

May 9, 1939.

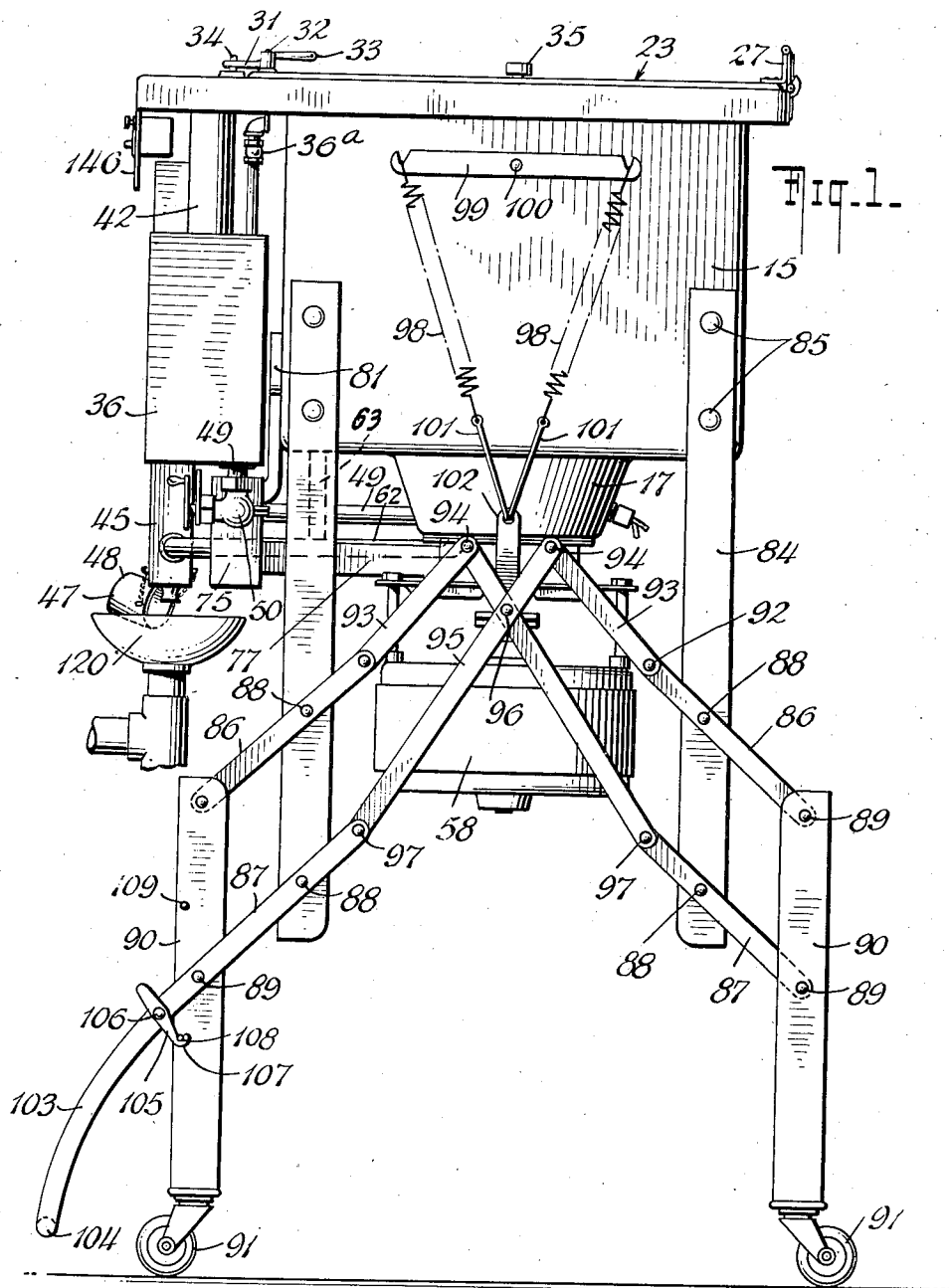
D. E. BONNER

2,157,112

MACHINE FOR CLEANSING AND TREATING

Filed Sept. 16, 1931

7 Sheets-Sheet 1



INVENTOR
DOUGLAS E. BONNER

BY
John A. McHenry
ATTORNEYS

May 9, 1939.

