Feb. 29, 1944. G. K. BALLENTINE 2,342,995

DISH-WASHING MACHINE

Filed April 25, 1942 2 Sheets-Sheet 1

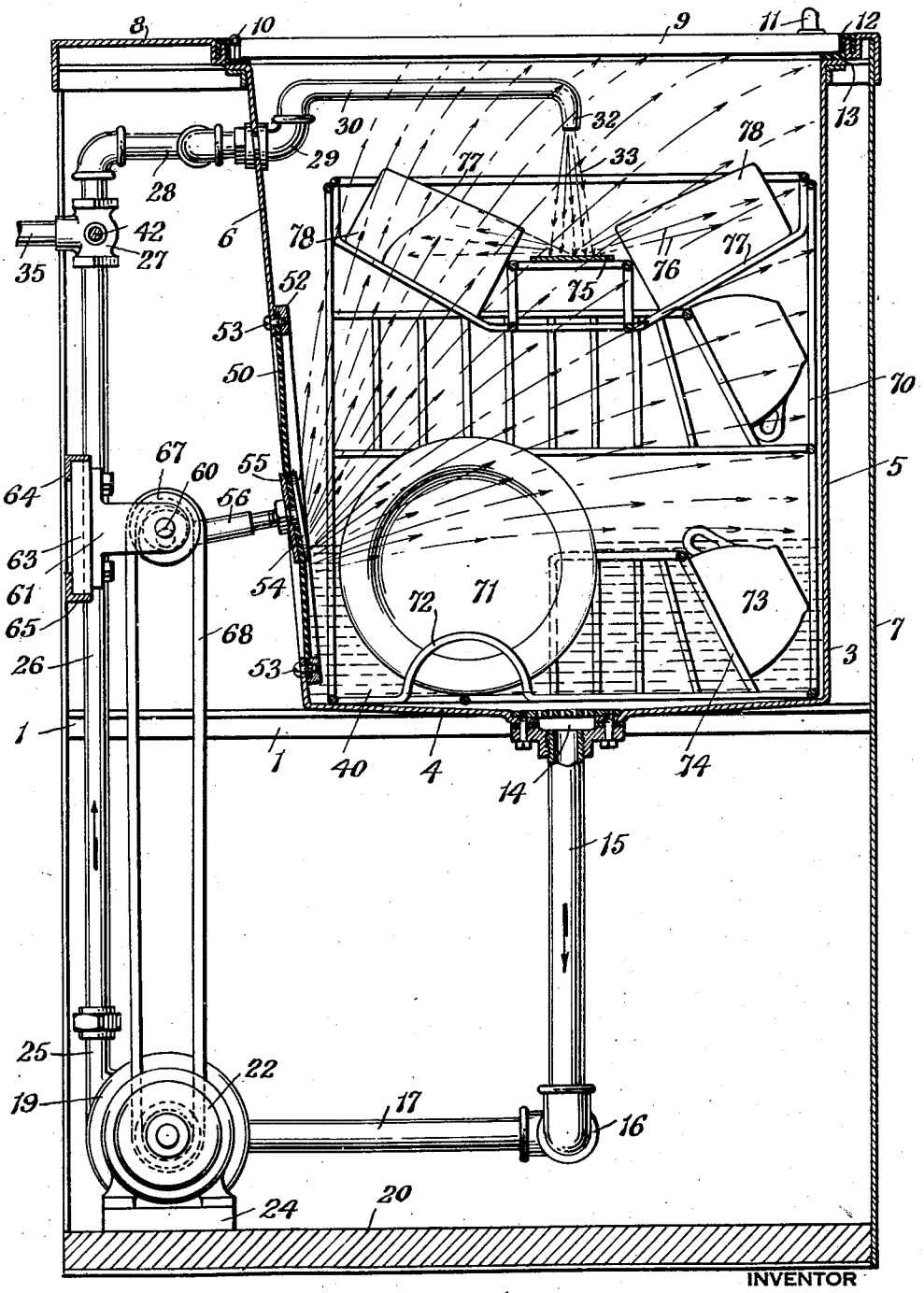


Fig. 1.

