

March 26, 1935.

J. B. KIRBY

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DISHWASHING MACHINE

Filed Nov. 7, 1931

3 Sheets-Sheet 1.

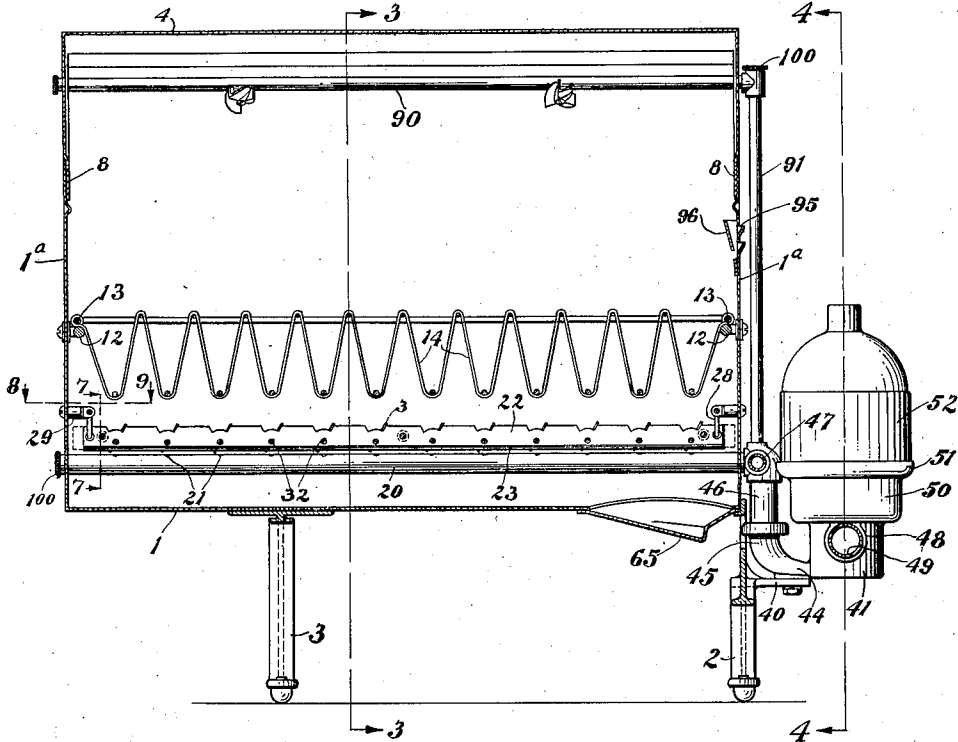


FIG. -2

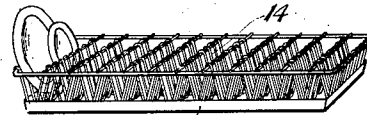


FIG. -14

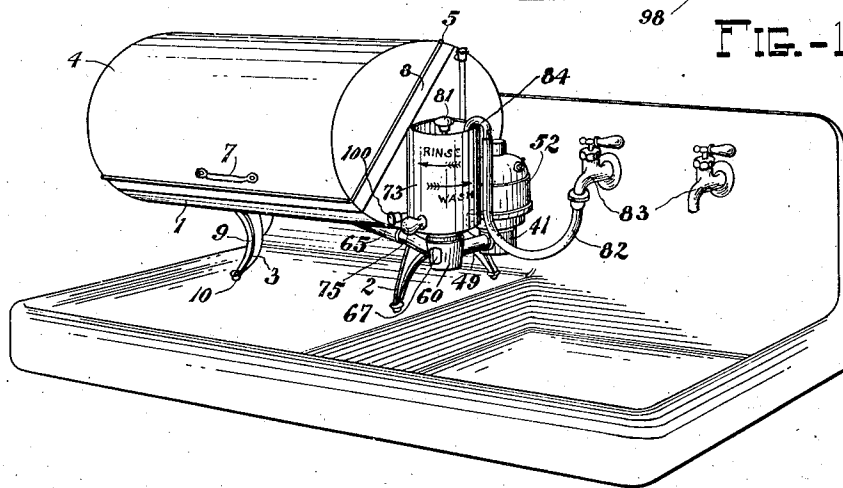


FIG. -1