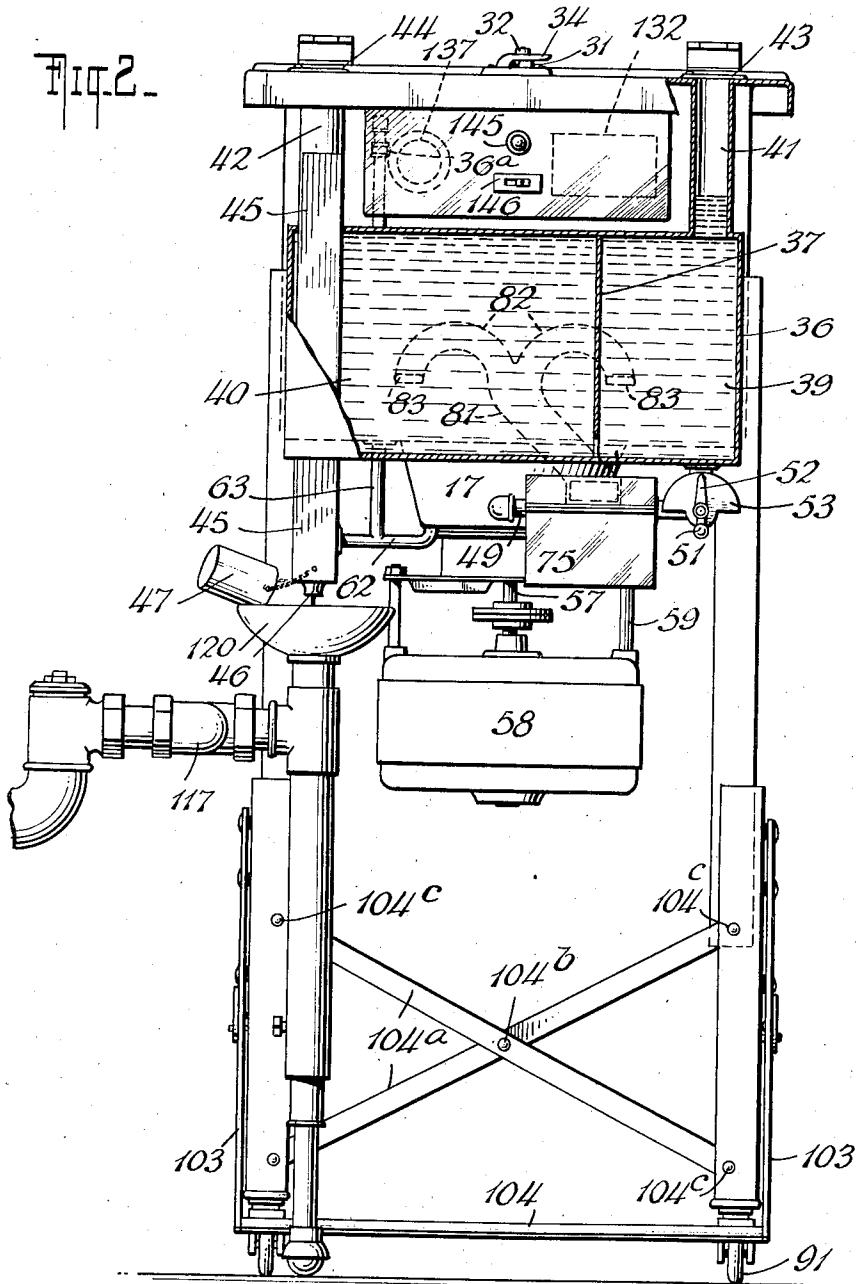
D. E. BONNER

2,157,112

MACHINE FOR CLEANSING AND TREATING

Filed Sept. 16, 1931

7 Sheets-Sheet 2



INVENTOR
DOUGLAS E. BONNER
BY
Douglas E. Bonner
ATTORNEYS

May 9, 1939.

D. E. BONNER

2,157,112

MACHINE FOR CLEANSING AND TREATING

Filed Sept. 16, 1931

7 Sheets-Sheet 3

Fig. 3.

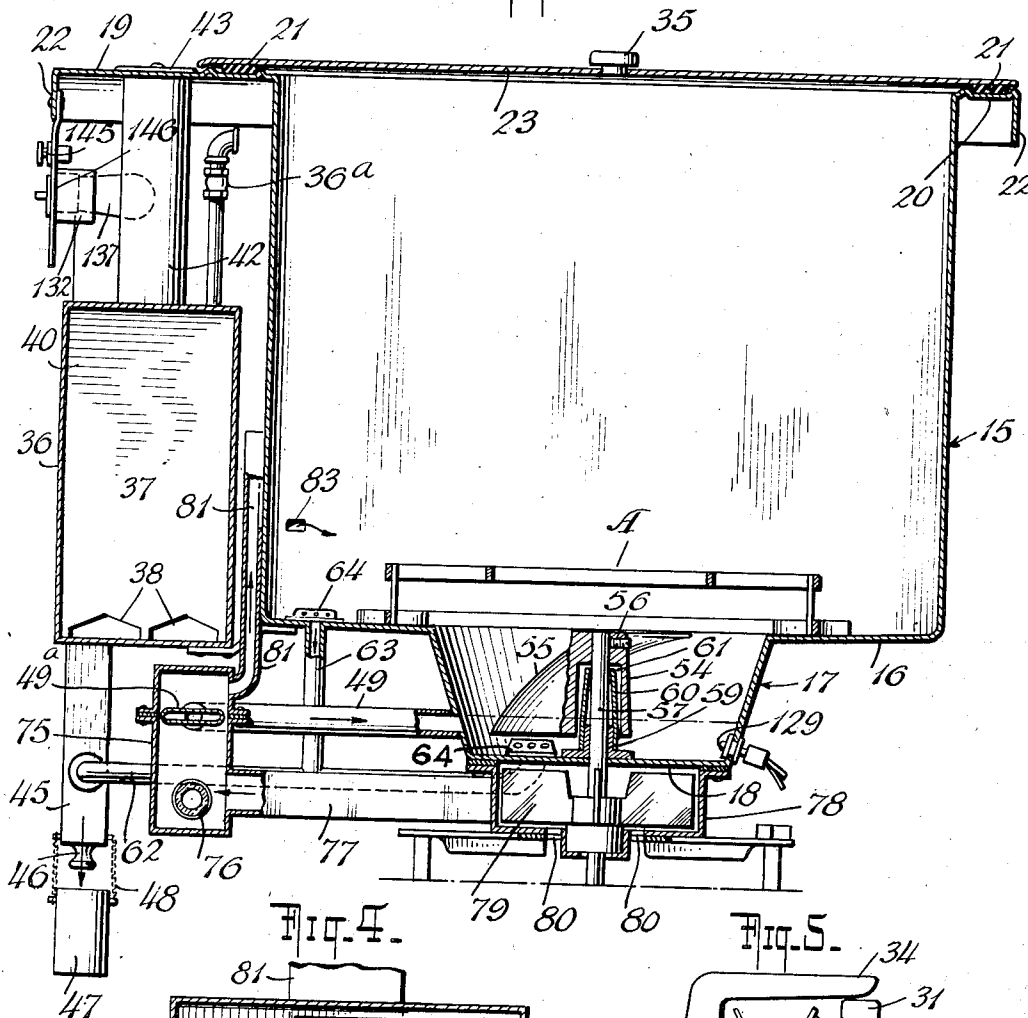


Fig. 4.

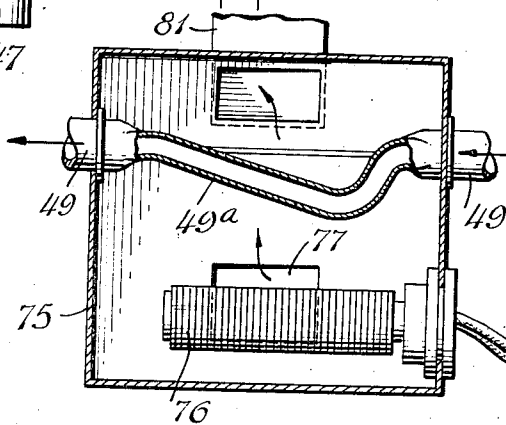
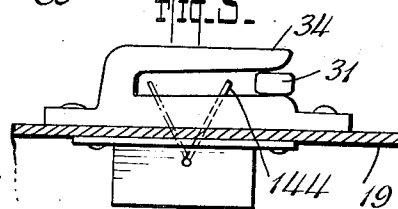


Fig. 5.



INVENTOR
DOUGLAS E. BONNER

BY
W. A. McKeen
ATTORNEYS

May 9, 1939.

D. E. BONNER

2,157,112

MACHINE FOR CLEANSING AND TREATING

Filed Sept. 16, 1931

7 Sheets-Sheet 4

Fig. 6.