INVENTOR

George K. Ballentine

BY

Harry Ridgely

ATTORNEY

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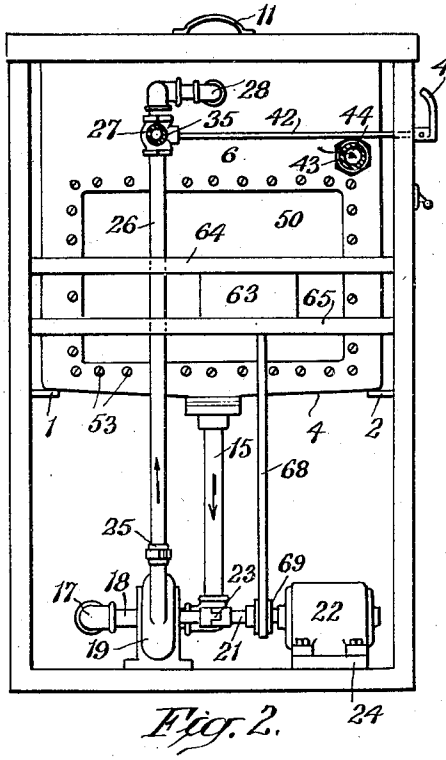


Fig. 2.

Fig. 3.

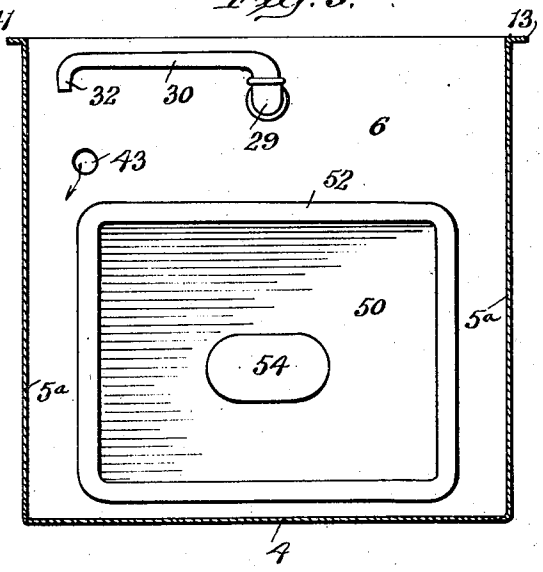
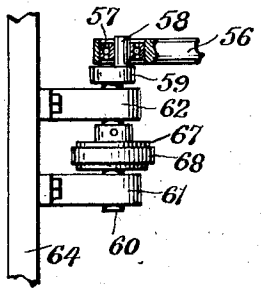


Fig. 4.



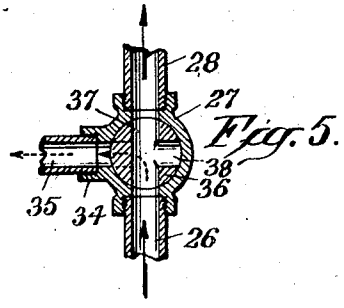


Fig. 5.

Fig. 6.

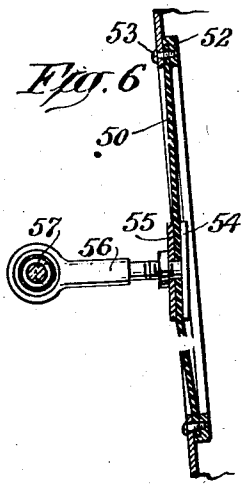
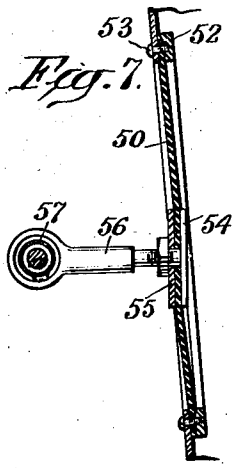


Fig. 7.



INVENTOR

George K. Ballentine

BY

Harry Rabinowitz

ATTORNEY

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DISHWASHING MACHINE

George K. Ballentine, Ridgewood, N. J.

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13 Claims. (Cl. 141—9)

This invention relates to dish-washing machines and particularly to those of the type disclosed in my Patent No. 2,152,455 dated March 28, 1939, wherein is disclosed a machine provided with one or more diaphragms vibrated or pulsated against the body of water to agitate the same.

One of the objects of the present invention is to provide a machine in which the water, or soap-and-water mixture, is agitated and splashed by means of a vibrated or rapidly flexed diaphragm moved in a novel and unique manner and operating in conjunction with a water-circulating means as well as radially-splashing means, whereby great efficiency in dish-washing is attained.