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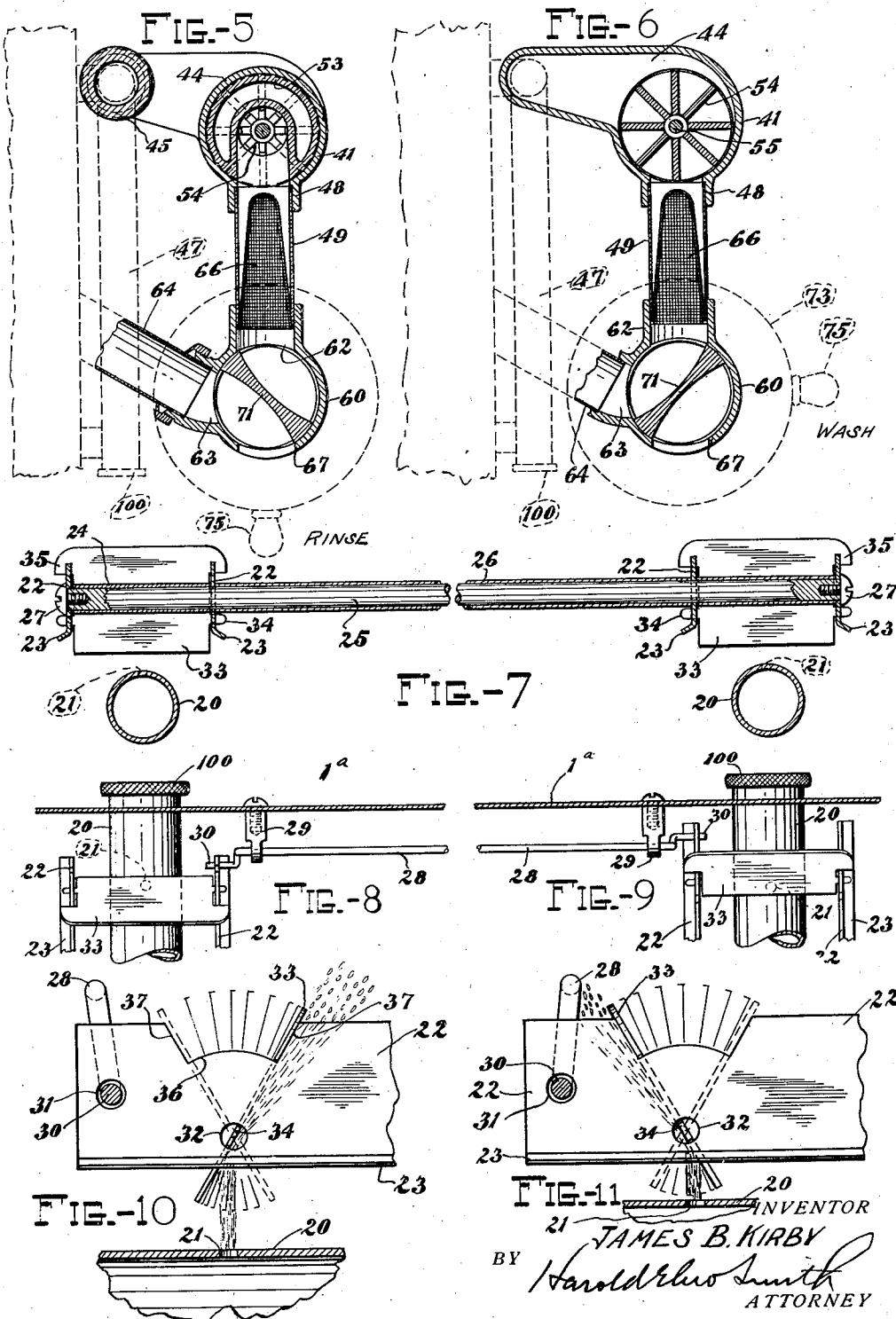
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UNITED STATES PATENT OFFICE

1,995,927

DISHWASHING MACHINE

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Application November 7, 1931, Serial No. 573,575