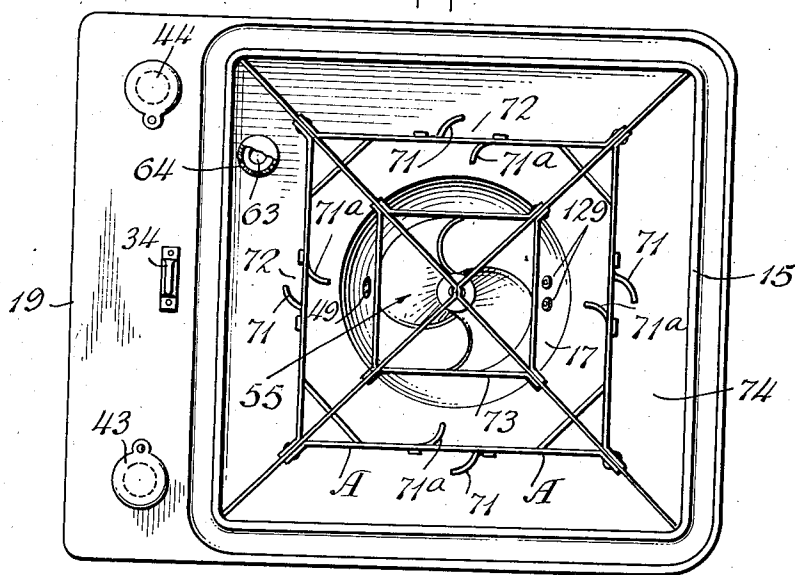
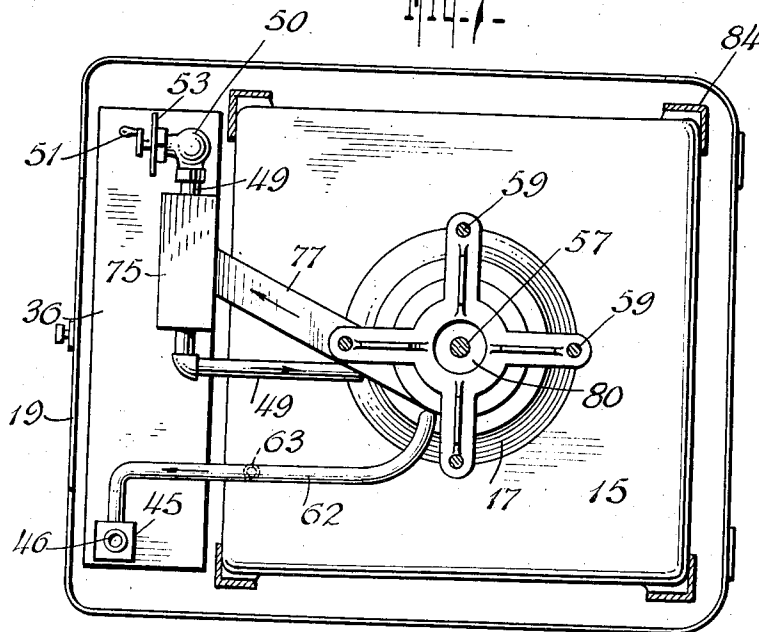


Fig. 7.



INVENTOR
DOUGLAS E. BONNER

BY
John J. Kehring
ATTORNEYS

May 9, 1939.

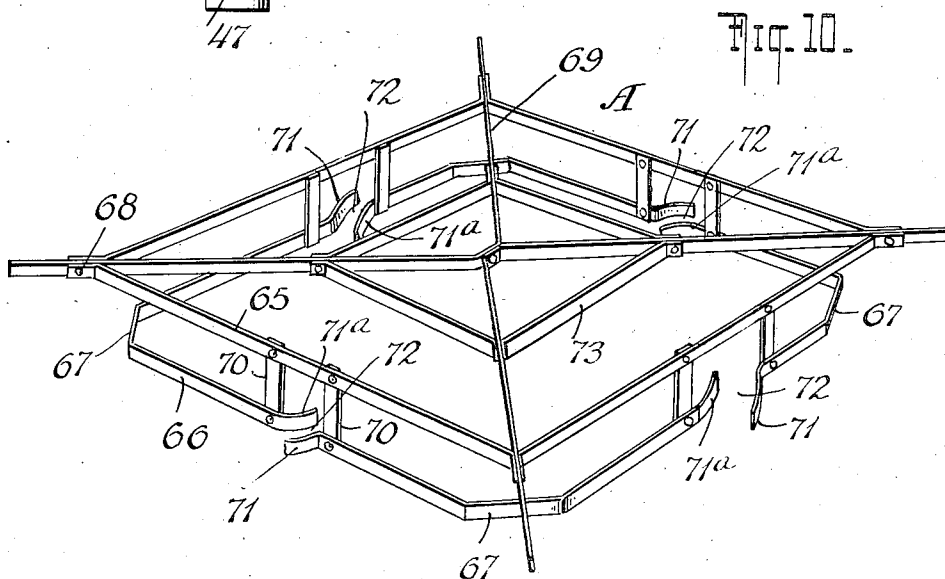
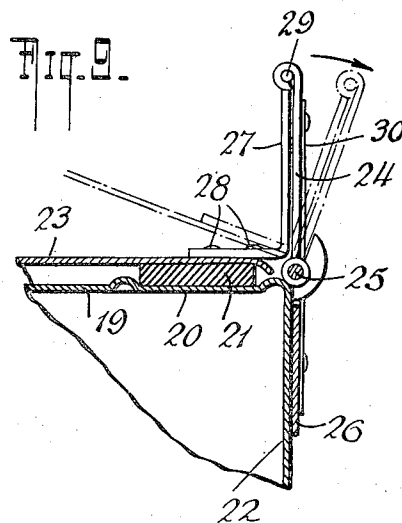
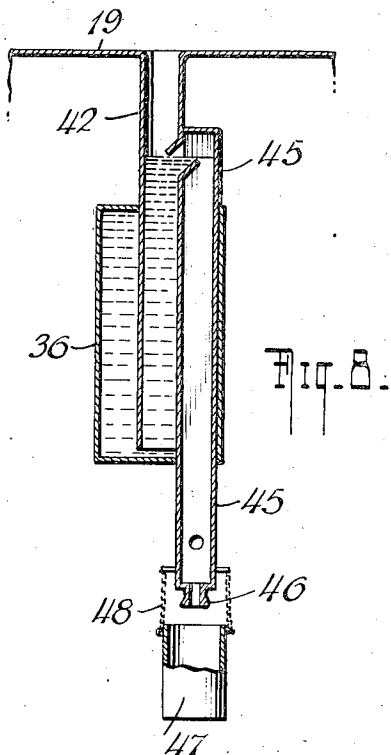
D. E. BONNER

2,157,112

MACHINE FOR CLEANSING AND TREATING

Filed Sept. 16, 1931

7 Sheets-Sheet 5



INVENTOR
DOUGLAS E. BONNER
BY
Forka & Kehlener
ATTORNEYS

May 9, 1939.

