swinging portion 106. The actuating link 89 is connected to the swinging portion 106 by the hook 107. In the embodiment shown a sediment plug 108 is provided for emergency purposes. The passage of water through the valve may be further limited by the adjustable plug 110 which controls the movement of the swinging portion 106 by cooperating with the contact portion 111. During the charging of the measuring tank 75 the valve 88 in the conduit 81 is kept closed by lowering the handle 90. When the machine is to be charged, the measuring tank is filled to the level 84 with wash or rinse liquid. Then the handle 90 is elevated, opening the valve 88 and the liquid in tank 75 is permited to flow into the tank 21.

The tubular member 43 (see Figures 1, 6 and 8) in the particular embodiment of the invention shown contains the bearings 118 and 119 for the driving shaft 120 of the water impelling member. These bearing members are press fittted into recesses in the top and bottom of the tubular member 43. They are preferably self lubricating bearings of suitable composition, although standard bearing metal units may be utilized for this purpose. If desired they may be screwed rather than pressed into place. The interior portion of the tubular member 43 between bearings 118 and 119 is made of slightly larger diameter than the interior diameter of the bearings 118 and 119 and the outside diameter of the shaft 120. The water impelling member consists of a cylindrical shell 121 to the exterior of which are attached the circular inclined blades 122 which terminate in enlarged concave centrifugal spray-projectors 123. The upper part of the shell 121 (see especially Figure 8) is attached to the nut 124 which is screwed upon the threaded extension 125 of the shaft 120. The nut 124 screws down to, and rests, upon a shoulder 132 at the top of the shaft 120. In operation it rests upon the top of the upper bearing 119. Upon the top of this shaft is screwed a grease cup 127 which has a knurled cap 128 by means of which the pressure upon the grease may be regulated. A conduit 129 leads from the grease compartment within the cup to the upper bearing 119. This grease

cup may be omitted when self lubricating bearings are utilized.

The shaft 120 is connected to the shaft 133 of the motor 134 by means of the insulating coupling 135. The insulating coupling 135 (see Figures 1, 7 and 8) consists of two C-shaped members 136 the ends of which are attached to, and pass through, the insulating disk 137 which is preferably made of hard rubber, but under different conditions may be made of bakelite or vulcanized fibre. The yoke or clevis members 136 are positioned so that their concave surfaces oppose one another and so that the legs of the opposing members will be in planes at 90° to each other. These members are fastened to the member 137 either by riveting, bolting or other means of attachment.

The motor is centered in the following manner (see Figures 1 and 8). The lower part of the casting 30 has a flange 44 which is provided with the circular shoulder 153. The upper part of the motor casing is similarly shouldered or recessed as indicated at 154 and these two shoulders are adapted to cooperate and hold the motor shaft firmly centered in respect to the impeller shaft 120. The flange 44 is provided with a series of symmetrically arranged holes (see Figure 7) through which bolts 156 may be passed. These bolts screw into suitable tapped openings in the end bell of the motor 134. The bolts 156 are insulated from the journal casting 30 by means of the molded rubber, bakelite, etc. insulating disk. This disk is provided with the vertical cylindrical insulating sleeve portions 158, which fit over the portions of the bolt 156 which pass through the flange 44, and the flat annular insulating ring portion 159, which fits between the flange 44 and the end bell of the motor. The inner portion of the annular ring 159 is provided with a shouldered portion 150 which rests between the cooperating shoulders 153 and 154. The concentric bosses 149 are provided on the upper face of the flange 44 at the bolt holes to prevent the easy access of small quantities of water to the bolts 156. The bolts 156 are further insulated by the insulating washer 148 which separates the bolt 156 from the boss 149.

The impeller shell 121 (see Figures 1, 6 and 8) which is attached to the nut 124 projects continuously downwardly into the pump chamber 42. The lower portion of shell within the chamber 42 is provided with a centrifugal device 167.