Another object of the invention is to provide means for maintaining a constant circulation of the water through the dish-containing chamber; to agitate and transversely splash the water in the chamber, thereby insuring rapid passage of the same over the dishes to be washed, and the imparting of friction thereover to insure complete and thorough cleansing of the dishes.

A further object of the invention is to provide in a water circulating system, means by which entry of the water at the top of the dish-containing chamber is had through a swingingly mounted spout, and to provide a splash plate disposed below the outlet of the spout whereby the water flowing therefrom will impinge against said splash plate and be directed radially therefrom into the open ends of glasses, cups or similar receptacles held on a support around the splash plate.

Another object of the invention is to provide a water-circulating pump and a diaphragm-vibrating means operated by a single motor placed lower in a sturdy frame and providing stability and reducing vibration to a minimum.

These and other objects are attained by the structure hereinafter described and more particularly pointed out in the claims appended hereto.

In the accompanying drawings, forming a part hereof, Fig. 1 is a vertical sectional view through a dishwashing machine constructed in accordance with the invention; Fig. 2 is a view of the rear of the machine with the rear cover plate of the casing removed to disclose the machinery; Fig. 3 is a vertical sectional view through the dish-containing compartment or chamber; Fig. 4 is a plan view, with parts in section, of the eccentric for vibrating the diaphragm; Fig. 5 is a sectional view through the valve for controlling the flow of water either into the dish compartment or out of the drainage tube; Figs. 6 and 7 are sectional views through the diaphragm indicating the manner in which the same is flexed by the operation of the eccentric.

With reference to Figs. 1 and 2 of the drawings, the apparatus is mounted in and supported by a suitable frame, preferably composed of a number of angle bars joined or connected by welding, so that a sturdy, vibration-proof supporting structure results. In the drawings, several cross bars 1 and 2, forming a part of the frame, are shown, the same supporting the dish-containing compartment or chamber 3, the same being provided with a bottom 4, front wall 5, side walls 5a, and a rear wall 6. The dish-containing compartment is formed with an open top so that the dish-supporting rack 10 and the dishes and other receptacles supported thereby can be placed in and removed from the compartment through the open top of the same. All of the apparatus, including the supporting frame, is contained within a casing or housing 7, preferably of enamelled sheet metal, and the top 8 of the housing, above the open upper end of the dish compartment, is provided with a hinged cover 9, pivoted at 10, and provided at the front end of the machine with a handle 11 by which the cover may be raised or lowered. When the cover is in its lowered position, as shown in Fig. 1, it seats upon the gasket 12, located on the rim or flange 13 of the upper end of the dish-compartment, so that the water contents of the dish-compartment or chamber are confined within the same during the operation of the machine.

The bottom 4 of the dish-containing compartment is provided with a centrally located outlet 14, coupled to the upper end of a vertically disposed pipe 15 having its lower end connected to an elbow 16 attached to a horizontally disposed piping 17 leading to the intake 18 of a pump 19 secured to the floor or base 20 of the machine. The pump is connected, through the coupling 23, to the shaft 21 of an electric motor 22 also secured to the floor or base 20 of the machine. Rubber or similar vibration-dampening material is preferably disposed between the motor and the floor 20, as indicated at 24. The outlet 25 of the pump 19 connects to the lower end of the vertically disposed pipe 26, which has its upper end connected to a three-way, manually-operated valve 27. One outlet of the valve 27 connects to piping 28, which is coupled to a nipple 29, leading through the rear wall 6 of the dish-containing chamber. Connected to the nipple 29 is a swingingly mounted spout 30, provided with a

downwardly directed free end 31, adapted, when the spout is in its extended position, as shown in Fig. 1, to direct a water flow 33 downwardly and into the dish-containing chamber at substantially the vertical center of the same. When it is desired to remove the dish rack, or the dishes supported thereby, out of the dish-containing chamber, the spout 30 may be swung out of the way and toward the rear wall 6 of the chamber, as clearly indicated in Fig. 3.