D. E. BONNER

2,157,112

MACHINE FOR CLEANSING AND TREATING

Filed Sept. 16, 1931

7 Sheets-Sheet 6

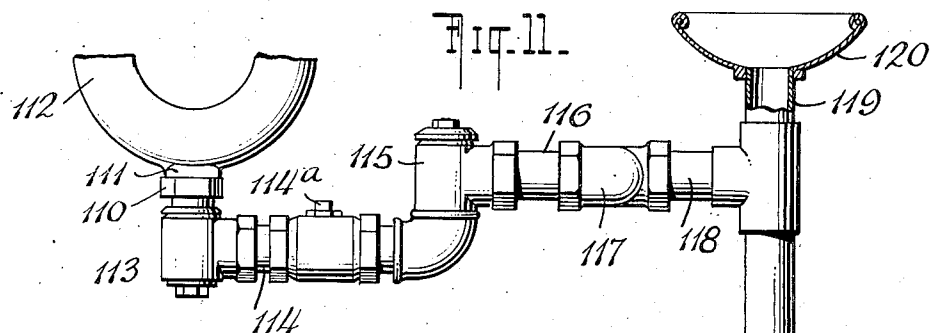


Fig. 12.

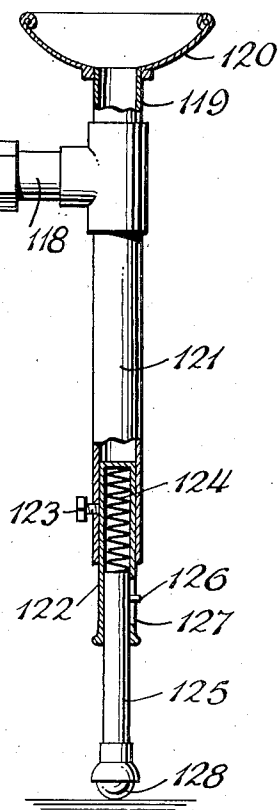
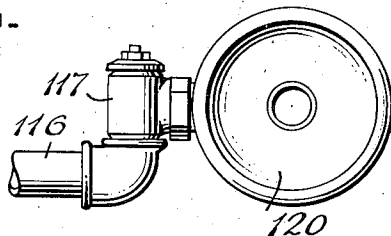
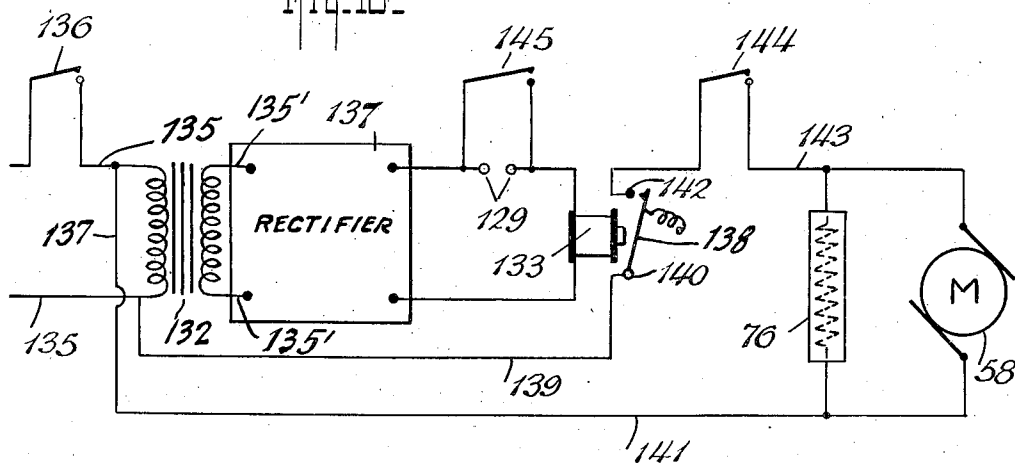


Fig. 13.



INVENTOR
DOUGLAS E. BONNER

BY
John A. Kahlenberg
ATTORNEY

May 9, 1939.