13 Claims. (Cl. 141—9)

This invention relates to dishwashing machines and has for its object the provision of a device for this purpose exhibiting an extreme simplicity and cheapness of construction and containing a minimum of movable parts, operable with a minimum amount of liquid and exhibiting both a minimum danger of becoming clogged or obstructed together with a maximum facility of removing any clogging or obstructing material; the provision of a device for this purpose of a new character and mode of construction and susceptible of a new and improved mode of operation; the provision of a device for this purpose having improved facilities for the introduction and manipulation of the detergent liquid; the provision of a dishwasher which can be made easily, be kept cleaner than other devices, and whereby miscellaneous dishes can be washed and rinsed with the smallest number of manipulations; the provision of a new and improved apparatus for diverting and distributing jets of liquid; while further objects and advantages of the invention will become apparent as the description proceeds.

In the drawings accompanying and forming a part of this application I have shown for illustrative purposes a preferred embodiment of my inventive idea, although it will be understood that these drawings are intended to be illustrative of the general principles of my invention rather than exhaustive of their practical application.

Fig. 1 is a perspective view showing one of my improved machines in operative position relative to a kitchen sink of the usual type; Fig. 2 is a vertical sectional view through a machine of the character shown in Fig. 1; Figs. 3 and 4 are vertical cross-sectional views corresponding to the lines 3—3 and 4—4 respectively of Fig. 2 and looking in the direction of the arrows; Figs. 5 and 6 are horizontal sectional views corresponding to the lines 5—5 and 6—6 respectively of Fig. 4 and looking downwardly; Fig. 7 is a detail view corresponding to the line 7—7 of Fig. 2; Figs. 8 and 9 are top plan views corresponding to the section line 8—9 of Fig. 2 looking downwardly and showing the reciprocating frame in different positions; Figs. 10 and 11 are enlarged diagrammatic views showing the mode of interaction between the jets and blades whereby reciprocation of the frame is produced; Fig. 12 is an enlarged detail view of one of the top distributors shown in Fig. 3; Fig. 13 is a face view of the spinner employed therewith; Fig. 14 is a perspective view of the dish-basket with its car-

rying tray; Fig. 15 is a detail sectional view of the pump; and Fig. 16 is a perspective view partly in section of the valve mechanism.

The casing of my improved dishwashing machine preferably assumes a cylindrical form as shown in Figs. 1 to 4 and is made in two parts, namely: a body-part 1 provided with suitable legs 2—3 by which it may be supported with its axis substantially horizontal as shown in Figs. 1 and 2; and a cover part 4 hinged to the body-part along a horizontal axis at 5, the two parts meeting along a plane indicated at *a—*a** which is oblique to the vertical. As a result, when the cover 4 is raised the entire interior of the casing is thrown open to ready inspection and manipulation and certain advantages of air-circulation are secured as hereinafter described; and besides the body part of the casing is rendered liquid-retaining up to the level where the cover engages the same. A suitable handle 7 is provided for manipulating the cover-part, and the margins of the cover-part are caused to fit inside the margins of the body-part as shown at 8—8 in liquid-shedding relation. Three legs are preferably employed to insure stability, two at that end which carries the motor as hereafter described, and one near the opposite end, the last-named being preferably curved as shown at 9 so that when the machine is set on a sink-shelf, or similar support it will offer less obstruction to the rims of trays and platters; and all the legs are provided with feet 10 of rubber or other composition which shall be non-slipping and non-scratching.

Located inside this casing parallel to but spaced from the upright ends thereof are two horizontal supports 12—12, rigidly secured to the end members of the bottom part and defining a horizontal plane which intersects the plane *a—*a**. Slidably mounted upon these supports are the terminal supporting projections 13—13 of the dish basket which I have indicated diagrammatically at 14, this diagrammatic representation being chosen from the fact that this basket may assume any one of a great many different detail constructions. Each support 12 is illustrated as having a downwardly-bent nose 15 at its forward end to facilitate the application of the dish-basket thereto, but this and the basket may be formed in any suitable or desired manner so long as the basket rests suitably thereon. The forward end of the basket projects sufficiently above the casing opening to enable ready insertion and removal.