Valve 27 is also provided with an outlet 34 connected to a pipe 35, which may be connected to the sewer, or it may be a flexible tube capable of being directed into a sink. The valve body 36 is formed with the passages 37 and 38 so that by turning movement of the valve, communication may be established between pipes 26 and 28 or between the pipe 26 and the drainage pipe 37. Thus, when the valve is in position shown in Fig. 5, and the pipes 26 and 28 are in communication, the water, or soap-and-water mixture indicated at 40 in the dish-containing chamber, will be drawn by pump action out through pipe 15 and piping 16, through the pump and forced up through piping 26 and 27 and through spout 30 into the dish chamber, so that constant circulation of the soap-and-water mixture through the dish chamber is assured as long as the pump is in operation. When it is desired to drain the soap-and-water mixture completely out of the chamber, the valve 36 is turned to bring passage 38 into registration with pipe 26 and passage 37 into line with pipe 35. This will direct the flow out through the drainage tube 35 until all of the water has been drained out of the dish-containing chamber. Thus, the pump 19 is used for not only circulating the soap-and-water mixture through the dish-containing chamber but is also used for draining the same completely out of the machine. The valve head 36 is manually operated in the manner set forth by means of the handle 41, conveniently located at one side of the machine casing, and connected to the head of the valve by means of the rod 42.

For initially filling the dish-containing chamber with the requisite amount of water, a filler opening 43 is provided in the rear wall 6 of the dish-containing chamber, said opening being connected to a faucet, or other source of water supply by means of flexible tubing 44 or the like.

At the lower portion of the rear wall 6 of the dish-containing chamber is provided a diaphragm 50, which is preferably composed of rubber or a non-corrosive and non-deteriorating rubber substitute. The diaphragm is flexible and resilient and forms a substantial portion of the rear wall of the dish compartment or chamber. The diaphragm is clamped around its marginal edge to the edge portion of the opening in the rear wall of the chamber by means of the annulus 52 and attaching screws 53 so that a water-tight joint between the diaphragm and the wall 6 of the dish-containing chamber is secured.

Substantially at its center, the diaphragm is attached to vibrating or flexing means, the same consisting of two rigid plates 54 and 55 between which the diaphragm is clamped. Extending rigidly from these plates is the operating arm 56, provided at its end with the bearing 57, engaging the pin 58 of the eccentric 59. This connection between the end of the arm 56 and the eccentric is such that said end of the arm is moved through a circular path. Since the opposite end of the arm 56 is rigidly or fixedly connected to the diaphragm, the effect of such movement is to flex or vibrate the diaphragm upwardly, forwardly, downwardly and then backwardly, repeating this over and over with extreme rapidity. This rapid flexing movement of the diaphragm causes it to impinge against the soap-and-water mixture 40 and not only agitate the body of the water, but to also splash the upper portion of the same upwardly and diagonally across the dish-containing compartment toward the top and front wall of the same, as indicated by the plurality of dotted lines in Fig. 1.

The eccentric 59 is mounted on the short shaft 62, rotated in the bearings 61 and 62, secured in properly spaced relation on the plate 63 attached to the cross members 64 and 65 of the frame. A pulley 67 is secured on the shaft 60, said pulley being driven by the belt 68 which extends downwardly and passes around the pulley 69 on the shaft 21 of the motor 22.

In Fig. 1 the dish rack 70 is disclosed. The same is preferably composed of non-corrosive wire to permit unrestricted passage of the water between the dishes during the washing operation. Plates 71 and similar dishes, are preferably held upright between wire supports 72, while cups 73 and like receptacles are held angularly by supports 74 to permit the ready entry of the washing water inside of them. The dishes, cups and other articles to be washed are arranged to be supported in the rack in several tiers, as clearly shown in Fig. 1 and in spaced relation, so that the water may readily pass between the various articles supported in the rack. At the top, the rack is provided with a splash plate 75 which may be in the form of a disk and is so located that when the spout 30 is extended in the manner shown in Fig. 1, the downwardly-directed end 32 of the same will be positioned directly above the splash plate 75 and the flow of water 33 from the spout will impinge against the splash plate and be directed radially thereby as indicated at 76 in Fig. 1. The rack is provided with suitable supporting wires 77, arranged around the splash plate 75 for the support of drinking glasses 87, cups or other receptacles which can be held on said supporting wires with their open ends directed toward the splash plate 75. The water that is splashed radially by impingement against the splash plate 75 will be thus directed into the open mouths of the receptacles 78 to thereby reach the interior of these receptacles and cleanse the same.