D. E. BONNER

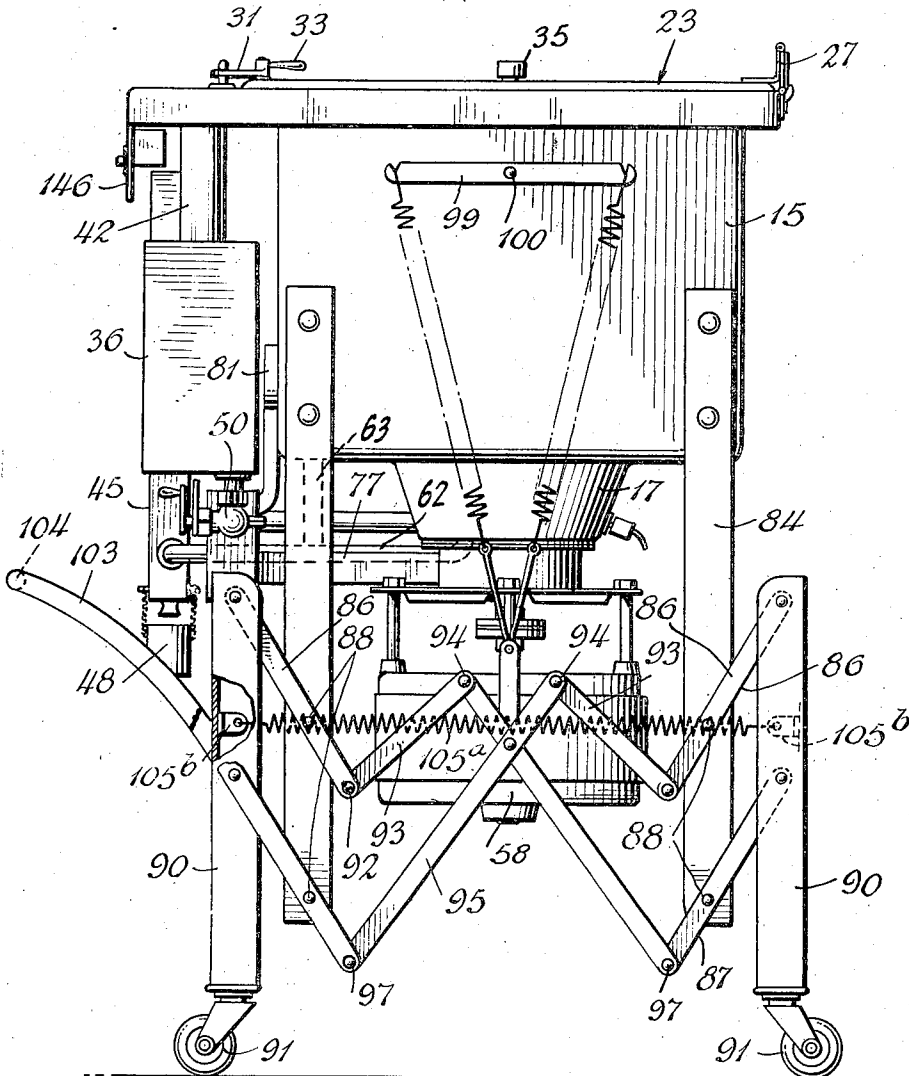
2,157,112

MACHINE FOR CLEANSING AND TREATING

Filed Sept. 16, 1931

7 Sheets-Sheet 7

Fig. 14.



INVENTOR
DOUGLAS E. BONNER

BY
W. C. & K. E. K. K. K.
ATTORNEYS

UNITED STATES PATENT OFFICE

2,157,112

MACHINE FOR CLEANSING AND TREATING

Douglas E. Bonner, New York, N. Y.

Application September 16, 1931, Serial No. 563,029

6 Claims. (Cl. 141-9)

My invention relates to cleansing and treating machines and has for its object to provide a machine of simple construction whereby articles such as dishes in domestic, hotel or restaurant use, or articles of metal or other materials in industrial use or in the process of manufacture, may be washed or otherwise treated with liquids in a variety of operations in a reliable and efficient manner and entirely under automatic control after having been started. Other specific objects will appear from the description hereinafter, and the features of novelty will be pointed out in the claims.

In the accompanying drawings, which illustrate an example of the invention without defining its limits, Fig. 1 is an elevation of the novel machine; Fig. 2 is a similar view, partly in section, looking at right angles to Fig. 1; Fig. 3 is a detail sectional view of the machine on an enlarged scale; Fig. 4 is a detail sectional view illustrating a heating means included in the machine; Fig. 5 is a fragmentary detail view showing a latch and switch arrangement forming part thereof; Fig. 6 is a plan view of the machine showing the interior thereof; Fig. 7 is an inverted plan view, with parts in section; Fig. 8 is a fragmentary sectional view showing a novel drip attachment; Fig. 9 is a similar view of a preferred form of hinge for mounting the cover of the machine; Fig. 10 is a perspective view of a supporting grill included in the machine; Fig. 11 is a fragmentary elevation, partly in section, of a sink trap attachment for use with the machine; Fig. 12 is a fragmentary plan view thereof; Fig. 13 is a diagram illustrating a preferred arrangement of electric circuits for the machine, and Fig. 14 is a view similar to Fig. 1 with the machine in its lowered position and showing a different means for fixing the machine in the illustrated position and also in its raised position.

While the illustrated example of the novel machine, for purposes of explanation and description, is shown in a form intended primarily for washing dishes, silverware, etc., in domestic use, it is to be understood that this is not to be construed as a limitation, as obviously the machine is capable of being adapted for many other uses without in any way departing from the spirit of the invention.

As shown in the drawings, the machine comprises a tank 15 of predetermined dimensions best suitable to the purpose for which said machine is designed, and preferably of substantially rectangular shape in cross-section as shown in Figs. 6 and 7. The bottom of said tank 15 consists of a relatively flat peripheral portion 16,

which, as shown, may be inclined toward the centre of the tank 15, and in which a depending sump 17 is formed at the central or other predetermined point, the portion 16 and sump 17 preferably being made as integral elements and the latter having a closed bottom 18 and communicating with the tank 15 as clearly shown in Fig. 3; the sump 17 is of relatively reduced dimensions with respect to the tank bottom 16, and preferably is circular in form and has a downwardly converging, conical shape as illustrated in Fig. 3, the purpose of which will appear more fully hereinafter.

At its upper end the tank 15 is normally open and is provided with a peripheral preferably horizontal flange 19 grooved as indicated at 20 to accommodate a suitable packing or gasket 21 and including a depending apron 22 as shown in Fig. 3. The open upper end of the tank 15 is arranged to be closed during the operation of the machine by means of a cover 23 which, in its closed position, co-operates with the packing or gasket 21 to prevent escape of the liquid when the machine is being used for its intended purpose. As the cover 23 is subject to spraying of the liquid during operative periods of the machine, it is desirable and even necessary to make provision for preventing dripping of liquid therefrom outside of said tank 15 when the cover 23 is in its open position after an operative period has been completed. This may be done by suitably hinging the cover 23 to the tank 15 in any conventional manner inside of the inner peripheral edge of the latter so that drippings from the open cover will return to the tank 15 as will be obvious; or as shown in the illustrated example the cover 23 may be mounted on the tank 15 by means of novel compound hinges whereby said cover 23 may be shifted so as to occupy an open position within the inner periphery of said tank 15 to prevent dripping exteriorly thereof. These hinges, as shown in Fig. 9, each comprise a member 24 pivotally secured at 25 to a pivot member 26 fastened, for instance, to the apron 22 of the tank 15 and a member 27 fixed to the cover 23 by rivets 28 or other suitable fastening means and pivotally connected at 29 with the member 24. The hinges further each include a flat spring 30 suitably secured to the member 24 and the pivot member 26 so as to bridge the pivot 25 and exerting a tension on the hinge in the direction indicated by the arrow in Fig. 9.

With this novel hinge arrangement, the tension exerted by the springs 30 will cause the cover 23 to pivotally swing on the pivots 25 during its initial opening movement, the members 24 and 27 55

moving, as a unit at this stage; as a result of this the cover 23 moves away from the tank 15 in a substantially vertical direction without developing any appreciable rubbing of the gasket 21 between the cover and tank. When the pivotal movement on the pivots 25 has reached its limit, the cover 23 will be clear of the gasket 21 and continued opening movement will cause said cover 23 to swing on the pivots 29 and accordingly shift to the left in Fig. 9 to an extent corresponding approximately to the length of the members 27. As a result of this, the lower edge of the cover 23 in its open position will be positioned inwardly over the tank 15 so that any dripping of liquid from said cover will pass into said tank 15.