The centrifugal device 167 is adapted to turn in the chamber 42 in the casting 30. The lower edge of the tube 121 is provided with an outwardly curved portion or flange 176, which prevents the centrifugal device 167 from slipping downwardly off the sleeve. Above the flange 176 and within the chamber 42, the sleeve 121 is provided with one outwardly projecting button 173 to serve as a means of preventing slippage between sleeve 121 and the curved ejector blades 167 clampingly mounted thereon. Above the single button 173 and within the chambers 42 the sleeve 122 is provided with four symmetrically positioned outwardly projected buttons 177 to prevent the ejector 167 from moving upward on sleeve 121. The centrifugal device 167 consists of two curved members 166 (see Figure 6) the ends of which are widened as indicated at 170. These members are curved so that they impart a suitable amount of centrifugal motion to the liquids in the chamber 42 to remove them from the tank 21 through the outlet system. The members 166 have a central or clamping portion 168, each of which partially embraces the shell 160. These central portions cooperate with each other to grasp the lower portion of the sleeve 121 and they are bolted together as indicated at 169. The driving button 173 will fit into the opening which is caused by the jointure at 169 between the opposite clamped central portions 168 of the centrifugal device 167.

The centrifugal device 167 is provided with blades curved convexly to the direction of rotation, so as to follow the shape of the rotating water. The curve of the blade may preferably be an arc of a circle. The outer edge of the blade continued should form an angle with the tangent to the outer wall of the chamber 42 which is less than 90° and preferably less than 45°. In the embodiment shown it is about 15°. This angle may also be attained by means of a straight blade which is bent away from a radius, but a curved blade is most efficient. The curved blade is widened as it leaves the central shell so that it will create its maximum centrifugal force in the outer portion of the chamber 42. It should also have as much active area as possible adjacent to the central shell, but the area should be so regulated that it will not create sufficient centrifugal force adjacent to the inlet into the chamber 42 to throw the liquid upwardly therethrough. The blades should be so sized and driven at such a rate as to discharge the machine in less than a minute. For example, if the machine normally contains 5 to 5½ quarts of water, it should be discharged in less than ½ minute, in preferably about ⅓ minute. If it contains 10 quarts, in preferably about ¾ minute. The rate of discharge should be such that there should be no violent splashing as the water empties into the sink.

The lower chamber 42 in the journal casting 30 in which the centrifugal device 167 rotates is separated from the upper chamber 41 by means of the plate 180 (see Figures 1, 2 and 8). The upper side of the plate 180 is provided with the outwardly tangentially projecting ribs or baffles 181, the outer ends 182 of which clear the upper outer rim of the flange 32 of the casting 30. The plate 180 has a central annular opening which permits passage of liquids into the chamber 42 from the chamber 41. The central annular opening is made of such width (see Figure 2) as to exclude particles from chamber 42 which will tend to bend the blades of the centrifugal device. The width of the annular opening is usually between about $\frac{3}{16}$'' to $\frac{5}{16}$'' but preferably should not be less than ⅛'' nor more than ½''. The discharge opening from the chamber 42 should be preferably equal in area or slightly smaller than the annular inlet opening. The ribs 181 are preferably tangent to a circle of slightly larger diameter than the diameter of the outer boundary of the annular opening. They serve to prevent the swirling of the water as it enters the pump chamber 42 through the opening 426.

The top of the impeller shell 121 is elevated above the normal water level. There will be very little tendency for water leakage to take place past the bearings of the shaft 120 under normal conditions. It will be noted that the impeller sleeve 121 forms an apron-like enclosure over the top of the tubular bearing member 43 so that an air pocket is formed between the interior of the impeller sleeve and the tubular bearing.

The outside diameter of the journal member 43 (see Figures 1 and 8) is caused to increase as such journal member 43 approaches the lower portion of the sleeve 121. The impeller sleeve is made

substantially cylindrical with the same interior diameter from top to bottom. As a result there will be a much smaller annular space 187 between the impeller shell 121 and the tubular bearing member 43 at the lower part of the impeller sleeve than there will be adjacent to the upper part of the impeller sleeve. This decreases the tendency for the water to enter the annular space between the tubular bearing 43 and the interior of the impeller sleeve 121. The air which is trapped in this annular space will be prevented from leaking through the bearing 119 by the lubricant contained in such close-fitting bearing.

The channel 198 (see Figure 8) in the end bell of the motor 134 is drained to the exterior by drain hole or slot 199 so that no water accumulates to ground the motor on the tank.

