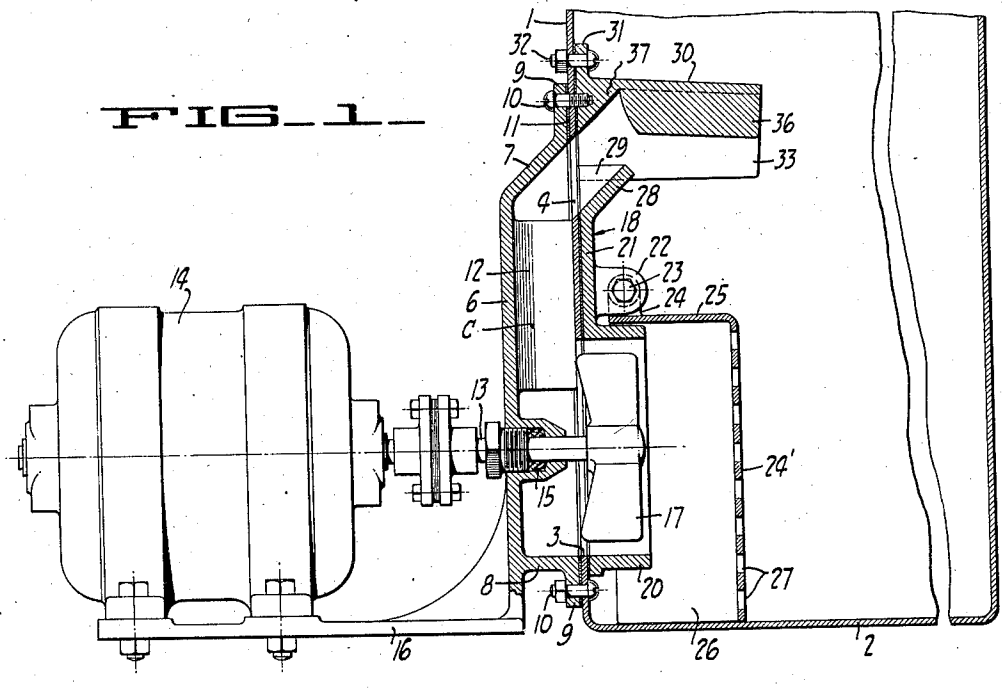
June 23, 1942. W. R. ADAMS 2,287,591

DISHWASHING APPARATUS

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FIG. 1



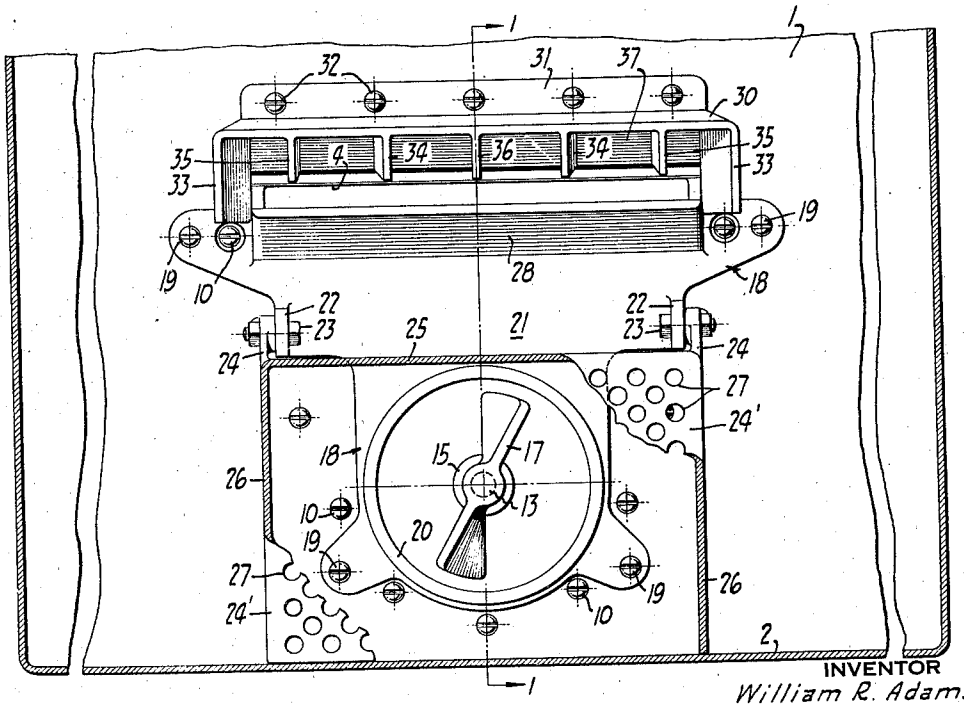


FIG. 2

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DISHWASHING APPARATUS

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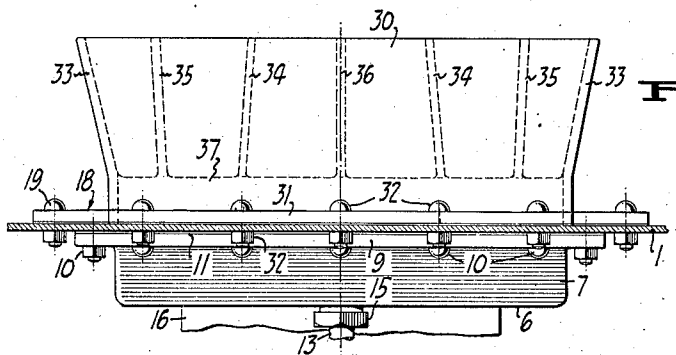


FIG_4_

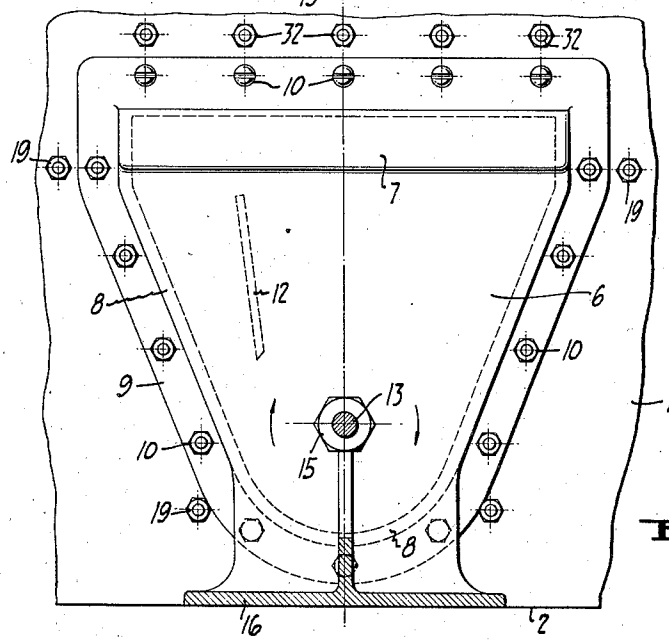


FIG_3_

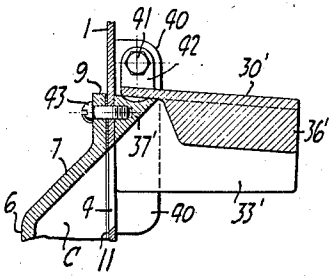


FIG_6_

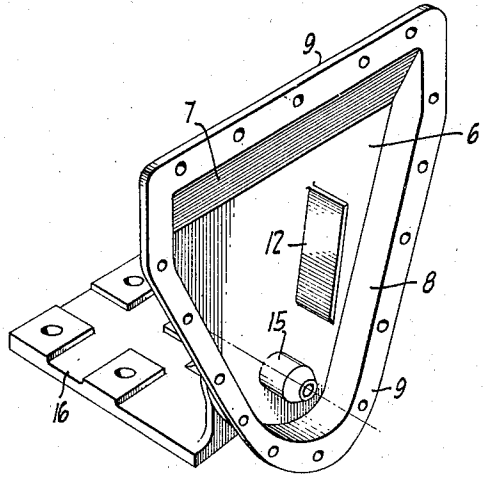


FIG_5_

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2,287,591

DISHWASHING APPARATUS

William R. Adams, San Francisco, Calif.

Application June 3, 1941, Serial No. 396,383

14 Claims. (Cl. 259—95)

This invention relates to dishwashing machines.

An object of the invention is to provide a water circulating apparatus on one of the vertical side walls of a conventional tank, in which tank water and dishes are to be placed, and which apparatus is so arranged and constructed as to withdraw water within said tank from the bottom portion thereof through said wall, and to move and conduct such water upwardly over the outer side of said wall in a conduit, one wall of which is said side wall and the remaining walls of which is an un-cored channel member, and to then eject the water so moved back into the tank at a point spaced above the bottom.

