

June 19, 1934.

P. E. BARKER
WASHING MACHINE

1,963,520

Filed May 2, 1931

5 Sheets-Sheet 1

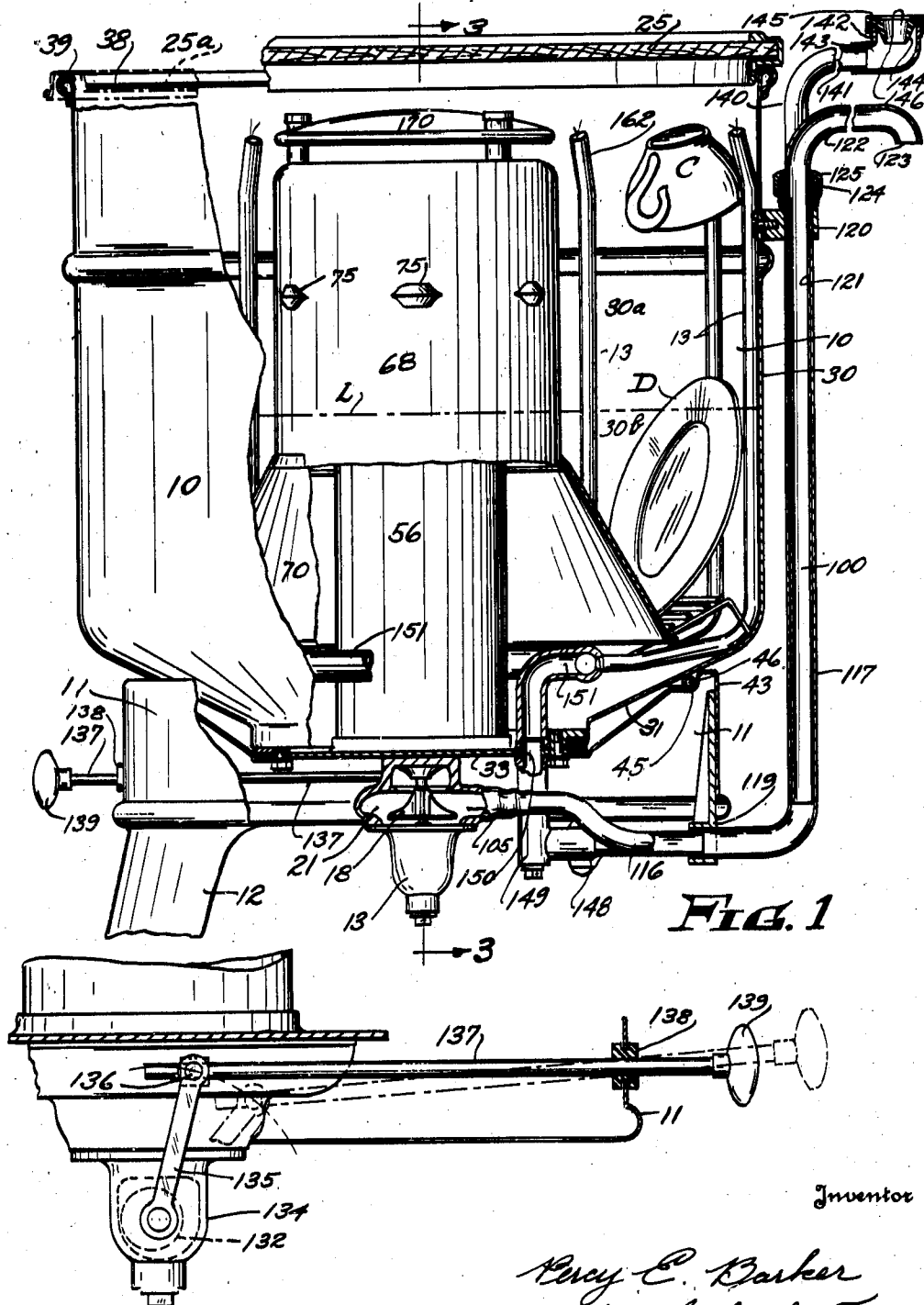


FIG. 1

FIG. 2

Inventor

Percy E. Barker
By *Bates, Gollick & Tease*
Attorneys

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5 Sheets-Sheet 2

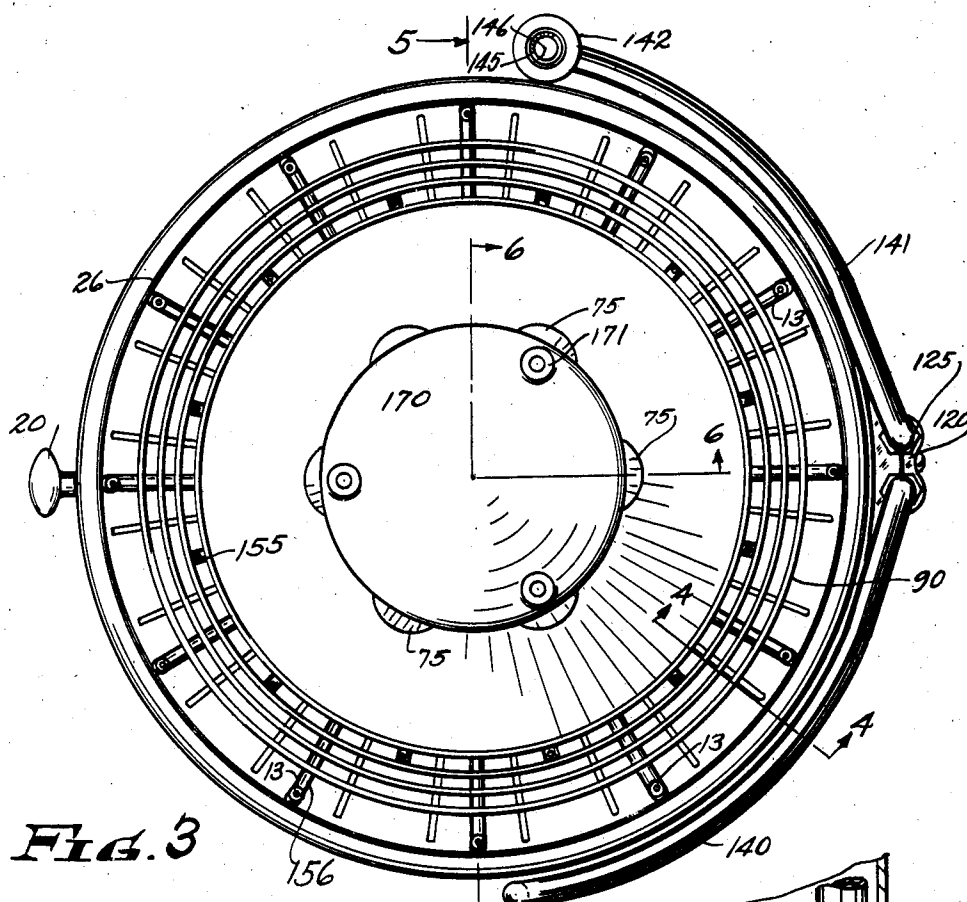


FIG. 3

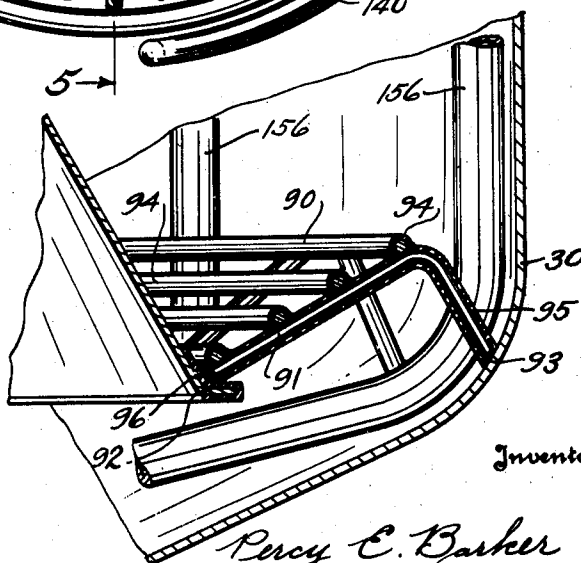


FIG. 4

Inventor