From the foregoing, the operation of the improved machine will be readily understood. In setting the machine in operation, the dish-containing chamber 1 is first partly filled with the soap-and-water mixture, the water being permitted to flow into and accumulate in the chamber through the opening 43. The dish-containing chamber is preferably filled with the soap-and-water mixture to a level slightly below the transverse center line of the diaphragm 50 or slightly below the diaphragm-operating arm 56. I have found that with this amount of water in the dish-containing chamber, a completely effective operation is assured and a vigorous agitation and splashing of the water by the vibratory movement of the diaphragm occurs. When the dish-containing chamber has been filled to the proper level, the flow of water through the inlet 43 is shut off, and the motor 22 is set in

operation by manipulation of the switch 80 conveniently provided on the outside of the casing adjacent to the valve operating handle 41. If the valve 27 is in the proper position, or as shown in Fig. 5, the water will begin circulation, as previously explained, the same being drawn out of the outlet opening 14 and returned to the dish-containing chamber through the inlet spout 32. The rapid vibrations or pulsations of the diaphragm through the mechanism heretofore described, will not only vigorously agitate the body of water 40 contained in the dish-containing compartment but will also splash the water as indicated by the dotted lines in Fig. 1, across the compartment and between the dishes and other receptacles held in the dish rack. The water entering through the inlet spout 32 impinging against the splash plate 75 will be directed radially thereby and will be splashed into the interior of and around the outside of the receptacles in the upper tiers of the rack and particularly those supported in the rack around the splash plate 75. Thus, the soap-and-water mixture is not only in constant circulation through the dish-containing chamber, but is vigorously agitated and splashed, the co-operating action of circulation and splashing tending to cause the soap-and-water mixture thus moved to frictionally operate against the surfaces of the dishes and cleanse the same.

The pump indicated at 19 is preferably provided with an impellor of such a nature that any food particles removed from the dishes by the washing operation and drawn into the pump through piping 15 and 17 will be pulverized by it so that finally, when the soiled soap-and-water mixture is drained out of the machine through the drainage tube 35, all of the food particles removed by the washing operation will also pass out of the machine through the drainage tube.

While I have shown and described an embodiment of the invention, it is obvious that the same is not to be restricted thereto, but is broad enough to cover all structures coming within the scope of the annexed claims. Various modifications may be readily made, particularly since the mechanism of the machine is adaptable of modification to machines of various shape and size and for the washing of specific articles, dishes or other receptacles.

What I claim is:

1. In a dish-washing machine, a dish-containing chamber, water agitating means comprising a flexible diaphragm constituting at least a part of a wall of said chamber, means for flexing the diaphragm comprising a connecting rod rigidly and non-pivotally secured at one end to the diaphragm and having its other end connected to an eccentric, and means for operating the eccentric to cause the same to move the end of the arm engaged by it through a circular path of movement.

2. In a dish-washing machine, a dish-containing chamber, a wall portion consisting of a flexible diaphragm, a plate secured to and wholly supported by said diaphragm, an arm rigidly and non-pivotally secured at one end to said plate, and eccentrically operating means connected to the other end of said arm for moving the last mentioned end of the arm through a circular path of movement.

3. In a dish-washing machine, a dish-containing chamber, a substantially vertical wall portion consisting of a flexible diaphragm, means for flexing said diaphragm to cause the same to splash the water contents of the chamber upwardly and towards an opposite wall of the chamber, said means comprising a rigid element fastened to the diaphragm only and having a non-pivotal rigid extension, and an eccentric to which said extension is connected and which causes the diaphragm to be flexed upwardly, downwardly and forwardly.

4. In a dish-washing machine, a dish-containing chamber, a water inlet and an outlet for said chamber, a pump interposed between the outlet and inlet for constantly circulating water through the chamber, splash means against which water from the inlet is impinged to thereby radially direct said water flow through the chamber, and co-operating water-agitating means for operation on the circulated water flow comprising a flexible diaphragm constituting a wall portion of the chamber and carrying a rigid extension attached at one end to an eccentric for flexing the diaphragm to cause the same to splash the water contents of the chamber upwardly and toward the opposite side wall of the chamber.