Rigidly carried by the casing-part 1 beneath

this basket are a plurality of horizontal pipes 20, here two in number, and formed with spaced jet-apertures 21 in their upper parts; and movably supported between these pipes and the basket, for longitudinal reciprocatory movement in a horizontal plane, is an intercepting frame having deflecting elements adapted to divert the issuing liquid-jets to different parts of the casing without materially decreasing the momentum of the liquid, and by means of which the jets are diverted towards all parts of the casing interior with strong eroding effect. While it will be clear that a great many modes of constructing, supporting, and moving this frame can be adopted within the scope of my inventive idea, the construction now to be described is preferred for inexpensive machines because of its simplicity.

Located above and parallel with each of the pipes 20—20 are two longitudinal sill-elements consisting of parallel sided strips 22 of sheet metal, having longitudinal stiffening flanges 23 at their lower edges, each turned away from the similar flange of the companion sill-member. These sill-members are arranged in pairs, one at each side of the vertical plane through the corresponding pipe 20, and are rigidly maintained in spaced relation in any suitable manner as by the spacing sleeves 24 working in conjunction with transverse rods 25, one near each end of the frame and one at the center thereof; the proximate sill members of the different pairs being spaced apart by other sleeves 26 interposed between them, the rods 25 traversing the entire width of the frame and binding all the sills and sleeves together through the agency of threaded members 27 at their ends. A simple and convenient mode of supporting this frame is by the employment of a pivoted bail at each end, each bail having a horizontal portion 28 pivoted on a horizontal axis to suitable brackets 29 carried by the end member 1a, and also having an offset or displaced or cranked portion 30 parallel to the portion 28 and received in supporting relation in a suitable aperture 31 in one of the sill-members 22 adjacent thereto. In this way the frame is readily mounted for a limited endwise reciprocation in opposed horizontal directions lengthwise of the pipes 20—20. The distance between the portions 28 of the bails at opposite ends of the casing is preferably the same as the distance between the apertures 31 at opposite ends of the frame so that free swinging may occur; and formed in each sill member 22 immediately above the flange 23 are a series of spaced apertures 32, each exactly opposite one of the jet-apertures 21 in the corresponding pipe 20, when the frame occupies its intermediate or normal position. Pivottally supported between adjacent sill-members are a series of oscillatable metal blades 33, each having at each side an integral tongue 34 received in one of the apertures 32, and also having at a distance from said tongue a projecting finger 35 freely movable along a recess 36 having abutments 37 symmetrically located upon opposite sides of the corresponding aperture 32. Each of these blades extends below its pivot tongue as well as above the same, and in the preferred construction each blade is a very light piece of metal and may be of decidedly small size, e. g. less than an inch in either dimension; although the portion above the pivot should be heavier than the portion below the pivot so that the blade will tend to retain whichever inclined position it occupies at anytime. The mode of operation of this frame is as follows: liquid under pressure

being forced into the tubes 20 and through the jets 21 (as by the means hereafter described), such jets strike each blade on one side or the other. Assuming that this contact occurs as shown in Fig. 10, a component of the force produced by the jet tends to displace the frame toward the left, since rotation of the blade about its pivot cannot be produced by the action of the jets on the bottoms of the blades, but as soon as the movement of the frame has carried the pivot axis past the jet the action of the latter on the top part of the blade reverses its position to that shown in Fig. 11, whereupon the jet catches the depending portion of the blade on the opposite face and drives the frame in the opposite direction. Since all the jets operate upon all the blades at the same time the result is a constant oscillation of the frame; and the consequent impact of the jets upon the inclined surfaces of opposite faces of the blades causes each jet to be diverted instantaneously into fan-shaped streams, first in one direction and then in another, these streams covering the entire interior of the casing due to the constantly changing position of the blades relative to the jets. Also, the angle produced by the blades being comparatively small in any case the momentum of the liquid is not seriously reduced, the result being that the liquid drops fly with substantial power in all directions and consequently with a high degree of cleansing effect.

While the liquid employed for the operation of the above described device can be obtained from any desired or suitable source, still for the purpose of producing the necessary pressure and volume conditions while at the same time properly disposing of refuse matters and economizing liquid I preferably employ the mechanism now to be described. Carried by the legs 2—2 is a horizontal bracket 40 on which is mounted the casing 41 of a centrifugal pump, said casing being of a cup-shape as shown in Figs. 2 and 4, having a closed-bottom 42 and a cylindrical side-wall 43 rising therefrom with its axis vertical. Carried by the side-wall adjacent to the bottom is a tangential outlet 44 terminating in an upturned neck 45 which communicates with the pipes 20—20 by means of a nipple 46 and header 47; and formed in the side-wall at a higher level than said outlet is an inlet-opening 48 in which is secured the inlet-nipple 49.