Percy E. Barker
Bates, Golick & Teare
Attorneys

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P. E. BARKER

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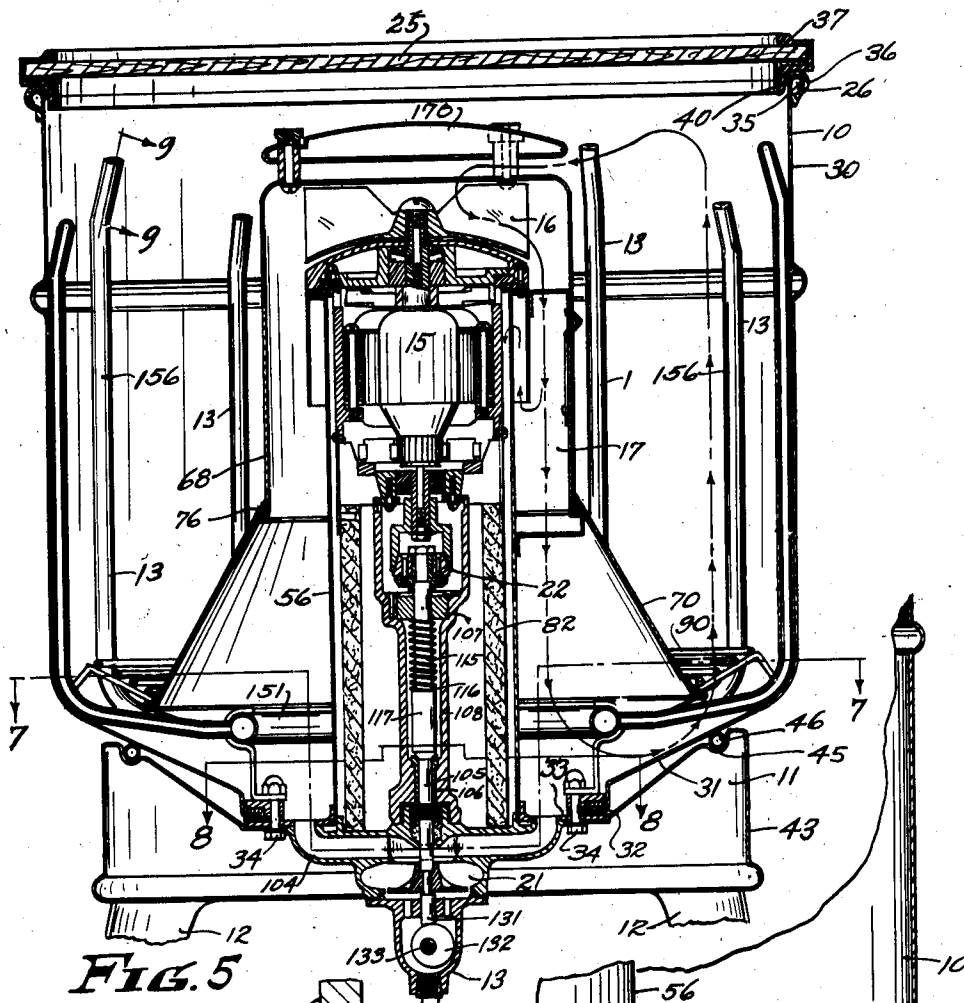


FIG. 5

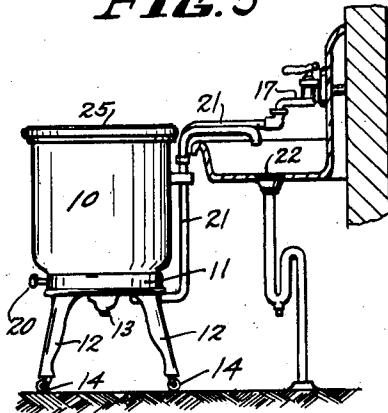
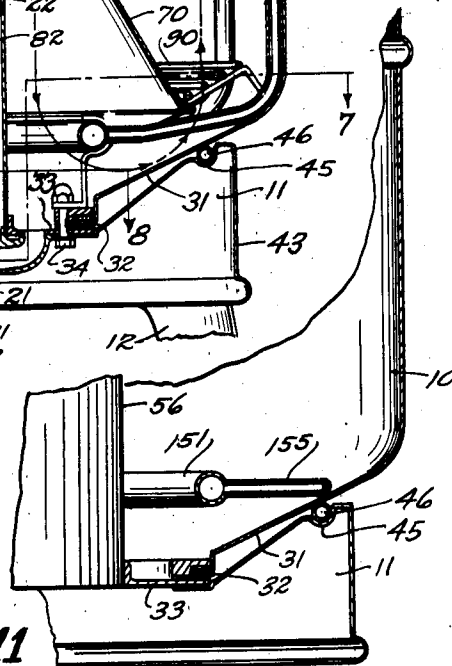


FIG. 12

FIG. 11



Percy C. Barker
 by Bates, Gollick & Teare
 Attorneys

June 19, 1934.