For the purpose of releasably locking the cover 23 in its closed position a suitable latch is provided which, in the example illustrated, comprises a locking member 31 pivotally mounted at 32 upon the cover 23 so as to be movable to a position in which it projects beyond the edge thereof, and provided with a handle 33 for manipulating said locking member 31, as shown in Fig. 1; the locking member 31, in its operative position, is arranged to extend beneath a latch member 34 fixed upon the flange 20 of the tank 15 or any other suitable part thereof. The latch arrangement is such that, when the locking member 31 is located beneath the latch member 34 as shown in Fig. 2, the cover 23 will be pressed into firm, liquid tight engagement with the gasket 21 and fixed against any unintentional opening movement. In the illustrated example, the aforesaid latch also controls an electric switch whereby the operation of the machine is automatically arrested if the cover 23 is carelessly or otherwise opened during an operative period, as will be more fully described hereinafter. In the preferred arrangement, the cover 23 is preferably also provided with a vent 35 to permit the escape of vapors or gases while the machine is in operation; said vent 35 being so constructed and arranged as to prevent the escape of any liquid from the tank 15 during given operative periods.

The machine further includes a reservoir 36 located exteriorly of the tank 15 and divided interiorly into a plurality of compartments, by means of one or more partitions 37 provided in their lower portions with one or more openings 38 whereby communication between adjacent compartments is established, as will be more fully pointed out hereinafter; the illustrated example shows the reservoir 36 provided with a single partition 37, whereby said reservoir is divided into a chamber or compartment 39 arranged to contain the washing liquid or its equivalent and a chamber or compartment 40 adapted to contain a rinsing or other co-operating liquid depending upon the functions which are being performed by the machine. The reservoir 36 is further provided with a check valve 36^a in communication with the chamber 40, so arranged that air will pass freely out of said chamber but will be prevented from passing into the same. The reservoir 36 is fixed in place in any suitable manner, as, for instance, by being suspended from the flange 19 of the tank 15 by means of inlet tubes 41 and 42 leading respectively to the chambers 39 and 40 and having their upper ends open and lying flush with the outer surface of the flange 15, as shown in Figs. 2 and 8. In the preferred arrangement, the inlet tubes 41 and 42 may comprise integral parts

of the flange 19 and have their open upper ends normally closed by means of suitable covers 43 and 44 so arranged as to seal the upper ends of said tubes 41 and 42 when said covers are in their closed positions. The inlet tube 42 communicates at a point above the reservoir 36 with an overflow tube 45, which extends through said reservoir and downwardly beyond the same, and terminates in an exit nozzle 46, as shown in Figs. 1, 2, 3 and 8. As a continuously fed machine such as the one illustrated in the drawings is bound to drip liquid out of the exit nozzle 46 for some time after the machine has ceased to function, it is desirable to provide a means for catching such drippings when the machine is shifted to a non-operative position, as will appear more fully hereinafter. In the illustrated example, this means comprises a drip cup 47 suspended from the overflow tube 45 by chains or other flexible supports 48, so that the cup 47 will normally occupy a position beneath the exit nozzle 46 and automatically return to such position when free to do so. An intake pipe 49 leads from the bottom of the reservoir 36 to the sump 17 and establishes communication directly between the latter and the compartment 39 of said reservoir. The intake pipe 49 is controlled by means of a valve 50 arranged to be manipulated by a handle 51 combined with a pointer 52 adapted to move across a dial 53, provided with suitable designations to indicate the position of said valve and the duration of the operative periods of the machine. The sump 17 accommodates an impeller consisting of a hub 54 and a plurality of blades 55 shaped and arranged to throw the liquid which passes from the reservoir 36 into the sump 17 upwardly into the tank 15 in disintegrated spray-like form when the machine is in operation. The hub 54 of the impeller is secured by means of a set screw 56 or the like upon the upright driving shaft 57 of an electric motor 58 which, in the illustrated example, is suspended in place beneath the machine by means of rods 59, as clearly shown in Fig. 2.

The dimensions of the sump 17 and the impeller 54-55 are such that the impeller, when rotating, has a safe clearance, and is located with the lower edges of the blades 55 at a distance above the bottom 18 of the sump 17, as shown in Fig. 3.

Since the shaft 57 passes through the bottom 18 of the sump 17, provision must be made to prevent leakage at this point, which result may be secured by means of conventional packings or stuffing boxes, the latter however, being costly and likely to become defective in time. To overcome the expense and other disadvantages of such packings or stuffing boxes, the shaft 57 is journaled in a bearing 59 located interiorly of the sump 17 and projecting into a tube 60 which extends upwardly from said bearing and converges into engagement with the shaft 57 at a point above the highest level reached by the liquid at any time in the sump 17; in order to accommodate the bearing 59 and the tube 60, the hub 54 of the impeller is provided with a recess 61, as clearly shown in Fig. 3. A lower drain tube 62 leads from the bottom of the sump 17 and is connected with the overflow tube 45, as shown in Figs. 2 and 3; an upper drain tube 63 depends from the bottom 16 of the tank 15 so as to communicate with the interior of the latter, and is connected with the lower drain tube 62 at a point between its inlet and outlet ends, as shown in Figs. 2 and 3. The inlet ends of the

drain tubes 62 and 63 are covered by strainers 64 provided with holes facing only in a direction away from the direction from which the liquid approaches said drain tubes 62 and 63. With this arrangement, the drainage from the machine is reduced to a relatively slow speed by a partial vacuum set up at the holes of the strainer by the revolving liquid.

The machine further includes a support or grid A adapted to be removably set upon the bottom 16 of the tank 15 and comprising spaced, parallel, upper and lower members 65 and 66 united in the form of a rectangle, the lower members each consisting of sections having their opposed ends spaced apart, and preferably being bent at the corners to form angular portions 67, and the upper members being continuous and being secured at 68 to the members of a spider 69, dimensioned to fit the corners of the tank 15 or maintaining the support against shifting therein. The members 65 and 66 are connected together in parallel arrangement by cross bars 70, the opposed ends of the lower members 66 being curved as indicated at 71 and 71^a to form deflectors which project in opposite directions and define passages 72, as shown in Figs. 6 and 10. To increase the rigidity of the grid A, the spider 69 may be provided with strengthening bars 73, as also illustrated in Figs. 6 and 10. When the aforesaid support or grid A is in place in the tank 15, it forms with the vertical walls of the tank 15, a canal or channel 74 into which the drain 63 extends, said drain 63 communicating with said canal 74 at a point close to a vertical wall of the tank 15 and near a corner thereof as illustrated in Fig. 6; the arrangement is such that the wall of this canal 74, formed by the members 66 of the aforesaid support, is of a height corresponding to the level of the strainer 64 of the upper drain 63, this height being established so that the liquid in said canal will not develop a head over the upper drain which would expedite drainage through the same. Communication between the canal or channel 74 and the sump 17 is effected by means of the deflectors 71, 71^a and passages 72 for the purposes to be more fully described hereinafter.