5. In a dish-washing machine, a dish-containing chamber having a wall portion composed of a flexible diaphragm, a plate secured to and wholly supported by said diaphragm, an arm constituting a rigid non-pivotal extension of said plate, said arm having its end connected to eccentric means for moving said end of the arm through a circular path whereby the diaphragm is caused to be flexed upwardly, downwardly and forwardly.

6. In a dish-washing machine, a dish-containing chamber having a wall portion composed of a flexible diaphragm and a rigid arm having one end wholly and non-pivotally supported by the diaphragm, said arm extending from the diaphragm and having its other end connected to an eccentric.

7. In a dish-washing machine, a dish-containing chamber having a rear wall portion composed of a flexible diaphragm, an arm rigidly and non-pivotally attached to said diaphragm, an eccentric for oscillating one end of the arm to thereby flex the diaphragm, a shaft carrying said eccentric, a motor having a shaft, drive means operative from the motor shaft for operating the eccentric shaft, a pump driven by the motor shaft, an outlet pipe leading from the chamber and connected to the inlet of the pump, and the chamber having an inlet connected to the outlet of the pump.

8. In a dish-washing machine, a frame, a dish-containing receptacle mounted in the upper part of said frame, a base in the frame below the dish-containing receptacle, a motor mounted on said base, a diaphragm forming a wall portion for the receptacle, a rotating shaft supported in the frame adjacent to the diaphragm, means for driving said shaft from the motor, an eccentric driven by said shaft, an extension rigidly and non-pivotally projecting from the diaphragm and driven by the eccentric, and means for circulating a water flow through the dish-containing receptacle, said means including a pump mounted on the base and driven by the motor.

9. In a dish-washing machine, a dish-containing receptacle having a wall portion composed of a flexible diaphragm, a pair of plates between which the diaphragm is clamped, an arm rigidly and non-pivotally extending from one of said plates, and means at one end of the arm for oscillating said end of the arm through a substantially circular path.

10. In a dish-washing machine, a dish-containing chamber, outlet means at the bottom of the chamber for drawing water therefrom, inlet means at the top of the chamber for delivering the water into the chamber, a vibrated and vertically disposed diaphragm within the chamber located between the outlet and inlet means for laterally splashing and agitating the water on its flow from inlet to outlet, an arm rigidly secured at one end to said diaphragm and means at the other end of the arm for moving said end through a substantially circular path.

11. In a dish-washing machine, a casing having its upper portion provided with a dish-containing compartment, an outlet in the bottom of said compartment, a pump to which the outlet is connected, an inlet at the top of the compartment, the delivery end of the pump being connected to said inlet, a discharge pipe, a valve to which said discharge pipe is connected, said valve being connected to the delivery end of the pump and adapted for manual operation to cause water drawn from the compartment by the pump to be directed either through the inlet of the compartment or into the discharge tube, a motor within the casing and having driving means for operating the pump, a flexible diaphragm constituting a wall portion of the compartment, an arm wholly and rigidly supported at one end by the diaphragm and having its other end movable through a circular path by an eccentric, means for driving said eccentric from the motor to thereby cause the diaphragm to be vibrated and laterally splash the water in the compartment, removable means in the compartment for supporting dishes in several superposed tiers, and a splash device on the upper tier located adjacent to the inlet for radially splashing water flowing from said inlet, said upper tier being provided with means adjacent to the splash device for supporting articles to be cleansed by splashing water from said device.

12. In a dish-washing machine, a chamber for holding dishes to be washed, a dish-containing basket in said chamber having tiers in which the dishes are stacked, a water inlet situated over the top of said basket and directing a water flow downwardly and into the basket, said basket having an upper tier including inclined rack elements for supporting a plurality of open-mouthed receptacles radially around the center of the upper tier with their mouths directed toward the center, and a fixed splash plate on said upper tier at the center thereof, said plate being elevated above the rack portions and surrounded by the open mouths of the receptacles carried thereby and located directly below the water inlet whereby the flow therefrom impinging against the splash plate will be directed into the open mouths of the receptacles to cleanse the interiors of said receptacles.

13. In a dish-washing machine, a dish-containing chamber, a vertically disposed wall portion including a flexible diaphragm, means connected to said diaphragm for flexing it upwardly, forwardly, downwardly and backwardly against a body of water contained in said chamber, with said body of water disposed below the connection of the diaphragm to its operating means, whereby said diaphragm is operative against a relatively small body of water.

GEORGE K. BALLENTINE.