Figure 1 shows the details of the improved lid or cover 22 and the air vent therein. The lid is provided with handles 200 which are positioned diametrically opposite and adjacent to the edge of the lid. The cover 22 is preferably made flat and it is provided in the preferred form with a central opening 211, the edges 212 of which are bent downwardly. Below the opening 211 is placed a dome 213 which is supported in a depending well 214 which is attached to the cover 22. Between the dome 213 and the depending well 214 is a large area of opening through which air or vapor can escape. The dome structure will prevent any spray from escaping from the apparatus, acting as sort of a baffle separator. It will be noted that the lower horizontal portion 215 of the depending well 214 slopes inwardly and downwardly so that any moisture separated by the dome 213 can readily drain back into the body of the tank through the lower opening in 214.

The edge of the lid 22 is provided with a lip 218 (see Figures 1 and 3) which is adapted to rest adjacent to the upper beaded edge 216 of the tank 21. The lid is provided with a downwardly projecting cylindrical portion 217, the lower edge of which is adapted to rest upon the upper bead 25. This will produce a very effective moisture tight joint between the lid and the body of the tank. The inwardly projecting bead 219 on the upper portion of tank 21 between the upper bead 25 and the curved edge 216 is adapted to cooperate loosely with the outwardly projecting bead 220 on the depending portion 217 of the cover 22. The combination of the baffing effect of the cooperating beads 219—220, and of the lower edge of the depending portion 217 of the cover 22 with the inwardly shelving bead 25 of the tank 21 with the resultant expansion chambers 221 and 222 serves to provide a moisture-tight seal. The resultant joint must be loose enough to permit the slow passage of gases through the chambers 221 and 22. The length of the depending rim 217 will vary inversely as the angle between the impacting stream of water and the side of the tank adjacent to the jointure with the cover. The rim 217 will be shortened as the angle of impact of the water against the vertical side of the tank 21 approaches 90° to the side of the tank adjacent to the lid. The vertical distances between the contacts 216—218 and 25—217 should be proportioned so that it will be beyond the splashing range of the water passing the line of contact 25—217 and striking against the walls of the chamber 222. The beads 219 -220 will reduce the tendency of the soap bubbles to pass from the chamber 222 to chamber 221. The beads 219—220 may be omitted if soap or other similar frothing agents are not utilized.

The electrical connection to the motor may be actuated by the switch 225 (see Figures 1, 2 and 5) which is placed adjacent to the top of the tank 21. The extension cable when not in use may be held in a hook-shaped member 226. The switch 225 and the hook 226 are attached to the side of the tank 75 by the screws 227 which pass through both. The cord 229 passes from the switch 225 through the supporting spring 228 and the insulating bushings 230 (see Figure 11). Figure 11 is a sectional view through the switch 225, the insulators 230 and the spring 228. The insulators 230 are designed to act as an attachment between the switch 225 and the spring 228 and as a desirable terminal insulator for the end of the supporting spring 228. The cable 229 leads down along the side of the tank to the motor 134.

The interior bottom of the tank 21 is provided with the symmetrically positioned baffles 240 (see Figures 1 and 2). These baffles 240 are attached to bottom of the tank adjacent to the center at 241 and adjacent to the vertical wall at 242. These baffles are curved and are spaced a slight distance from the bottom of the tank between their points of attachment. Four baffles 240 are shown in the embodiment of Figure 2, but less than four or preferably more than four, might be utilized. These baffles tend to prevent swirling of the water in the lower part of the tank and tend to assist its return to the point of lowest level in the tank. The baffles are so curved so as to change the rotational movement of the water into an inwardly directed radial movement. The curvature of the baffle against the direction of rotation increases as its distance from the center of the machine increases and as it acts upon liquid with a higher rotational velocity in the outer part of the bottom of the tank. The central portions 325 of the baffles 240 are radial. The spacings 326 between the baffles 240 and the bottom 27 of the tank 21 are provided (see Figure 1) to equalize the pressures on both sides of the baffles. The baffles will increase the efficiency of the impeller as they will prevent the formation of a vortex. The baffles 240 should reach the highest operating water level.

The baffles 181 (see Figure 2) are made parallel to the radial portions 325 of the baffles 240. Two of these baffles 325 are parallel to the pump chamber outlet and two of them are perpendicular thereto.