Removably carried by this pump-casing member is a motor-support 50 having at its upper end a cup-shaped flange 51 which is rigidly secured to one end of the frame 52 of an electric motor and having at its lower end an externally cylindrical projection 53 which fits inside the cup-wall 43 and cooperates with the end-wall 42 to define a chamber for a centrifugal impeller 54 carried by the motor-shaft 55 which has a bearing 56 inside the member 50. The extension 53 is formed with a passageway 58 leading from the inlet 48 to the center of the impeller. The above described arrangement provides an inexpensive motor-mounting together with a pump of maximum efficiency, which can be taken apart for cleaning if it ever becomes clogged by merely loosening a single screw 57.

Located at one side of the pump casing is a control valve which preferably comprises a hollow upright casing 60 adapted for the reception of the turning-plug valve-member 61. Formed in the side-wall of the casing 60 at ninety degrees apart are two ports 62 and 63, the former being connected to the nipple 49 and the latter being connected by means of a second nipple 64

with a depression or sump-cavity 65 at the lowest part of the casing 1. Mounted in the nipple 49 is a conical screen 66 readily removable through a port 67 on the opposite side of the valve-casing, merely upon removing the valve-member. The valve-member as here shown is characterized by a bottom-web 70 intersected by a vertical partition 71 and by having at its upper end an opening 72 constituting a valve-seat and by an upright cylindrical flush-tank 73. This tank is movable, removable, and rotatable with the valve-member and itself has a radial handle 75 by which it may be turned. Located inside this flush-tank is a buoyant valve member 76 adapted either to engage the valve-seat 72 in closing relation, or to float upwardly in the liquid contents of the tank. In order to guide and restrain the movements of this float valve I have shown the same as having a vertical axial tube 77 freely slidable over a vertical guide-rod 78 mounted in the partition 71 of the valve, the upper end of the rod 78 having an enlarged, externally-threaded head 79, over which said tube is freely slidable as soon as a constricted portion 80 at the bottom has been screwed therepast. To the upper end of the tube 77 a knob 81 is affixed by which the float-valve is operated.

Suitable directions as to the position of the valve may conveniently be applied to the exterior of the tank 73 as shown in Fig. 1, and for filling said tank with liquid I have here illustrated a flexible hose 82 having one end connected to a hot water faucet 83 and the other end provided with a hook-shaped nozzle 84 supported on the rim of said tank so as to discharge therein.

In addition to the foregoing features I preferably provide the interior of the casing 1 with a horizontal jet pipe 90 at its upper part close to the hinge 5 and communicating with the header 47 by means of the upright connection 91. I have found it sufficient in most cases to provide the pipe 90 with a comparatively small number of jets, and in this embodiment I show only four jet orifices 92, arranged in pairs, one at each side of a stud 93 on which is rotatably mounted a spinner 94, having inclined blades 95 by which the jets issuing from the orifices 92 are broken up and distributed about the interior of the casing.

I have also shown one end wall of the casing as formed with louvered slots 95 (protected internally by a baffle plate 96 to prevent the issuance of the water jets), these slots being provided for the purpose of allowing the escape of heated air, since the introduction of hot water jets into the casing without some such precaution blows open the cover.

The position of the partition 71 of the valve member is such as to enable the port 63 to be put into communication with either the port 62 or the port 67, selectively, while the port 62 remains always in communication with the aperture 72.