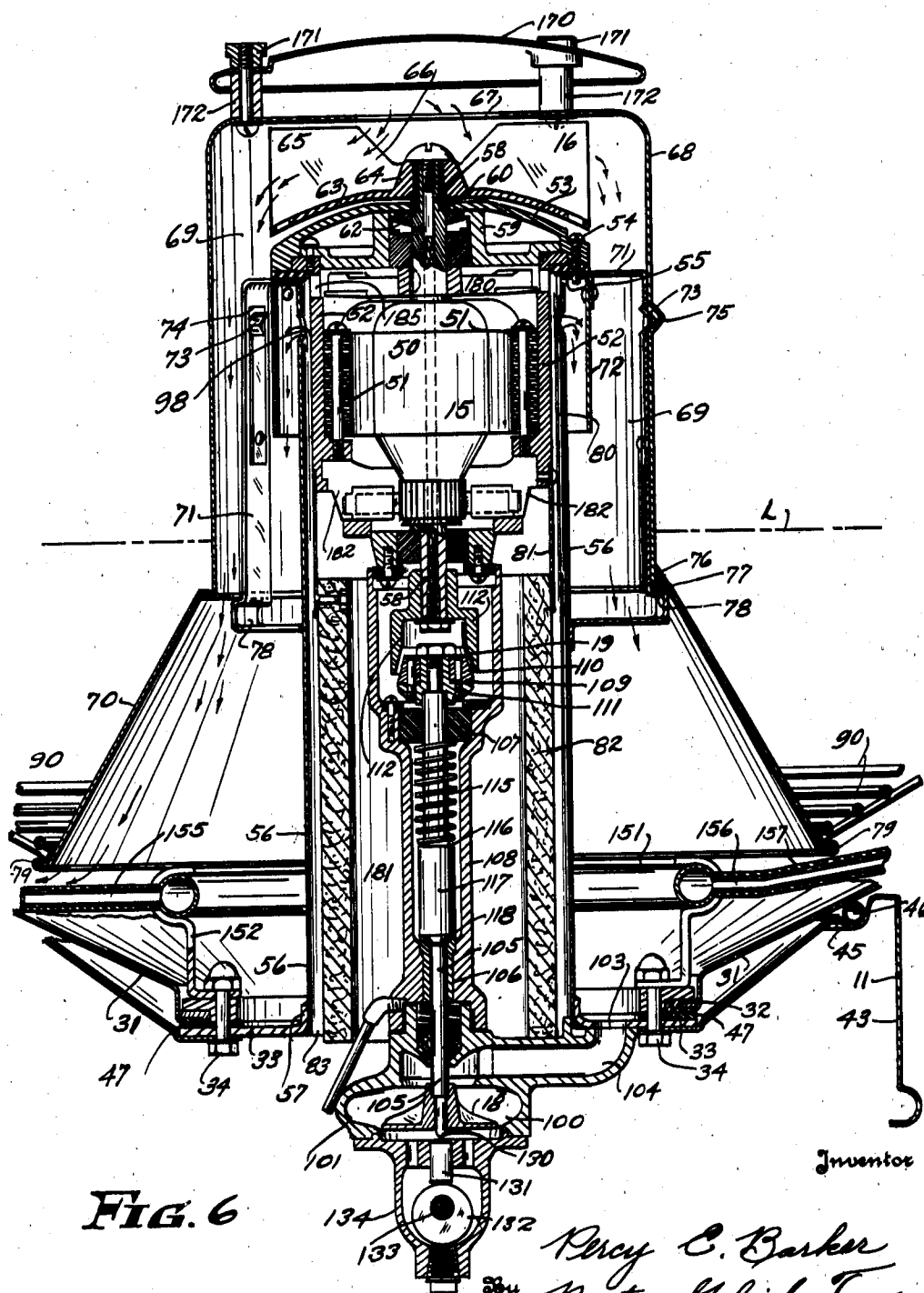
P. E. BARKER

1,963,520

WASHING MACHINE.

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5 Sheets-Sheet 4



Inventor

Percy C. Barker
Bates, Golrick & Jare
Attorneys.

June 19, 1934.

P. E. BARKER

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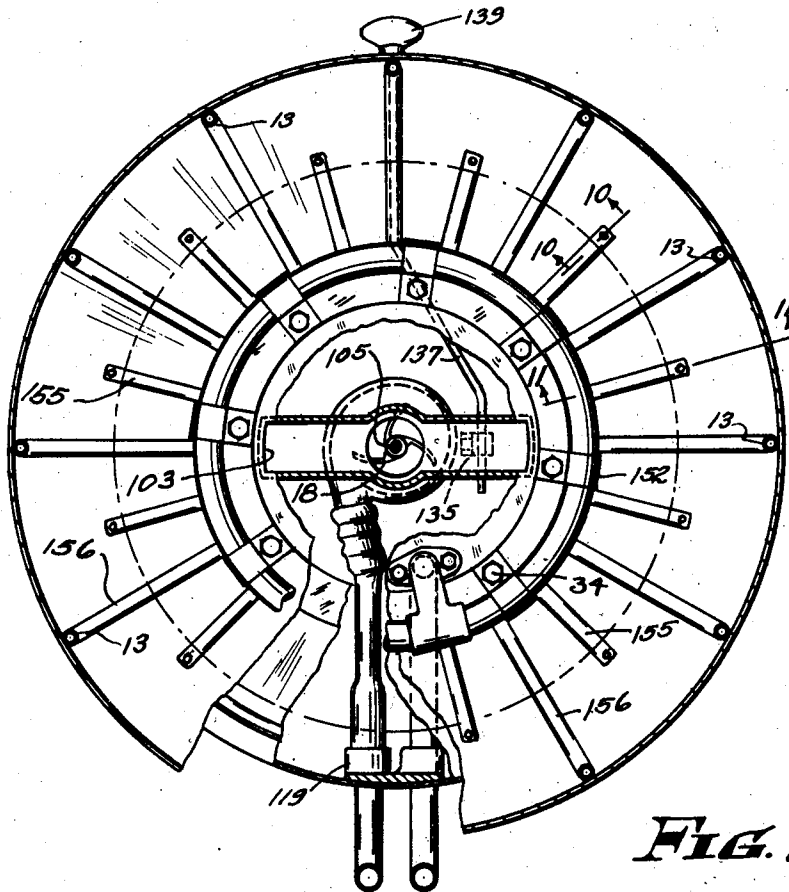


FIG. 7

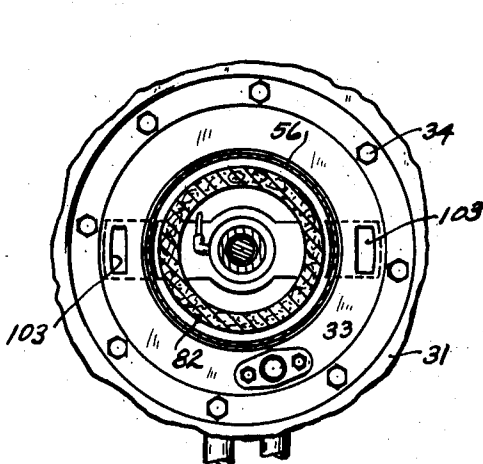


FIG. 8

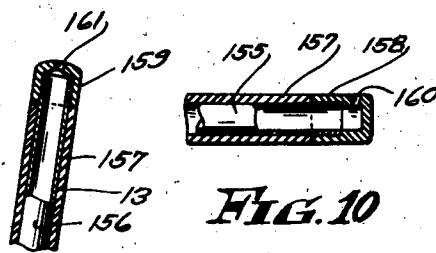


FIG. 9

FIG. 10

Inventor

Percy E. Barker
Bates, Golick & Teare

Attorneys

UNITED STATES PATENT OFFICE

1,963,520

WASHING MACHINE

Percy E. Barker, Towson, Md., assignor to The Cinderella Washing Machine Company, Cleveland, Ohio, a corporation of Ohio