Another object is to provide a water circulating apparatus on a vertical side wall of a tank, in which water and dishes are to be placed, and which apparatus includes an electric motor, and an impeller driven thereby, and an open sided, un-cored, channel-like member, all adapted to be removably secured as a unit to said side wall in a position in which the said member cooperates with said side wall to form a vertically extending conduit outside said side wall that communicates at its upper and lower ends with the interior of the tank through vertically spaced openings in said side wall, and through the lower of which openings the said impeller is adapted to be moved to a position within said tank when the said member is secured on said side wall, thus enabling the removal of the motor, impeller, and channel member as a unit, from said side wall outside said tank without interference with the dishes or any structure within said tank.

Another object is an improved construction for more efficiently circulating the water within a dishwashing tank for washing the dishes in said tank, than heretofore.

A still further object is dishwashing apparatus that is more compact, and more economical to make and install than heretofore, and the several major parts of which may be removed from a dishwashing tank independently of each other, and which apparatus provides for greater dish capacity in a tank than heretofore.

Other objects and advantages will appear in the specification and drawings.

In the drawings,

Fig. 1 is a vertical sectional view taken through my device installed on a side wall of a tank.

Fig. 2 is a view of the device of Fig. 1 as seen from inside the tank, with the screen on the device partially broken away and partially in section.

Fig. 3 is an elevational view of the device of Fig. 1 as seen from outside the tank, with the motor removed for clarity and the motor shaft in section.

Fig. 4 is a plan view of the device of Fig. 1.

Fig. 5 is a perspective view of one element of my circulating device that is outside the water tank as seen from the inside of said element that is next to the tank.

Fig. 6 is a fragmentary sectional view of a modified form of water deflector in my device.

This invention is an improvement of my dishwashing machine shown in my United States Letters Patent No. 2,205,113 dated June 18, 1940, wherein the major portion of the apparatus for circulating the water in a tank was disposed within the tank.

Heretofore various other apparatus has been designed to be installed within a tank for circulating the water in much the same manner as in the present invention, but in practically every instance the conduit in the apparatus through which the water is circulated is a core in a housing in which the entire housing including the intake and discharge nozzle is within the tank, and the motor is outside the tank with a stuffing box in the wall of the tank for the motor shaft. Thus, any screens, or desirable water deflectors that may be used in connection with these prior devices would project still further into the valuable space within the tank, decreasing the capacity of the latter. Cored housings are objectionable due to their relatively high cost and uncertainty of uniformity in the core. Also in most prior attempts, construction has been adopted that make it impossible to remove the motor, with the impeller as a unit from outside the tank, without either removing the stuffing box or detaching the other elements of the apparatus that may be inside the tank, which latter elements seldom, if ever, require removal.

With my device, the above objections are overcome, since the impeller and motor are removable, together with the stuffing box, as a unit from outside the tank, without removing the deflector or impeller cage and screen from within the housing.

Other details, such as a water flow control means insuring an even ejection of water into the tank, and a swinging screen on the impeller cage, are important features in my dishwashing apparatus, as will be hereinafter described in detail.

In detail, the dishwashing tank itself, illustrated in the drawings, comprises vertically dis-

posed side walls, one wall 1, of which, carries my water circulator and deflector. The tank has a bottom 2, and may or may not have a top.

The wall 1, centrally between the adjacent side walls, is formed with a relatively large circular opening 3 adjacent the bottom, and a relatively long, horizontally extending opening 4 spaced above opening 3. This upper opening 4 ordinarily extends the major distance between the side walls of the tank that are adjacent wall 1.

The opening 3 will be termed the inlet opening, since water within the tank is forced through this opening to outside the wall 1, while opening 4 will be termed the outlet opening, since the water forced through opening 3 is ejected back into the tank through opening 4. A conduit outside wall 1 conducts the water upwardly from inlet 3 to outlet 4, hence the inlet 3 is the inlet to said conduit and outlet 4 is the outlet from the conduit.