The preferred mode of using my improved machine is as follows: the basket 14 is placed on a shallow tray 98 provided for the purpose, and the dishes introduced into the basket at the table, the basket and tray being then carried together and introduced as a unit into the casing, after which the tray is removed, this being rendered possible by the fact that the space below the basket is unimpeded and is accessible horizontally. This tray receives drip from the dishes and protects floor and table-cloth. The cover is then closed, the motor started, and the handle 75 moved to the position indicated by the word "rinse", in which position the parts occupy the

relation shown in Fig. 5, the port 63 communicating with the port 67. A quantity of hot water is introduced into the tank 73 either by the hose 82 or from a tea-kettle or other receptacle, the valve 76 being meanwhile closed. As soon as this tank is filled the knob 81 is displaced, whereupon the valve 76 floats and the liquid contents of the tank are rapidly ejected by the pump through the jet-apertures 21. This action, combined with the distributing effect of the intercepting frame, produces a distribution of the liquid in forceful streams in all parts of the casing as hereinbefore described. If, as happens on rare occasions, the frame fails to start into reciprocation automatically, due to the oscillating blades being arranged half in one position and half in the other, a slight jar given to the casing is sufficient to start it into operation. The liquid introduced into the casing with the valve in this position is all discharged immediately through the port 67, together with the greater part of the meat scraps and other adherent refuse which may, if desired, be caught in a strainer located in the sink, the water being allowed to run to waste since it is not expedient to return these first portions through the machine lest the jet-apertures become clogged.

As soon as the tank 73 has been emptied the valve 76 automatically closes its outlet. In case the dishes are substantially soiled they may be given a second rinsing as soon as the tank has been refilled, when it will be found that the heating previously accomplished, together with the soaking, will remove nearly all adherent matter. The reason for employing the tank is because a centrifugal-pump of the character illustrated will eject its contents a great deal faster than it can easily be supplied. No ordinary faucet stream will keep pace with such a pump, and the employment of the tank insures a sufficient supply of liquid to produce adequate jets. In case the supply of liquid to the pump be so impeded at any time as to allow the pump to suck air, the efficiency of the jets is enormously decreased.

After one or two rinsings, as the case may be, the handle 75 is turned to the position shown in Fig. 6 corresponding to the directions "Wash" in Fig. 1, thus placing port 63 in communication with port 62. The tank is refilled with liquid and at this time a proper charge of detergent substance is introduced; for example soda-ash or a compound thereof or any one of numerous washing powders to be found on the market. I prefer not to use ordinary soap, because of its greater tendency to emulsify and froth, although it is sometimes useful. If now the knob 81 be again displaced the detergent-containing liquid will be introduced into the casing and will be circulated continuously so long as the valve occupies the position indicated in Fig. 6, the valve 76 closing automatically as soon as the tank is emptied, thus preventing access of air to the pump. The size of the tank 73 is so chosen as to charge the casing sufficiently with liquid to allow the pump to operate continuously without sucking air, and also without the danger of overflowing the casing, which would drown the jets. This tank also facilitates the measuring and solution of the detergent material, a convenient amount such as a spoonful (teaspoon, dessert spoon, or table spoon according to size of the machine) being thrown therein while the tank is being filled. An important advantage of my improved dishwasher is the small amount of liquid necessary to its operation.

Due to the previous rinsing and heating of the dishes this detergent-liquid operates rapidly and completely, and during its circulation the operator is well advised to fill a second basket with dishes. After a few minutes, during which time the tank 73 may be filled with rinsing water, the handle 75 is restored to the position shown in Fig. 5, which causes the ejection of the first washing liquid. This may well be caught in a dipper for reuse if desired, after which the knob 81 is displaced, and the rinsing liquid ejected upon the dishes, after which the cover is raised, the first basket removed and the succeeding basket introduced and the process repeated. The dishes are removed from the casing at such temperature as to dry readily without wiping. Due to the peculiar shape and mode of opening of the casing the steam, due to scalding hot rinse-water, is discharged instantly the cover is opened thus enabling immediate access to and removal of the dishes which is not possible with vat types of washing machines. By leaving the cover 4 elevated the casing itself readily dries out due to its own internal heat and needs no wiping. I have had excellent results in making the casing of stainless steel and the frame and blades of Monel metal, which substances are not discolored by the liquids and do not attract adherent layers of grease or other offensive substances. Due to the advance rinsing above described little or no material is left in the casing by which jet-apertures can become clogged, and these remaining portions are filtered out by the screen 66, which screen also serves to decrease the extent of the catastrophe otherwise encountered in case the user forgets or omits to employ this initial rinsing. Furthermore the straight shape and rigid mounting of the tubes enables their ready cleansing by suitable ram-rods or brushes, their ends being provided with removable screw-caps 100 for the purpose.