Application May 2, 1931, Serial No. 534,608

14 Claims. (Cl. 141—9)

This invention relates to an improved washing machine of the type shown in my Reissue Patent No. 17,984, issued March 3rd, 1931. Washing machines of this type generally comprise a substantially enclosed container adapted to be partially filled with a cleansing liquid such as a detergent laden water, into which dishes, clothes or other articles to be cleansed are placed. The cleansing fluid is agitated by creating a partial vacuum over the surface thereof, and this is usually accomplished by drawing air from the upper portion of the container and forcing such air through a suitable duct, at atmospheric pressure, to the lower part of the container, where it escapes upwardly through the water, thereby surging, swishing and otherwise agitating the washing liquid.

The general object of the present invention is to provide an improved, compact, portable washing machine, operable in accordance with the principle of operation of the device shown in my former patent, but wherein the washed articles may be efficiently rinsed and quickly dried.

A further object is to provide a dish-washing machine, adaptable for domestic use, with suitable drain and water connections, which may be readily adjusted for drains and water taps of various heights and relative positions, and to provide such machine with means to raise the water from the container and discharge it into the drain, even though the latter be at a higher elevation than the machine.

Another object is to provide a washing machine which will normally retain sufficient water to maintain the contents thereof moist when not in operation, thereby preventing the encrustation of dirt on articles placed therein, which are to be washed in the future.

A further object is to provide an improved structure for supporting articles to be washed in the path of greatest agitation of the washing fluid.

Other objects of the invention will become apparent from the following description and claims considered together with the accompanying drawings, which illustrate my invention, as applied to a machine for washing dishes.

Fig. 1 is a side elevation, partially broken away, to show the interior construction thereof; Fig. 2 is a fragmentary elevation of the clutch control mechanism and as viewed from the opposite side of the machine, and shown in Fig. 1; Fig. 3 is a plan of my improved machine, with the cover removed; Fig. 4 is a sectional detail of a dish rack, showing its location and construction,

as indicated by the lines 4—4 on Fig. 3; Fig. 5 is a vertical section as indicated by the lines 5—5 on Fig. 3, the plane of the section being normal to the elevation shown in Fig. 1; Fig. 6 is a vertical section on an enlarged scale of the motor, fan and pump unit, as indicated by the offset lines 6—6 on Fig. 3; Fig. 7 is a horizontal section as indicated by the off-set lines 7—7 on Fig. 5; Fig. 8 is a horizontal section indicated by the lines 8—8 on Fig. 5; Figs. 9 and 10 are detailed sections of the spray nozzle as indicated by the lines 9—9 on Fig. 5, and lines 10—10 on Fig. 7, respectively; Fig. 11 is a fragmentary radial section, indicated by the lines 11—11 on Fig. 7; Fig. 12 is a side elevation of my improved machine, illustrating the manner of connecting it to the usual water tap and drain and illustrates the supporting structure for the machine.

The washing machine, as shown in the drawings, comprises a casing 10 within which dishes or articles may be washed, rinsed and dried. The casing 10 is mounted on a suitable base or frame 11, which is supported by legs 12 and provided with suitable casters 14, to permit the machine to be readily moved from place to place, (see Fig. 12). The casing 10 is provided with an improved means for agitating the water and for the circulating of currents and air therethrough in an advantageous manner. Said means may comprise in general a motor 15 (see Figs. 5 and 6), adapted to rotate a suction fan 16, to draw air and vapor from the top of the casing and force it through suitable conduits towards the bottom of the casing, where the air is permitted to escape upwardly through an annular dish supporting compartment and cause surging and gurgitation of the cleaning fluid in a rapid manner. The casing is also provided with spray conduits 13, adapted to communicate with a water tap 17 to facilitate the rinsing of the washed articles. A suitable pump mechanism 18 is located in the lower portion of the casing and is adapted to be connected to the motor 15 by a suitable clutch mechanism 19, controlled by a lever 20, which extends outwardly from the frame 11. The pump 18 communicates with an outlet conduit 21, adapted to discharge the liquid from the machine into a suitable drain, as indicated at 22. The casing is provided with a suitable cover 25, which engages the upper edge 26 of the casing 10, making a substantially air-tight connection therewith.

The casing 10 of my improved washing machine comprises a cylinder 30, the lower end of which is curved inwardly and downwardly, form-

ing a sloping bottom portion 31, which terminates in an inwardly extending annular flange 32, to which a closure member 33 and the base 11 are secured by suitable bolts 34. The upper edge of the cylinder 30 terminates in an outwardly extending bead 35, which carries a protecting member 36, preferably made of rubber or some similar material, and which coacts with a suitable cover 25.

In Fig. 1, I have shown two forms of covers, either of which may serve to seal the washing compartment when the device is in operation, a preferred form 25 being illustrated in full lines, and a modified form, 25a being illustrated in dotted lines. The cover 25 comprises a substantially flat plate of glass or wood or any lightweight water-proof composition material, and carries a bead 37 at its periphery. The bead 37 is adapted to abut the upper and inner surfaces of the bead 35 of the casing, the rubber sealing member 36 forming an air-tight seal therebetween. The cover 25a comprises a metallic plate 38 having an annular trough 39 adapted to receive the sealing member 36. The latter cover is maintained in place on the casing by atmospheric pressure on its top surface, when the pressure within the container is reduced below that of atmospheric pressure, as will hereinafter be described. The cover 25, however, does not depend entirely upon this difference in pressures to retain it in position on the cylinder 30, but is retained by a tight-fitting, downwardly extending annular flange 40, which projects into the casing and contacts with the inner surface of the sealing member 36.

The base 11, which supports the casing 10, comprises a pressed metal cylindrical drum 43, having an inwardly extending top flange secured to the casing 10 by bolts 34, as heretofore described. The base 11 is slightly smaller in diameter than the casing and its upper face is sloped to substantially conform to the slope of the bottom 31 of the casing. Adjacent its periphery the upper face of the base 11 is provided with an annular groove 45 adapted to receive a resilient supporting member, such as the rubber tube 46 which supports the casing 10 adjacent its periphery. The flange 32 of the casing, to which the base is secured, is also gripped between gaskets 47, preferably rubber. Therefore noise and vibration set up within the casing is insulated from the base 11 and partially absorbed by the gasket members. The supporting legs 12 are secured to the base 11 by welding, riveting or any other suitable manner, and are of such length as to bring the upper end of the casing 10 to a height convenient for the operator to place and remove articles to and from the casing.