Said conduit, as illustrated, comprises a body member cast or stamped from metal, (preferably cast) to provide a flat, vertical wall 6, when in normal position (Fig. 5), which wall is disposed parallel with the wall 1 of the tank and spaced outwardly of the outer side of said wall. This plate is generally triangular in shape with the base edge uppermost and horizontal and the apex rounded to conform in curvature to the curve of the lower opening 3 in said wall. The upper edge of plate 6 is provided with an extension 7 that extends slantingly toward wall 1 and over the upper opening 4 in said wall. A flange 8 extends from the other edges of plate 6, perpendicularly thereto; toward wall 1 and a planar flange 9 extends outwardly of flange 8 and extension 7, which latter flange is parallel with wall 1 and is adapted to be secured tightly to said wall by bolts 10 extending through registering openings therein and in wall 1. A gasket 11 is disposed between said flange 9 and wall 1 to prevent leakage of water. A baffle 12 is integrally connected with plate 6 and extends at right angles thereto between said plate and wall 1. This baffle is elongated and is at one side of a vertical medial line bisecting plate 6 and extends at a slight incline diagonally upwardly relative to such medial line, as best indicated in Fig. 3.

It will be seen from the foregoing description that the wall 6 and flanges 8 and extension 7, together with the wall 1 of the tank, form a conduit C outside the wall 1 of progressively increased, horizontal width in the plane of wall 1 from inlet 3 to outlet 4.

The wall 6 is formed with an opening coaxial with opening 3, through which horizontal drive shaft 13 of a motor 14 extends, a packing gland 15 being provided in the said opening in wall 6 for said shaft. A bracket 16, preferably formed integrally with wall 6, carries said motor 14.

The drive shaft 13 extends through the opening 3 into the dishwashing tank and is provided at its outer end with an impeller, or propeller, 17. Thus upon rotating the impeller 17 in a clockwise direction, as seen in Fig. 3 the water in the tank will be drawn through opening 3 into the conduit C and will be ejected through outlet 4 back into the tank.

The tendency of the impeller is to throw the major portion of the water in conduit C to the right hand side of said conduit (Fig. 3) but the baffle 12 prevents this, by being in a position to conduct the water in said conduit uniformly to all points along outlet 4. The baffle is, therefore, highly important to the successful operation of the dishwashing machine of the type herein described.

Within the dishwashing tank, I provide a vertically disposed plate 18, which plate is bolted to wall 1 independently of the plate 6, by bolts 19. This plate 18 carries a cylindrical, vertically disposed ring 20 at its lower end within which the impeller 17 is positioned. The impeller is just inside the wall 1, and thus the ring, which is only slightly wider than the impeller, is disposed practically adjacent wall 1.

The plate 18 at its lower end is of a horizontal width substantially the diameter of ring 20, but at a level just above said ring, it is formed with a substantially wider portion 21 carrying at its ends horizontally spaced ears 22 formed with coaxial openings for bolts 23 that extend through said ears and through the registering openings in ears 24 that extend upwardly from a perforated screen member adapted to be suspended from said bolts over the open inner end of ring 20.

This screen member comprises a vertical, rectangular, perforated plate 24' that extends over the inner end of ring 20 to about the bottom 2 of the tank, and which plate extends laterally a substantial distance past opposite sides of ring 20. An upper, horizontally disposed, imperforate plate 25 formed integrally with the perforated plate 24', extends to portion 21 above ring 20, and carries the ears 24 through which bolts 23 extend. Side plates 26 extend from the lateral edges of plate 24' to the wall 1 of the tank and to the lateral edges of plate 25. The total area of the holes 27 in plate 24' is at least equal to the cross-sectional area enclosed by ring 20, but preferably greater, thus insuring a full flow of water through the ring 20 equal to the capacity of the impeller to draw water through the ring and opening 3, allowing for the normal resistance to flow through openings 27. To clear the impeller of any obstruction, the plate 24' together with side plates 26 and top plate 25, may be manually swung upwardly on bolts 23, and will then fall by gravity to its position shown in Figs. 1 and 2. Thus screen is carried with plate 18 as a unit, but can be removed from plate 18, if desired, without removing said latter plate.

The upper margin 28 of plate 18 is slanted from the lower edge of opening 4 into the water tank at an angle so it will parallel the portion 7 of the plate 6 that is outside the tank.

Parallel end pieces 29 at the ends of margin 28 close the space between the tank wall 1 and the margin 28.