In machines of the kind under discussion, and particularly in such machines when designed for cleansing dishes and the like, it is very desirable, and in fact, important to have the cleansing liquid and rinsing water in a heated condition. To effect or maintain such heated condition, or to both effect and maintain the same, the intake tube 49 passes through a heating chamber 75 in which a heating element 76, preferably electrically actuated, is located; in the preferred arrangement, that part of the intake tube 49 which is located in the heating chamber 75 is flattened, as indicated at 49^a, so as to extend transversely across said chamber 75, as illustrated in Fig. 3; this flattened portion 49 furthermore is preferably also bent downwardly to form what may be termed a trap in said heating chamber 75, as clearly shown in Fig. 4 to facilitate the heating of the liquid and to effect the production of steam for sterilizing purposes, as will appear more fully hereinafter. The heating chamber 75 is connected by means of a conduit or passage 77 with a chamber 78 located beneath and depending from the sump 17, but having no communication therewith. A device for developing air currents, such as a blower or fan 79 is located within the chamber 78 and is fixed upon the motor shaft 57 which, as shown in Fig. 3, passes through said chamber 78, the latter being provided with air

inlets 80 in its bottom, or at any other suitable points thereof.

In many forms of the illustrated machine, particularly when the latter is designed for cleansing dishes and the like, it is desirable to introduce a supply of warm air into the tank 15 for the purpose of drying the cleansed dishes or otherwise treating the articles after the same have been acted upon by the machine. In the illustrated example, the heating chamber 75 is accordingly in communication with a tube 81, which terminates in forked branch tubes 82 having the form approximately of ram's horns, and communicating with the interior of the tank 15 at 83.

Because of the fact that it is necessary to have the tank 15 of considerable depth, this being particularly true with respect to portable machines for washing dishes and the like, it is impossible to arrange for gravity intake of water from a faucet to the tank, and gravity drainage from the latter into a sink, without building the machine to such a height that it would be inconvenient for storage purposes when the machine is not in use. A machine of such excessive height also could not be conveniently used as a table, nor could it be easily placed beneath other kitchen equipment during periods of inactivity. The difficulty would not be so much with the filling of such excessively high machines, as it would be with the easy drainage thereof. In order to overcome the above objections, and to provide for easy filling and draining of the machine, without sacrificing anything in efficiency, the machine illustrated in the drawings is mounted upon an extensible and collapsible pedestal so as to be capable of being raised to an operative position and lowered to an inoperative position when not in use. The pedestal in its illustrated form comprises upright supporting members 84 depending from and secured to the tank 15, by means of rivets 85 or the like; links 86 and 87 are operatively mounted at 88 upon the supports 84 and are operatively connected at 89 with upright members 90 which, to facilitate the shifting of the machine, may be supported upon casters or rollers 91, as shown in Fig. 1. The links 86, in turn, are pivoted at 92 to links 93, which, in turn, are pivotally connected at 94 with links 95 pivotally connected with each other at 96. The links 95 are further pivotally connected at 97 with the aforesaid links 87, as shown in Fig. 1. Counter-balancing springs 98 each have one end connected with the hooked ends of a member 99, pivotally fixed at 100 upon the tank 15 and their other ends connected with hooks 101 secured to lugs 102 suitably fastened to the pivots 96. The systems of links hereinbefore described constitute what may be termed "toggle supports" capable of being operated to raise and lower the tank 15 to the desired operative and inoperative positions. In order to facilitate the operation of the aforesaid toggle support, one set of links 87 may be continued in the form of extensions 103 which are connected by a transverse footbar 104, as shown in Fig. 2; in addition bars 104^a are connected with each other at 104^b, and at 104^c with each pair of members 90 on a given side of the machine to increase the rigidity of the pedestal. Suitable means is preferably provided for locking the pedestal in its extended and in its folded positions, to fix the tank 15 in its raised and lowered positions respectively. As shown in Fig. 1 this means may comprise locking devices 105 pivotally mounted on the extensions 75

103 at 106 and having hooked ends 107 adapted to engage pins or projections 108 located on the supports 90 for preventing unintentional lowering of the machine, and for engaging similar pins 109 to lock the tank 15 in its lowered position. Instead of the locking devices 105 and their associated elements, the means illustrated in Fig. 14 may be provided, which comprises springs 105^a extending between and having their opposite ends secured to the members 90 for instance by means of brackets 105^b to provide the necessary clearance, and so as to exert a tension tending to draw said members 90 toward each other. The springs 105^a are so located with respect to the system of links constituting the toggle support that they lie beneath the pivots 88 in the raised position of the tank 15 and above the same in the lowered position thereof as shown in Fig. 14. As a result of this the tendency of the springs 105^a to draw the members 90 toward each other will serve to fix the toggle support in both its extended and folded positions and accordingly to lock the tank 15 in its raised and also in its lowered position.

As previously stated herein, natural drainage from the machine into a sink over the customary sink front generally requires the machine to be built to an objectionable height. In order to overcome this disadvantage, I have provided a sink trap attachment comprising a union 110 adapted to be connected to the drain 111 customarily located at the bottom of the conventional trap 112 with which existing sinks are usually provided. The union 110 is swivelled at 113 upon a pipe 114, which in turn is in swivelled connection at 115 with another pipe 116, and the latter communicates with a tubular joint 117 communicating with a pipe 118, which carries and is connected with an upright tube 119 terminating in a funnel or basin 120. The funnel 120 and tube 119 are supported upon a tubular rod 121, in the lower end of which a downwardly open sleeve 122 is slidably secured by means of a set screw 123. A spring 124 is located within the sleeve 122 and bears with its upper end against the upper closed end face of the sleeve 122, and with its lower end engages a rod 125 which extends slidably into the sleeve 122 and is provided with a pin 126 movable in a slot 127 of the sleeve 122 whereby the slidable movements of the rod 125 in said sleeve are guided; if desired, the lower end of the rod 125 may be provided with a ball bearing 128 or equivalent anti-friction device. The sink trap attachment further includes a check valve 114^a of any conventional type arranged to prevent the drainage through the trap 112 from passing to and out of the funnel 120, without interfering with the flow of liquid from said funnel 120 to said trap 112. With the arrangement set forth the device is capable of being swung on the swivels 113 and 115 in a horizontal plane to and from its operative position and vice versa, and the funnel 120 is capable of swinging on the joint 117 in vertical directions to compensate for unequalities in the floor or equivalent supporting surface upon which the ball 128 rests; this ability to move vertically also permits the funnel 120 to be depressed if, for any reason this becomes necessary so that the connection between the funnel 120 and the trap 112 is at all times relieved of strains which otherwise would result from such vertical movements. It will be obvious that the yielding support comprising the spring 124 and its associated elements co-operates with the joint

117 in permitting the aforesaid vertical movements of the funnel 120.