The motor 15 drives the fan 16 to create a partial vacuum at the surface of the liquid within the container. The motor 15 is preferably axially located relative to and within the casing 10 above the normal water level thereof. The motor is best illustrated in Figs. 5 and 6, and comprises an armature 50, and field members 51, all contained within a housing 52, the upper end of which is secured to a dome shaped cap 53, in turn secured by suitable bolts 54 to an outwardly extending annular flange 55 of a cylinder 56. The lower end of the cylinder 56 is open, and is secured or welded to an upwardly extending annular flange 57 of the bottom closure member 33 of the casing 10.

The air pressure in the upper portion 30a of

the casing 30 is decreased by the fan 16, thereby creating a partial vacuum in the container 30 above the water line thereof. The fan 16 is rigidly secured to the upper end of an armature shaft 58 of the motor 15. This shaft extends through a boss 59 in the housing 52, and through an opening 60 in the cap 53. Suitable packing 62, retained within the boss 59 by the cap 53, prevents the liquid contained within the casing from entering the motor housing. The fan 16 comprises a dished plate 63 having a hub portion 64, rigidly secured to the armature shaft 58. The plate 63 is provided with a series of upstanding fan blades 65, which extend from the hub towards the periphery of the plate, and have a reduced area 66 adjacent the hub, so that they will draw the air from the portion 30a of the casing through an opening 67 in a housing 68, which extends around and is spaced apart from the cylinder 56, forming a passageway 69 therebetween. The lower end of the housing 68 is conical, flaring outwardly as indicated at 70, and extends to within a comparatively short distance from the bottom wall 31 of the casing 30.

To permit the housing to be readily removed for cleaning the various passageways, the housing 68 is removably supported on brackets 71. The upper ends of the brackets 71 are secured to a cylinder 72, which lies intermediate the housing 68 and cylinder 56 and which is secured at its upper end to the motor housing 52, by bolts 54 heretofore described. The lower ends of the brackets 71 are secured directly to the cylinder 56. Each bracket 71 has a leaf spring 73 secured to its inner face, the upper or deformed ends of which pass through openings 74 in the brackets 71, and engage suitable recesses 75 in the housing 68, thereby securing the housing 68 to the bracket. This permits the removal of the housing 68 and at the same time it prevents rotation of the housing during the agitation of the cleansing fluid. The cylindrical and conical portions of the housing 68 are joined by an annular horizontal flange 76, which rests upon a rubber or fabric ring 77, carried by outwardly extending ears 78 of the brackets 71, thereby limiting the downward movement of the housing and permanently controlling the distance between the lower edge 79 of the housing and the bottom wall 31 of the casing 30.

The conduit 69 through which the air passes from the top to the bottom of the housing 30, also communicates with the atmosphere. It will be noted, as shown in Fig. 6, that the cylinder 56 is spaced apart from the motor housing 52, leaving a passageway 80 therebetween. The motor housing 52 is extended downwardly by an annular band 81, adapted to carry a tube 82 of fibrous or other sound-absorbing material, which extends to the lowermost edge of the container 30. Both the band 81 and tube 82 are separated from the casing 56, thereby extending the passageway 80 downwardly to an opening 83 in the closure member 33, which forms the bottom of the housing 30.

The agitating action of the liquid within the housing 30 is so turbulent that I find it desirable to provide protecting means for the opening 67 in the housing 68, which communicates with the fan 16. To this end I provide a dished plate-like member 170, which is spaced apart from the upper surface of the housing 68 by spacing members 172, and is secured thereto by suitable bolts 171. It will be noted that the cross-sectional

area between this cap 170 and the top of the housing 68 is such that the area between the two members increases as it reaches the center, thereby preventing any restricting action by the cover 5 or cap 170.

To prevent the articles that are to be washed from dropping beneath the conical portion 70 of the housing 68, I provide a supporting rack 90. In the drawings, I show the rack 90 constructed to support dishes. In the drawings, the rack is best illustrated in Figs. 3, 4 and 5, and comprises a plurality of radially extending L-shaped supporting wires 91, one leg of each of which rests upon an outwardly extending flange 15 92 of the conical portion 70 of the housing 68, while the other end of each wire 91 rests upon the bottom 31 of the casing 30 adjacent its periphery, as indicated at 93. These radial wires are connected by suitable continuous annular 20 wires or bands 94, which are preferably welded to the radial wires. To prevent breakage and marring of the articles to be washed, I find it preferable to coat the wires 91 and 94 with rubber, as indicated at 95. As shown, the wire rack 25 90 is formed and then coated with rubber, thereby filling the crevices between the wires 91 and 94, and preventing the accumulation of dirt therein. The lower edge of the cone 70 is likewise covered with a rubber protecting ring 96, 30 which prevents breakage of the article to be washed. It will be noted that the ends of the supporting members 91 of the rack 90 are coated with rubber, to prevent metal to metal contact between the legs and the casing 30, and thereby 35 greatly reducing noise of operation.

The washing action of the machine is as follows: The machine is first filled to the line marked L (Fig. 1) with a washing liquid, such as a soapy, hot water. The articles to be washed, 40 such as the dishes D, (Fig. 1) are then placed on the rack 90. It will be noted that it is not necessary that the articles be entirely covered with the liquid, as the washing is caused by the agitation of the liquid, and it is found that with 45 the apparatus provided the liquid is carried to the very top of the container 30. After the dishes have been placed within the casing 30, the cover 25 is set in place and the motor energized by a suitable switch. The fan 16 then 50 reduces the air pressure in the upper portion of the casing 30 by drawing the air therefrom and forcing it down through the passageway 69. Atmospheric pressure then acting through the conduit 83 and openings 98 in the upper end of 55 the housing 56, downwardly through the passageway 69, acts upon the surface of the water within the housing 68 and cone 70. Due to the decrease in air pressure at the top of the water in the container 30, and the atmospheric pressure which acts upon the water within the housing 68, the water within the housing 68 and the cone 70 is forced down and out into the space 30b 60 between the housing 68 and the container 30, thereby raising the level of the water in the portion 30b of the container. When the pressure in the upper portion 30a of the container 30 is so reduced that practically all the water within the housing 68 and cone 70 has been 65 drawn or forced by atmospheric pressure into the housing 30, air will escape from beneath the cone 70 into the housing 30a, and through the water within the casing 30 to balance the pressures. This action is practically instantaneous, hence greatly agitates the water and causes it 70 to be swished about the entire area between the

casing 30 and the housing 68. Likewise, because of the quantity of air being drawn into the container 30 being so great, and is accomplished practically instantaneously, the pressure within 80 the container is almost immediately brought to atmospheric pressure, at which time the water within the container quickly recedes, again filling the cone 70 and further agitating the liquid. The fan 16, which rotates continuously, again begins to decrease the pressure above the surface 85 of the water in the container 30. This agitating of the liquid within the container 30 is therefore intermittent and causes the water to be swished from side to side and spurted intermittently upwards, throughout the casing 30, as 90 the housing 70 is alternately emptied and filled.