It will be understood of course that a great many changes can be made in the different parts, elements and combinations of this washing machine; that other modes of supporting and operating the deflector-element may be employed; that other apparatus for producing and directing the liquid-jets can be employed with this type of casing; that other expedients for supporting and operating the intercepting frame can be employed, or the frame may be entirely supplanted by other jet-directive means; that other constructions and arrangements of pump valve may be employed; that changes in the flush-tank and rinse-valve can be made; that the flush-tank principle herein described can be employed with machines of other types: wherefore I do not limit myself to the details, constructions, or operations herein shown except as the same are specifically recited in my several claims, which I desire may be construed each according to its own limitations and independently of limitations contained in other claims.

Having thus described my invention what I claim is:

1. In a dishwashing machine, the combination, with a casing and means for supporting soiled dishes therein, of a jet-pipe located in position to discharge upon said dishes, a pump having its outlet connected to said jet-pipe, a motor for driving said pump, a removable detergent supply tank having an apertured bottom and member fixed thereto adjacent to such aperture, a ported fitting connected to the inlet side of said

pump having an aperture for receiving the member fixed to the bottom of said tank whereby the tank may be supported by said fitting in position to feed its contents to the inlet of said pump, the capacity of said tank being equivalent to the amount of liquid necessary to perform the washing operation successfully, and valve means in said tank for retaining liquid therein upon the removal of the tank from the machine.

2. In a dishwashing machine, the combination, with a casing and means for supporting soiled dishes therein, of a jet-pipe located in position to discharge upon said dishes, a pump having its outlet connected to said jet-pipe, a motor for driving said pump, a removable detergent supply tank having a bottom part connected to and supported in sealing relation with respect to the pump-inlet, and having a capacity equivalent to the amount of liquid necessary to perform the washing operation successfully, and a flush-valve in said tank adapted when opened to allow a free discharge of the tank contents into said pump and to become automatically closed immediately upon the tank becoming empty.

3. In a dishwashing machine, the combination, with a casing and means for supporting soiled dishes therein, of a jet-pipe located in position to discharge upon said dishes, a pump having its outlet connected to said jet-pipe, means for driving said pump, a removable tank having a bottom part for supporting the tank, said part being connected to the pump-inlet and sealed with respect thereto, and a float valve located in said tank and adapted to become closed automatically whenever the level of liquid in the tank falls below a predetermined point after the valve has been opened.

4. In a dishwashing machine, the combination, with a casing and means for supporting soiled dishes therein, of a jet-pipe located in position to discharge upon said dishes, a pump having its outlet connected to said jet-pipe, an apertured member communicating with the pump inlet, means for driving said pump, a tank for supplying liquid to said pump having a bottom part removably supported in said member whereby the interior of the tank may be connected to the inlet of said pump, a pipe for supplying liquid to said tank, and valve means in said tank for controlling the outflow from said tank to said pump, said valve means comprising a floating element in said tank for closing communication between the tank and the pump when the tank becomes empty after said valve means has been opened.

5. In a dishwashing machine, in combination, a casing, means for supporting soiled dishes inside said casing, a jet-pipe located in position to discharge upon said dishes, said casing having a sump adapted to collect the discharged liquid, a pump having an outlet connected to said jet-pipe, two valves communicating with the pump-inlet, a tank carried by one of said valves having its outlet controlled by the other of said valves whereby admission of liquid to said casing is controlled, said tank carrying valve having an inlet communicating with said sump and having two alternatively usable outlets, one of said outlets communicating with the pump-inlet and the other communicating with a place of discharge.

6. In a dishwashing machine, in combination, a liquid supply tank having an outlet, a casing, means for supporting soiled dishes therein, a jet-pipe located in position to discharge upon said

dishes, said casing having a sump adapted to collect the liquid so discharged, a pump having its outlet connected to said jet-pipe, and a three-way valve having an inlet communicating with said sump and having two outlets, one outlet communicating with the pump inlet and the other outlet communicating with a place of discharge, said valve including a movable hollow member fixedly secured to the outlet of said tank whereby said tank outlet and said valve inlet are placed in communication with one of said valve outlets or said valve inlet is placed in communication with the other of said valve outlets alternatively.