It will be seen that portion 7 and margin 28 thus cooperate to form an upwardly inclined, horizontally elongated continuation of conduit C that will direct water forced upwardly in conduit C into the tank in an upward direction. The margin 28 is not absolutely necessary, but is desirable, since the portion 7 of plate 6 which is outside the tank, functions to deflect the water in about the same manner as the water would be deflected in the absence of margin 28, but said margin tends to hold the water so deflected in a more concentrated stream.

Above plate 18 and above the level of opening 4 is a generally horizontally disposed deflecter plate 30 formed with a flange 31 extending upwardly from its edge adjacent tank wall 1. This flange is provided with openings for bolts 32 that secure the plate 30 to the wall 1 in proper position. Plate 30 is inclined slightly downwardly from wall 1, and is provided at its end edges with

depending flanges 33 that extend divergently outwardly from wall 1 and from the vertical end edges of opening 4 in said wall. The lower edges of flanges 33 terminate at a level below the upper edge of marginal portion 28 of plate 18.

Between the flanges 33 is a horizontal row of horizontally spaced fins depending from plate 30, which fins are only about half the vertical width of flanges 33, and which fins extend transversely of the plate 30.

The most important of these fins are those designated 34, (Fig. 4) that are about equally spaced from each other and from flanges 33. These fins extend slightly convergently from wall 1 of the tank in direction transversely of plate 30, and function to cause the desired distribution of the water ejected through outlet 4 into the tank, since it is highly desirable that there be a relatively strong flow of water into the tank centrally thereof between the ends of outlet 4.

About equally spaced between each fin 34 and the flange 33 adjacent thereto is another fin 35, similar to fins 34. The fins 35 may be about parallel with a vertical plane at right angles to plate 18, or 30, bisecting the latter, while a central fin 36 in said plane may be provided between fins 34. In some instances it is preferable that fins 35 extend slightly divergently from their ends adjacent wall 1, but good results are obtainable in all instances where these fins are parallel.

Between the end edges of flanges 33 and 34, 35, 36 and wall 1 of the tank, and positioned above opening 4 between plate 30 and the upper edge of said opening, is a horizontally extending guide strip 37 that is substantially triangular in cross-section with one side integrally joined to plate 30, and a second side against wall 1, or a gasket that is between wall 1 and said side, and the third side is in upward continuation of the side of portion 7 on plate 6, so that water passing over the inner side of portion 7 will be guided into the open rear ends of the channels formed by the flanges 33, and fins 34 to 36, for guiding between said flanges and fins into the tank in direction so as to cause a generally fan shaped stream of substantially uniform volume at any point therealong, to be ejected into the tank from conduit C.

The normal water level in the tank, for ordinary dishwashing, is preferably above the lower edges of fins 34 to 36 and below the plate 30, although it may be at about the level of plate 30 or at about the level of the lower edge of opening 4.

The plate 30 with the parts hereinabove described as formed therewith, may be installed or removed from the tank and from plates 6 and 18 independently of the latter, although the stud bolts extending through the upper flange 9 adjacent portion 7 of plate 6 may be threaded into strip 37, if desired. However, bolts 32 function to support the plate 30 in position irrespective of said stud bolts.

From the description, it will be seen that the plate 6 with its bracket 16 and the motor therein, may be removed from outside the tank without disturbing the packing gland 15, and the propeller 17, and without disturbing plates 30, 18 or the screen carried on the latter.

The fact that conduit C is outside wall 1, enable propeller 17 to be within the tank almost in the plane of said wall, thereby permitting structure, such as plate 30, and screen 24 to be adequately formed within the tank for properly controlling the water, without sacrifice of space for the dishes. Such control cannot be adequately obtained, together with the advantages of assembly provided by my structure, where a cored conduit is disposed within the tank, to circulate the water, and where removal of the motor results in every element of the circulating apparatus being freed from the tank. Also, an efficient and proper seal for the drive shaft of the motor is difficult and not as satisfactory, where the packing gland passes through the relatively thin wall of the tank, and most dishwashing tanks have walls of galvanized sheet metal or the like, which is amply adequate to support elements if secured thereto at relatively widely spaced points, as in my invention.

In Fig. 6, I show a modified form of deflector plate 30', corresponding in function to plate 30, which plate has depending fins 34' to 36' and flanges 33' corresponding to these previously described.