Upon the completion of the washing operation, the washing liquid is drawn from the container 10 by means of a suitable drainage mechanism, which includes the pump 18. I have found it highly 95 advantageous to so construct the washing machine that it need not be placed above the level of the drain, but may be placed below it and therefore equip the washing machine with a pump 18, so that the drain on the ordinary kitchen sink may 100 be used, regardless of its elevation and without raising the machine to such a height that the draining could be accomplished by gravitation, which, in many instances, would render it inconvenient for the operator to place and remove ar- 105 ticles to and from the machine.

The pump 18, which draws the water from the casing 10, is located at the lowermost portion of the casing and is preferably of the centrifugal type. The pump 18 comprises a pump rotor 100 110 mounted in a housing 101, which is secured to the lower closure member 33 of the casing 30 by suitable bolts (not shown). The closure member 33 is provided with a pair of openings 103, which are joined by a suitable manifold 104 disposed be- 115 tween the casing 30 and the pump housing 101 and integral with the latter. The pump rotor 100 is rigidly secured and supported by a vertically extended shaft 105, axially located relative to the armature shaft 58. The shaft 105 is supported 120 in suitable bushings 106 and 107, carried in a vertically extending sleeve 108. Secured to the upper end of the shaft is one member 109 of the clutch mechanism 19. The clutch member 109 is the male member of the cone clutch 19 and carries on its conical face suitable friction means 125 110 rigidly held to the clutch member by suitable bolts 111. The clutch member 109 is adapted to coact with a female cone 112 rigidly secured to the lower end of the armature shaft 58. The 130 clutch members 109 and 111 are normally held in a disengaged position by a spring 115 carried within the housing 108, and acting upon a shoulder 116 of an enlarged portion 117 of the shaft 105, and which normally urges the shaft to its 135 lowermost position. The downward movement of the shaft is limited by a shoulder 118 on the shaft, which coacts with the uppermost end of the bushing 106.

When it is desired to drain the casing 30, the 140 clutch control mechanism 20 (illustrated in Figs. 2 and 6) is operated to raise the shaft 105, and cause the clutch member 109 to engage the clutch member 110, thereby rotating the pump rotor 100 and causing the water within the casing 30 to 145 be drawn through the conduit 104 into the pump housing and discharged through an outlet port, 114 (Fig. 1) which port is connected to a tube 116a, which extends substantially horizontally to a point beyond the periphery of the casing 30, 150

and then upwardly as at 117a, and is secured to the casing by suitable supporting members 119 and 120.

The vertical portion 117a of the tube 116a is so arranged as to lead the liquid into the drain 22. Telescopically arranged within the tube 116a is a second tube 121, which has a horizontally extending portion 122 adjacent the uppermost end, terminating in a downwardly extending spout 123, adapted to be positioned over the drain. The telescopic tubes are so arranged that the tube 121 may be moved up or down, or may be rotated relative to the tube 117a to place the outlet 123 in communication with the drain 22. Suitable packing 124 is retained in position on the tube 116 by a packing nut 125, providing a water-tight seal between the two telescopic tubes. It will be noted that the horizontal portion 122 of the tube 121 is curved, as is best illustrated in Fig. 3, and this curvature conforms substantially to the curvature of the casing 30, so that when the machine is not in use, the tube 121 may be swung about the tube 116a to a position where the horizontal portion 122 lies close to the casing 10, thereby providing a compact arrangement.

The clutch 19, heretofore described, is operated by a suitable lever and cam mechanism 20, best illustrated in Figs. 2, 5 and 6. The lowermost end of the shaft 105, which carries the clutch member 109, is rounded as at 130, and is adapted to be raised and lowered by a plunger 131, which coacts with the periphery of a suitable eccentric disc or cam 132, rigidly secured to a shaft 133, which is mounted in a housing 134, forming the lower closure member for the pump housing 101. The shaft 133 extends to the exterior of the housing 134 and carries at its outer end a lever 135, to which is pivotally connected as at 136 an operating rod 137, which passes outwardly through a bushing 138 at the base member 11. The operating rod 137 is provided at its outermost end with a suitable knob 139, permitting it to be readily withdrawn to rotate the shaft 133, causing the raising of the plunger 131 by the eccentric disc 132. This carries the clutch member 109 into contact with the clutch member 110, thereby causing the pump rotor 100 to be rotated and to drain the casing 10.

After the wash water has been drained from the casing 10, the articles are rinsed with hot water, which operation is readily accomplished by operation of the household hot water spigot which has been connected to a suitable conduit communicating with the interior of the housing 10. Secured to the side of the casing 30 by the securing members 119 and 120, heretofore described, is a second telescopic tube arrangement 140. The upper end of this tube has a substantially horizontally extending portion 141, to which is secured a coupling device 142, adapted to couple the tube 140 to a water tap, indicated at 17 (Fig. 11). The coupling device 142 comprises a body portion 143, adapted to receive a rubber gasket 144, which is secured in place in an opening in the upper portion of the body by a suitable retaining ring 145. The inner surface of the gasket 144 is conical, as indicated at 146, so that it may be wedged tightly in place on the water tap. The tube 140 is constructed in the same manner as the tube 116a, 117a heretofore described, and is adapted to be swung from side to side or moved up and down, as desired by the operator. The horizontally extending portion 141 of the tube 140 is curved, as indicated at 146, on Fig. 3, and is adapted to be swung to a position adjacent the

container 30 when the machine is not in use. The lower end of the tube 140 is connected by a horizontal tube 148 to a manifold 149, which passes through the closure plate 33, and is connected to a manifold 151, located within the casing 30 below the conical housing 70. The manifold 151 is supported as shown in Fig. 6 by a plurality of supporting members 152, which are secured in position to the closure plate 33 by the bolts 34. The manifold 151 has connected to it a plurality of tubes 155 and 156, which extend radially between the lower portion of the conical housing 70 and the bottom 31 of the casing 30. The tubes 155 and 156 are protected with a rubber coating 157, and have secured at their outermost ends nozzle members 158 and 159, respectively. The tubes 155 extend a short distance beyond the lower edge of the housing 70 and the stream of water from the tap is directed from these tubes upwardly into the casing 30 from openings 160 in the nozzles 158. The tube 159, however, extends outwardly and upwardly following the contour of the housing 30, to a point a short distance below the top of the casing 10, and are provided at their upper ends with nozzles 159 having openings 161 adapted to direct the spray of water upwardly against the top 25 of the casing, where the water will be deflected downwardly, thereby thoroughly rinsing the articles within the container.