The upper rack structure 250 and the lower rack structure 251 are shown in vertical section in Figure 1. These sections are rigidly connected to each other by the vertical wires 249. The rack construction is more fully shown and described in the copending application Serial No. 354,209 filed April 11, 1929, which has matured into Patent No. 1,971,587, dated August 28, 1934. The upper rack structure is made in two parts; an interior portion 252 and an exterior portion 253. The interior portion 252 is pivotally attached to the inner edge of the exterior portion and the exterior portion 253 is rigidly supported on the lower rack structure as described above. The upper rack is designed to hold the cups, glasses and deep vessels which are usually placed thereon with their basin portions downward. It will be noted that the basin portions of these articles will face toward the impeller to a greater or lesser degree so that the cleansing spray will strike them in a most effective manner. In the case of such vessels it is preferred that their basin portions be turned toward the cleansing projected stream in such a manner that the stream will strike the center in-

side bottom of the basin portion perpendicularly and then will be thrown out toward the sides of the basin portion. The outer portions of these vessels which are more readily cleansed will be struck by the sprays, which pass between the vessels, and by the returning spray. The dishes can be conveniently placed in these racks, or removed from these racks, either while the racks are in the tank, or when they are removed from the tank. The inner hinged rack **252** may be swung to a vertical position and in this manner ready access may be had to the lower rack **251** and to the bottom of the tank. The lower rack **251** may be supported upon the bottom of the tank by three or more downwardly projecting legs **260** or/and the impeller guard member **270**. The lower rack contains a special perforated sheet metal holder **261**, which is positioned in such a manner that knives, forks and spoons will receive the full effect of the cleansing spray. A series of wire holders are arranged in said lower rack so as to provide a holder for the dishes. The impeller may turn clockwise looking down and the concave portion of the dishes should be placed, so that they will face the spray which is hurled or projected by such rapidly rotating impeller. The backs of the plates are cleansed by the baffled and returning spray and streams or droplets of water.

In the lower part of the tank is an impeller guard (see Figure 1). The guard **270** consists of a protective cage for the impeller. The protective cage is formed of a series of concentric wire rings **277** and **278** which are welded to the vertical and horizontal portions of the radial wires **271** at various elevations. The wires **271** terminate in part at, and are welded to, the wire ring **278** which is above the impeller shaft. The protective cage will prevent the articles being cleansed and the hands from coming in contact with the turning impeller under normal circumstances. The upper part of the cage is left open as indicated so that ready access will be had to the grease cup **127** without removing the guard. The upper three concentric rings **277** and the ring **278** are spaced on the vertical wires **271** so that there will be the maximum space available for the passage of the projected cleansing fluids from the impeller to the dishes and the maximum protection against silverware and dishes falling into impeller. There is very little probability of articles dropping upon, or into, this portion of the cage while the impeller is in rotation. The lower three rings **277** are so positioned on the wires **271**, and a suitable number of additional vertical wires, are added to provide the maximum protection against the passage of relatively small articles into the guard or impeller without materially diminishing the speed of the returning cleansing liquids to the impeller. The wires **271** are so shaped at the bottom as to snap into the outwardly projecting bead **248**, which holds the guard rigidly in position and properly spaces it from the impeller and the vertical walls of the chamber **41**. These lower three wires **277** and the vertical wires **271** tend to prevent any articles, which may have been misplaced in the dish and silver racks and fallen to the bottom of the tank during the washing operation, from contacting with the rapidly rotating impeller.

In the preferred form both the interior and exterior of the lid and tank body are coated with glass enamel, so that the amount of heat transference therethrough will be reduced to a minimum. The use of glass enamel will give a much better appearance to the machine and will also enable the machine to be much more readily cleansed. It will be noted that the interior of the tank contains practically no crevices or recesses, in which dirt can collect and not be subjected to the direct cleansing action of the spray projected by the impeller. The use of a smooth inner coating of glass enamel will greatly increase the self cleansing properties of the machine. It will be noted that there is nothing over the water impeller in the center of the machine to interfere with the direct action between the projected spray and the articles upon the upper and lower sections of the rack structure.