Instead of securing this plate rigidly to wall 1 of the tank, I secure vertically extending, horizontally spaced angle strips 40 to wall 1 and pivot plate 30' adjacent its end edges to said strips by bolts 41 extending through one of the flanges of said strips and coaxial openings in ears 42 that extend upwardly from plate 30' adjacent wall 1.

The strip 37' (Fig. 6) that corresponds in its function to strip 37, is separate from plate 30 and is secured to the wall 1 of the tank in any suitable manner by bolts 43 or by welding. Thus upon loosening the nuts on bolts 41, the plate 30' with its fins 33' and flanges 34' to 36' carried thereon, may be swung to any degree of inclination relative to wall 1 and then secured rigid in adjusted position by tightening said nuts.

The lower ends of the angle strips 40 extend below the flanges 33' to function in generally the same manner as end pieces 29 in Fig. 1.

With the above structure, the marginal portion 28 may or may not be provided.

In operation, the apparatus hereinbefore described insures an even, strong, and relatively high volume flow of water through outlet 4 into the tank, and so distributes the flow in the tank as to effectively clean dishes in the latter that may be positioned anywhere between the opposed walls adjacent wall 1, and this result is accomplished with relatively low power and without complicated moving or stationary parts, or structure involving cored castings, and the maximum capacity of the tank for dishes is maintained.

Also, as will be seen in Fig. 1 the interior of the tank can be kept very clean, since the ring 20 is spaced above bottom 2 of the tank, and plate 18 is tightly sealed against wall 1 edges by spaced bolts 19, while in those instances heretofore where cored castings are supported in the tank, either by part of the packing gland around the motor shaft or by a projection from a cored housing extending outwardly through the tank, the dirt, grease, etc., will accumulate between such housing and the tank wall.

The removal of plate 18, with ring 20, and deflector 30, from the wall 1 independently of plate 6 and the motor, finds its greatest convenience where different sized rings 20 may be substituted for correspondingly sized propellers, or where different width deflectors may be installed independently of either plate 6 or plate 18. Any desired combination of elements for a particular job may be obtained with my construction without necessitating an entirely new unit, as has

heretofore been necessary. A deflector 30 of increased length and having proportionally similar spacing between fins, will produce a wider distribution of water than that shown, without altering any of the other elements and without removal of the other elements from the tank.

Having described my invention, I claim:

1. In a dishwashing tank, for water and dishes, having side walls and a bottom wall; a generally vertically extending conduit outside said tank, one of the walls of which conduit comprises one of said side walls; an inlet at the lower end of said conduit, and an outlet at the upper end of said conduit respectively formed in said one of said side walls and communicating between the interior of said tank and said conduit; a vertically disposed propeller within said tank adjacent said inlet and coaxial therewith for moving water from the tank through said conduit from the said inlet to said outlet; and a motor outside said tank and said conduit connected with said propeller for rotating the same to cause said movement of said water.

2. In a dishwashing tank, for water and dishes, having side walls and a bottom wall; a generally vertically extending conduit outside one side wall of said tank, one of the walls of which conduit comprises said side wall; a circular inlet at the lower end of said conduit, and a horizontally elongated outlet at the upper end of said conduit, respectively formed in said side wall and communicating between the interior of said tank and the upper and lower ends of said conduit; a vertically disposed propeller within said tank adjacent said inlet and coaxial therewith for moving water from said tank through said conduit from said inlet to said outlet; means outside said conduit for rotating said propeller to cause said movement; and means within said conduit for guiding the water so moved through said conduit in substantially equal volumes to various points along said outlet.

3. In a construction as defined in claim 2, said last mentioned means comprising a partition unequally separating said conduit into separate passageways each communicating at its opposite ends with said inlet and outlet.

4. In a construction as defined in claim 2, the said tank being rectangular and the said outlet extending the major distance between the opposed walls adjacent said one wall.

5. In a construction as defined in claim 2, means within said tank forming a continuation of said conduit at the upper end of the latter and extending into said tank in an upwardly extending direction; and a deflector plate carried by said one wall extending over said continuation of said conduit and inwardly therefrom into said tank and positioned to deflect the water ejected from said continuation downwardly.