I prefer to bend the uppermost ends 162 of the tube 156 inwardly away from the wall of the casing 30, so that they may be used to wash articles. In Fig. 1, I have shown these tubes as supporting cups C. It will be noted that the articles C will lie above the water line L of the container. This, however, is immaterial, as the agitating action of the liquid heretofore described is so turbulent that it carries the liquid up to the cover and is of adequate force to thoroughly wash the articles, even though they be situated above the normal water line. If desired, the motor 15 may be operated throughout the rinsing operation, thereby providing a thorough agitation of the water within the housing and further increasing the effectiveness of the machine during the rinsing operation.

After the articles are rinsed, they may be dried in the machine. This is accomplished by the draining of the rinse water, by means of the pump mechanism 18, the operation being similar in all respects as the operation for the draining of the wash water. The cover 25 is then removed and the motor 50 set in operation. This will cause air to be drawn from without the container and forced through the passageway within the housing 68 and the cone 70, down to the bottom of the ring, and then up through the portion 30a and 30b in the container 30, thereby effectively drying the articles within the container.

It is sometimes desired to use a washing machine for storing articles, to be washed in the future. Hence, I have provided means to prevent dirt and other accumulation on such articles from becoming encrusted. The pump mechanism 18 is situated at the base of the container 10, and the pump, being a centrifugal pump, will never entirely exhaust the rinse water from the outlet tube 116, when the clutch 19 is operated to disconnect the pump 18 from the motor, and the liquid in the outlet tube 116 will flow back, filling the pump chamber and the conduit 103. Hence, if the articles are stored within the container 30, and the cover placed in position, the air within the container will remain moist at all times, thereby preventing dirt and other accumu-

lations from drying on the articles to be washed.

It will be noted that I include a novel means of cooling the motor 15. In washing machines heretofore made, the motor 15 has been situated entirely outside of the machine, partially due to the fact that it is difficult to cool the motor and at the same time prevent moisture from accumulating therein and damaging the parts. It will be noted that I provide the motor 15 with a fan 180, which is rigidly secured to the armature shaft 58 adjacent the upper end and within the casing 52. A passageway 181 between the felt ring 82 and the sleeve 108 then communicates with the motor housing 52 by means of openings 182 in the lower end thereof. Air is therefore drawn from the atmosphere through the passageways 181 and 182 into the motor housing by the fan 180. This creates a pressure in the upper end of the motor housing, which pressure acts through the passageway 83 downwardly either through the openings 98 into the housing 68 and 70, or downwardly through the passageway 83, returning to atmosphere, depending upon the pressures within the passageway 83 and 69.

From the foregoing description, it will be seen that I have provided a washing machine for cleansing dishes or other articles which will thoroughly wash, rinse and dry such articles, and which washing machine includes an improved means for efficiently agitating the water by the circulation of currents of air through same. Likewise, I have located the motor, which operates the fan to cause the differences in pressure within the container, in a most advantageous position, wherein the passageways are as short as possible and located conveniently to the points of intake and outlet. It will also be noted that I have provided a washing machine, the top of which is located at a height convenient for the operator to place and remove dishes or other articles to and from the container, and which machine is provided with a pump mechanism adapted to draw the water from the machine and force it into a drain, even though the machine lie in a plane below that of the drain opening. It will also be apparent that I have provided means for connecting the machine with a water spigot and a drain which connecting means is readily applied to drains and spigots of various heights, and in various relative vertical and horizontal positions, and which connecting mechanism may be readily positioned adjacent the container when not in use, thereby providing a compact arrangement. I also provide a suitable supporting base, to enable the movement of the machine from place to place, as desired by the operator.

I claim:

1. A washing machine comprising a substantially enclosed liquid receptacle, a conduit entirely within and carried by the receptacle and spaced from the side walls of the receptacle and having openings adjacent the top and bottom walls of the receptacle, suction means disposed at the top of and within the conduit and adapted to draw air and vapor from above the water in the casing and circulate it downwardly through the conduit into the bottom of the receptacle, where it discharges upwardly through the liquid in the receptacle, and an electric motor mounted within the conduit and drivingly connected with the suction means.

2. A washing machine comprising a substantially enclosed liquid container, a conduit within the container and in communication with the top

and bottom portions thereof, said conduit spaced from the walls of the container forming a receptacle for articles to be washed therebetween, a motor mounted in said conduit, suction means disposed in the upper end of the conduit and adapted to draw air and vapor from above the liquid in the container and force such air and vapor downwardly around the motor through the conduit to the bottom of the container, where it escapes from all sides of the lower end of the conduit upwardly through the liquid in the container, wherein the conduit is so arranged that the air and vapor escapes substantially midway between the wall of the conduit and the wall of the receptacle.

3. A washing machine comprising a liquid container, an open-ended conduit axially mounted in the container and spaced equi-distant from the side walls thereof, said conduit having an enlarged portion below the normal water line of the container, said conduit being in communication with the top and bottom portions of the container whereby it is normally filled with liquid to the same level as the liquid in the container, the walls of said container and conduit forming a receptacle therebetween for articles to be washed, an open support in the bottom of said receptacle and above the lower edge of the conduit for articles to be washed, suction means supported from the base of said container and located within the top of the conduit and adapted to draw air and vapor from above the water level in the receptacle, thereby decreasing the pressure in the top of the receptacle, said conduit having a communication with the atmosphere whereby atmospheric pressure acts on the water level within the conduit, forcing such water downwardly as the pressure on the liquid in the receptacle is relieved and discharging it from the conduit into the receptacle, and whereby when the conduit is emptied of liquid, air and vapor will escape downwardly through the conduit and upwardly through the liquid into the receptacle to balance the pressures in the machine, at which time the liquid will be drawn from the receptacle into the lower portion of the conduit to balance the normal water levels in the conduit and water receptacles.

4. A washing machine comprising a liquid container, a housing within said container, the bottom of said housing being spaced apart from the bottom of the container, said housing forming a conduit for the passage of air vapor or water from the top portion of the container to the bottom portion thereof, a cover for said container, a second conduit open to atmospheric pressure and in communication with the first-named housing, a motor located within the last-named conduit, and supported independently of said cover and means drivingly connected with said motor to decrease the pressure in the top portion of the container to cause the liquid within the housing to be alternately expelled therefrom into the container.