7. In a dishwashing machine, in combination, a casing, means for supporting soiled dishes therein, a jet-pipe arranged to discharge upon said dishes, said casing having a sump adapted to collect such discharged water, a centrifugal pump having its outlet connected to said jet-pipe, means for driving said pump, a valve having a plurality of ports, one of said ports communicating with said sump, another port communicating with the pump inlet, and a third port communicating with a place of discharge, a movable member for controlling fluid flow through said ports, a tank secured to said member having a capacity equivalent to the amount of liquid necessary to successful operation of said dishwasher, and means including a valve in said tank for establishing communication between the bottom of said tank and the pump inlet.

8. In a dishwashing machine, in combination, a casing, means for supporting soiled dishes therein, a jet-pipe in said casing arranged to discharge upon said dishes, a pump fixed with respect to said casing and having its outlet communicating with said jet-pipe, means for driving said pump also fixed with respect to said casing, an open-topped tank removably carried by the exterior of said casing adapted to receive water and detergent, and valve means comprising a ported casing fixed with respect to said pump and an operating member fixed to the bottom of said tank for controlling the introduction of the tank contents into the pump-inlet, said tank being of such size so that it may be readily removed from its operative position for use as a container for transporting a supply of water to the machine sufficient for washing a batch of dishes.

9. In a dishwashing machine, in combination, a casing, means for supporting soiled dishes therein, a jet-pipe arranged to discharge upon said dishes, said casing having a sump adapted to collect such discharged liquid, a pump having its outlet connected to said jet-pipe, means for driving said pump, a valve-casing of turning-plug type having a plurality of ports therein, one port connected to said sump, another port connected to the pump-inlet, and a third port communicating with a place of discharge, a valve member of the turning-plug type movably mounted in said valve-casing upon a vertical axis and having passageways therein whereby said first port may be put in communication with either the second or third port selectively, a tank carried by and projecting above said valve-member and adapted for the reception of liquid and detergent to be introduced into said casing, and valve-means controlling the outlet from said tank into said valve-member.

10. In a dishwashing machine, in combination, a casing, means for supporting soiled dishes therein, a jet-pipe arranged to discharge upon said dishes, said casing having a sump adapted to collect the liquid so discharged, a pump having its outlet connected to said jet-pipe, a removable supply tank having a capacity equal to the amount of liquid necessary to a successful operation of said machine, and valve-means including a ported casing connected to said sump and tank and pump and fixed with respect to said sump and pump, said valve-means having an operating member fixed to the bottom of said tank for connecting said sump either to the pump inlet or to a place of discharge, selectively, and for connecting said tank to the pump-inlet.

11. In a dishwashing machine, a casing having supports, means inside said casing for supporting soiled dishes, jet-pipes located to discharge aqueous liquid on said dishes, a pump having its outlet connected to said pipes, valve means connected to one end of said casing and controlling the flow of liquid from said casing to said pump or to waste alternatively, said valve-means projecting beyond said supports so as to overhang and discharge into a sink when said casing is located upon a shelf adjacent thereto, and a liquid supply tank carried by said valve means and having communication therewith.

12. In a small portable dishwasher of the type adapted to be placed on the drainboard or shelf of a kitchen sink, an elongated hollow casing having support members, means inside said casing for supporting soiled dishes, a jet-pipe located to discharge aqueous liquid on the dishes in said casing, a motor driven pump at one end of said casing having its outlet connected to said jet-pipe, valve means connected to the same end of said casing and controlling the flow of liquid from said casing to said pump or to waste alternatively, and a liquid supply tank carried by said valve means and having communication therewith.

13. In a small portable dishwasher of the type adapted to be placed on the drainboard or shelf of a kitchen sink, an elongated hollow casing having support members, means inside said casing for supporting soiled dishes, a jet-pipe located to discharge aqueous liquid on the dishes in said casing, a motor driven pump at one end of said casing having its outlet connected to said jet-pipe, valve means connected to the same end of said casing and controlling the flow of liquid from said casing to said pump or to waste alternatively, a removable liquid supply tank also carried at the same end of said casing and having an outlet communicating with the pump through said valve means, and means in said tank for controlling fluid flow through the outlet thereof.

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