The machine is operated in the following manner. The dishes and articles to be cleansed are placed in the upper and lower sections of the rack, and the rack is then placed in the machine. If desired, the rack may be loaded in place in the machine. After the loaded rack is placed in the tank, the cover is placed in position. Before the cover is closed two tablespoonfuls of soap flakes are preferably placed in the tank of the machine. The concentration of soap should be such that the cleansing fluid has sufficient viscosity and froth to emulsify and/or support the grease and food particles to be carried out of the machine. The machine is usually adapted to hold eleven pints of water, when in operation. If ordinary water is being used, it is best to place a teaspoonful, or sufficient quantity of a water softener, say tri-sodium phosphate, in the funnel **60** of the swinging arm containing the conduit **59** or in the tank **75**. It is preferable to treat the water with the water softener before it is utilized to make a soap solution. It is assumed that this arm has already been adjusted so it will be of the proper height and length to cooperate with the faucet of a standard sink. The funnel is then placed under the spigot of the sink. The tank **21** is then charged in the manner previously described, hot water preferably being utilized. Before the tank **21** has been charged, the switch **225** is actuated so as to initiate rotation of the impeller. By setting the impeller in rotation before adding the cleansing fluids, the starting torque required of the motor is reduced and the tendency toward the evolution of large volumes or sudden rushes of steam, which cause lifting of lid and upsetting of the glassware and dishes may be practically eliminated. This possibility of charging the machine with a measured volume of cleansing fluid while the impeller is in rotation enables the operator to save some time in the performance of the series of steps involved in dishwashing. The relatively slow addition of cleansing fluid to the rotating impeller is preferable to the sudden initiation of rotation when the impeller is immersed to its normal static level. The dishes are allowed to wash for about five minutes, more or less, depending upon their condition. Then the spigot **55** is adjusted so that it will discharge into a sink or other place of waste disposal, the conduit **52** being opened. Since the motor is still running the centrifugal device **167** will exhaust substantially all of the waste liquid from the tank. The spigot **55** is then actuated to close the passage **52**. The tank is then charged with hot rinse water, after placing a teaspoonful, or sufficient quantity of water softener, to prevent the dishes and apparatus from being coated with lime soaps, in the funnel **60** or the tank **75**. The machine is then allowed to operate for a minute and is again discharged. The waste rinse water will then be exhausted to the sink or other place of

disposal. The machine may then again be rinsed in a similar manner by using clear hot water. This is done preferably without the softening agent being added so as to decrease the tendency of spotting due to a lessened amount of solids in solution in the rinsing water. After exhausting the second rinse water, the cover of the machine is removed and the racks of hot dishes are lifted from the machine and placed in the open to hasten drying. In case too much soap is put in the machine, the suds will become so thick as to make it difficult to discharge the machine. In such a case, additional water is allowed to enter the machine so as to dilute the suds and enable them to be removed.

What is claimed is:

1. In a washing machine, a vertical tank forming a washing chamber and having a draining bottom, a discharge chamber communicating with the lower portion of said draining bottom, a discharge conduit communicating with said discharge chamber, said conduit having a portion extending downwardly and outwardly from the discharge chamber, a vertical portion communicating therewith, and a horizontal terminating portion communicating with the upper part of said vertical portion, and a centrifugal pump in said discharge chamber for ejecting water through said conduit.

2. In a washing machine, a tank having a centrally draining bottom, a rotatable upright unenclosed impeller mounted above the lower portion of said draining bottom and spaced therefrom, a plurality of baffles secured to said draining bottom and spaced between said impeller and the wall of said tank, said baffles being spaced from said draining bottom and adapted to retard rotation of liquid; and a well chamber communicating centrally with the bottom beneath said impeller.

3. In a dishwashing machine, a tank provided with a centrally draining bottom, an upright unenclosed spray projecting impeller rotatably mounted above the lower portion of said bottom, a well chamber communicating centrally with the lower portion of the draining bottom, baffles positioned on the draining bottom and spaced from said impeller and the wall of said tank, said baffles being spaced from said draining bottom.

4. In a dishwashing machine, a tank provided with a centrally draining bottom, an upright rotatable impeller positioned above the lower portion of the draining bottom, baffles positioned on said draining bottom, the inner ends of said baffles extending radially from the lower part of said tank, and the outer ends of said baffles being curved opposite to the direction of rotation of the impeller and spaced from the wall of said tank.

5. In a dishwashing machine, a tank provided with a centrally draining bottom, an impeller rotatable on a substantially vertical axis positioned above the lower portion of the draining bottom, baffles mounted on said draining bottom and spaced therefrom, said baffles being curved against the direction of impeller rotation and spaced from the tank wall.

6. In a dishwashing machine, a tank provided with a centrally draining bottom, an impeller rotatable on a substantially vertical axis positioned above the lower portion of the draining bottom, baffles mounted on said draining bottom and spaced therefrom, the inner ends of said baffles extending outwardly adjacent said impeller and radially therefrom, and the outer ends of said baffles being curved against the direction of rotation of said impeller adjacent the wall of said tank.

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