6. In a dishwashing tank for water and dishes, having side walls and a bottom wall; a generally vertically extending conduit outside one side wall of said tank, one of the walls of which conduit comprises said side wall; and inlet at the lower end of said conduit adjacent said bottom wall, and an outlet at the upper end of said conduit, respectively formed in said side wall and communicating between the interior of said tank and said conduit; the upper end of the wall of said conduit disposed outwardly of said side wall being inclined downwardly and outwardly from the upper edge of said outlet for directing water slantingly upwardly through said outlet into said tank and means within said tank arranged and adapted to deflect the water, so directed, generally downwardly in said tank; a propeller adjacent said inlet arranged and adapted to move the water in said tank through said conduit to said outlet; and a motor outside said conduit for rotating said propeller for causing said movement.

7. In a construction as defined in claim 6, said inlet being circular, and a cylindrical ring within said tank secured to said side wall within which said propeller is positioned; said ring and circular inlet being coaxial, and said outlet being horizontally elongated.

8. In a construction as defined in claim 6, the remaining walls of said conduit being integrally formed as a unit; means removably securing said remaining walls to said one side wall; means carried by said remaining walls supporting said motor as a unit therewith for removal of the said remaining walls and motor from said side wall as a unit; said inlet being of greater diameter than said propeller, and a drive shaft on said motor to one end of which said propeller is secured, whereby upon removal of said conduit and motor from said side wall, the said propeller will be carried through said inlet with the motor from interference by said side wall.

9. In a water circulating device for a dishwashing tank that has a generally vertical, lateral side wall formed with a pair of vertically spaced openings therein, a body member formed with a single, outwardly opening recess in one of the sides thereof, the free edges of the sides of said recess being disposed in a common plane to fit against the outer surface of such lateral side wall outwardly of such pair of openings, the shape of the open side of said recess being generally that of an equilateral triangle when viewed from said open side with one of the sides of said recess defining the base of such triangle and with the two remaining sides extending convergently to joining relation at a point opposite said base to define the remaining sides of said triangle, the bottom of said recess being formed with an opening adjacent the convergent ends of said remaining sides adapted to rotatably pass an impeller shaft therethrough, and means for securing said body member to such lateral side wall with its open side directed toward such lateral side wall and with the side of said recess defining said base uppermost relative to the said remaining sides.

10. In a construction as defined in claim 9, the side of said recess defining said base extending slantingly outwardly from the bottom of said recess to the free edge of said last mentioned side, and the adjoining end portions of said remaining sides of said recess being substantially concentric with said opening for said shaft.

11. In a construction as defined in claim 9, the bottom of said recess having a rib projecting therefrom into said recess, said rib extending along said bottom generally radially relative to the axis of the opening for said shaft, and the outer edge of said rib terminating substantially at the common plane in which the free edges of the sides of said recess are disposed.

12. A dishwater including a tank having a generally vertical, lateral side wall, a water circulating device for water in such tank comprising; a body member secured to said lateral side wall and projecting outwardly therefrom relative to the inside of said tank, said body member being formed with a recess in the side thereof facing said tank with the edges of said recess being substantially co-planar with said

lateral side wall, and the outline of said recess as defined by said edges thereof and by its sides extending from said edges being generally that of an equilateral triangle having its base uppermost and generally horizontal and with the two other sides extending convergently downwardly; an opening formed in the bottom of said recess adjacent the convergent ends of the downwardly extending sides thereof; a substantially horizontal impeller shaft rotatably extending through said opening having an impeller secured thereon adjacent the side of said bottom that faces said lateral side wall; said lateral side wall being formed with an inlet and an outlet respectively communicating between the interior of said tank and the lower and upper ends of said recess for passing water in said tank into and out of said recess when said impeller shaft is rotated in a direction to cause the impeller thereon to move water in the tank through said inlet; and means for so rotating said impeller.

13. In a construction as defined in claim 12, the generally horizontally extending upper side of said recess that defines the base of said triangular recess extending slantingly outwardly and downwardly relative to the edge of the recess along said upper side, and the convergent end portions of the two remaining sides of said recess being curved toward each other to meeting relation along a line concentric with the said opening in the bottom of said recess.

14. In a construction as defined in claim 12, a rib on the bottom of said recess projecting toward said lateral side wall and extending on said bottom in a direction generally radially relative to the said opening in the bottom of said recess and outer edge of said rib terminating substantially at the common plane in which the edges of said recess are disposed.

WILLIAM R. ADAMS.