5. A washing machine comprising a liquid receptacle, a housing within said receptacle extending vertically below and above the normal water level of the machine, the bottom portion of said housing increasing in cross sectional area as it approaches the bottom of the receptacle, said housing forming a conduit for the passage of air and vapor from the upper portion of the receptacle to the bottom thereof, and means within said housing to support said housing from the base of the receptacle, a motor within the hous-

ing and carried by said support, and suction means drivingly connected with said motor to decrease the pressure at the top of the receptacle to cause the liquid within the housing to be alternately expelled therefrom into the receptacle.

6. A washing machine comprising a liquid receptacle, a cover having a substantially air-tight connection with said receptacle, a housing within said receptacle and spaced apart from the walls thereof, a motor within said housing and supported from the base of the receptacle, means driven by said motor within said housing to reduce the pressure in the upper portion of the receptacle by removing air and vapor therefrom, said housing being formed to afford communication with the upper and bottom portions of the container and forming a conduit for the passage of air and vapor therebetween and means connecting said conduit with atmospheric pressure.

7. A washing machine comprising a liquid receptacle, a cover having a substantially air-tight connection with said receptacle, a housing axially located within said receptacle and spaced apart from the walls thereof, supporting means adapted to removably support the housing, a motor carried by said supporting means and located entirely within said housing, means at the top of said housing and drivingly connected to said motor to reduce the pressure in the upper portion of the receptacle, a conduit including said housing for the passage of air and vapor in communication with the receptacle below the normal water level, and means to bring said conduit into communication with atmospheric pressure.

8. A washing machine comprising a liquid receptacle, a housing within said receptacle, having its upper end spaced from the top wall of the receptacle and provided with an opening therein, and having its bottom end spaced apart from the bottom wall of the receptacle, and having an opening therein relatively larger than the opening in the top of the housing, said housing being adapted to form a conduit between the top and bottom portions of the receptacle, a motor within said housing, and suction means within said housing and drivingly connected to said motor to draw air and vapor from the top of the container into said housing thereby causing said housing to be alternately emptied and partially filled with liquid.

9. A washing machine comprising a liquid receptacle, a housing associated with said receptacle, said housing forming a conduit increasing in cross sectional area from the top to the bottom portions of the receptacle, a motor mounted within said housing, and means connected with said motor to draw air and vapor from the top of the receptacle, said housing being in communication with atmospheric pressure whereby said housing will be alternately emptied and partially filled with liquid.

10. A washing machine comprising a liquid receptacle having openings in its bottom and top faces, a cover adapted to close the opening in the top of the receptacle and having a substantially air-tight connection therewith, an upstanding housing within said receptacle, said housing extending above the normal liquid level of the receptacle and adapted to substantially close the opening in the bottom thereof, said housing being provided with relatively small openings adjacent its upper end and adapted to serve as the conduit for the entrance of atmospheric pressure into the receptacle, a second housing intermediate the first named housing and the receptacle and hav-

ing openings in its top and bottom walls, means within said last-named housing and supported independently of said cover for drawing air and vapor from the top of the receptacle, means including said housing for conducting said air and vapor to the bottom of the receptacle, and wherein said means is in constant communication with the first-named conduit.

11. A washing machine comprising a casing having openings in the bottom and top faces thereof, a cover adapted to close the opening in the top of the casing, a closure member for the bottom of the casing including an upstanding tube with its interior open to atmosphere at its base and having comparatively small openings in its side walls adjacent the upper end thereof, said tube and casing forming a liquid receptacle, a housing surrounding the tube, said housing spaced apart from the walls of the tube and the walls of the casing and forming a passageway therebetween, wherein the upper end of said passageway is in communication with the upper portion of the receptacle and the lower end of said passageway is in communication with the bottom portion of the receptacle, suction means supported independently of said cover member and arranged to draw air and vapor from the top of the receptacle, and wherein said passageway is in communication with the openings in the tube, thereby permitting atmospheric pressure to expel the liquid from the housing when the pressure on the liquid in the receptacle is decreased by the suction means.

12. A washing machine comprising a liquid container, a motor, a motor housing having openings adjacent the upper end thereof, said motor being mounted axially within the upper portion of the container and spaced apart from the top and bottom walls thereof, an extension for said motor housing extending to the bottom of the container and having its lower end in communication with atmosphere forming a conduit for the passage of air from without the container to said motor, a fan mounted within the motor housing and at the upper end thereof to draw air through said conduit and expel it through the openings in the motor housing, a second housing having openings in its top and bottom walls and surrounding the motor housing, suction means disposed in the last named housing and adapted to be propelled by said motor to reduce the pressure in the top portion of the container below atmospheric pressure, said last named housing forming a conduit for the passing of such withdrawn air from the top to the bottom of the container and being in communication with the motor housing, wherein when the motor is operated air or vapor will be drawn through the motor housing from atmosphere by the motor fan and discharged through the second named housing into the bottom portion of the container below the normal water level therein.

13. A washing machine comprising a liquid container, a motor, a motor housing having openings adjacent the upper end thereof, said motor being mounted axially within the container and spaced apart from the top and bottom walls thereof, an extension for said motor housing extending to the bottom of the container and having its lower end in communication with atmosphere thereby forming a conduit for the passage of air from without the container to said motor, a fan mounted within the motor housing and adapted to draw air through said conduit and expel it through the

openings in the motor housing, a second housing surrounding the motor housing and having openings in its side walls adjacent the upper ends thereof, and having its lower end in communication with atmosphere, a third housing surrounding the last named housing, having openings in its top and bottom walls, suction means disposed in the last named housing and adapted to be propelled by said motor to draw air from the top portion of the container, said last named housing forming a conduit for the passing of such withdrawn air from the top to the bottom of the container, and being in communication with said first-named housing, wherein when the motor is operated air will always be drawn through the motor housing from atmosphere by the motor fan and discharged either into the atmosphere through the second named housing or through the openings therein into the container itself.

14. A washing machine comprising a liquid container, a motor, a motor housing having openings in its side walls adjacent the upper end thereof, said motor being mounted axially within the container and spaced apart from the top and bottom walls thereof, an extension for said motor housing extending to the bottom of the container and having its lower end in communication with atmosphere, and forming a conduit for the passage of air without the container to said motor, a fan mounted within the motor housing and at the upper end thereof to draw air from said conduit and expel it through the openings in the motor housing, a second housing surrounding the motor housing and having openings in its side walls adjacent the upper ends thereof, said last named housing having its lower end in communication with atmosphere, a third housing surrounding the last named housing and having openings in its top and bottom walls, suction means disposed in the upper portion of the last named housing and propelled by said motor to draw air from the top portion of the container, said last named housing forming a conduit for the passing of such withdrawn air from the top to the bottom of the container, and being in communication with said first-named housing and a baffle interposed between the last named housings to cause air drawn through the first named housing from atmosphere by the motor fan and discharged through the openings in the second named housing to act downwardly on the liquid between the last two named housings.

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