In the illustrated example, the electrical control of the machine is effected by the liquid in the sump 17 in co-operation with spaced electrodes 129, which project into said sump and constitute terminals of an electric circuit, which includes the electric motor 58. The electrodes 129 are so located as to be positioned at a point below the lower edges of the impeller blades 55, as shown in Fig. 3. Since with this arrangement the electric current must of necessity pass through the liquid when the machine is in operation, and unless prohibitively expensive insulation is provided for the tank, will electrify the same, the possibility exists that persons coming in contact with the metal parts of the machine may receive electric shocks during the operative periods of the machine. The average house current at present in use is of 110 volts and would give a decidedly noticeable shock which, in some instances, might be serious, and in addition presents a fire hazard which would be objectionable.

It is therefore necessary to disassociate the house service current from metal parts of the machine and liquid therein. This is accomplished by leading the house current to a transformer adapted to deliver an induced, secondary and independent current which is passed through liquid in the machine to operate a relay controlling the admission of the house current to the motor 58 and heating element 76.

Fig. 13 shows diagrammatically an example of the electrical equipment and wiring in which alternating electric current from a house service outlet is led through wires 135 to a transformer 132, a control switch 136 being provided whereby the circuit may be broken. The transformer 132 delivers a secondary, and induced, alternating current through wires 135' to a rectifier 137 whereby the current is rectified and delivered through the liquid switch terminals 129 as a direct current to the coil of relay 133. A momentary switch 145 is provided for short circuiting the terminals 129. One of the wires 135 from the house line beyond the switch 136 is connected with a wire 141 which leads to the heating element 76 and to the motor 58, the other wire 135 from the house line leading to one end 140 of a relay armature 138 through a connecting wire 139. The armature 138 when attracted by the relay magnet contacts with the terminal 142 of a wire 143 connected with the heating element 76 and motor 58, thereby admitting the house current to said heating element 76 and to said motor 58. A switch 144 is provided in the line 143 and is automatically opened by the raising of the cover 23 to break the circuit.

In an automatic machine of the type under discussion, particularly when the same is designed as a washing machine, it is obviously essential that at the proper time the motor 58 be shut off without fail; it is equally essential to have the machine start promptly at the desired moment. These necessary conditions present difficulties in that the average city water is a poor conductor of electricity and accordingly may not be a sufficiently good conductor to bring about the operation of the relay 133 as set forth above. On the other hand, it is generally known that water containing certain impurities constitutes a much better conductor of electricity. I have found that a relay wound with a coil of high resistance, properly arranged, will fail to function when the circuit is closed by clear wa-

ter covering the electrodes 129 and yet will function as soon as the electrodes are bridged by a good conductor; I have further found that such a relay will continue to function after having
 5 been started, even though clear water subsequently bridges the electrodes 129. The relay 133 may be of the above mentioned type, which will not start when the liquid between the electrodes is unusually pure water. It is then necessary to start the relay 133 by momentarily operating the switch 145 to bridge the gap between
 10 the electrodes 129. The relay responds instantly to the operation of the switch 145 and the motor starts and both continue in operation until the sump 17 has finally drained and the electrodes 129 are no longer connected by liquid therein. The result of the aforesaid arrangement is that the machine may be positively started by actuating the momentary switch 145 and stops positively because the residue clear water in the
 20 sump at the end of the rinsing operation hereinafter referred to is just enough to keep the relay 133 functioning and when the electrodes 129 are clear of the liquid, or perhaps only half submerged, the relay 133 is de-energized and permits the armature 138 to move away from the terminal 142 to thereby break the electric circuit and stop the motor. In the preferred arrangement, the electrical instrumentalities mentioned above are mounted upon a panel 146,
 30 which is secured to the apron 22 of the tank 15, preferably so as to be capable of being easily detached at will.

The current could be passed through the liquid in a circuit which is completed by said liquid, by having opposite sides of the circuit each connected to one of the terminals 129. In this case these terminals could be located adjacent in the sump or separated as preferred. If
 40 desired the circuit could also be completed, through the liquid, by having one side connected to one or both terminals 129, and the other side grounded to the sump or tank. This passage of the electric current into and through the liquid is believed to act as a "germ killer" to thereby free the liquid from germs; the more the current, the greater the germ killing properties thereof.

As shown in Fig. 5, the cover switch 144 projects into the path of the locking member 31 when the latter is moved beneath the latch member 34, said switch 144 being arranged so that it will always tend to return to its open position. Thus, as the locking member 31 is moved to its
 55 locking position beneath the latch member 34, the switch 144 will be engaged by the member 31 and shifted to its closed position indicated by dotted lines at the left in Fig. 5. As soon as the locking member 31 is moved from beneath the latch member 34 to unlock the cover 23, the switch 144 will automatically return to its open position to thereby break the electrical circuit in which the motor 58 is located. With the arrangement set forth, it is therefore impossible
 60 to raise the cover before the machine has been stopped. This prevents expulsion of water or other liquid from the tank 15, in case the cover 23 should be carelessly opened before the machine has stopped, or without bringing about a stoppage thereof.

Normally, the machine occupies the position shown in Fig. 14 in which the tank 15 is lowered and the toggle support is collapsed, said machine in this condition being capable of being easily
 75 stored out of the way. When it is desired to uti-

lize the machine, it is first shifted to a position close to the kitchen sink or other point at which the drain funnel 120 or its equivalent is located, after which the cover 23 is adjusted to its open position to permit the articles to be washed or
 5 otherwise treated, to be placed into the tank 15. The articles in question may be contained in a conventional wire dish rack arranged to properly hold and support dishes, cups, glasses, silverware etc., which articles may be placed in the
 10 rack while it is resting on a customary drain-board or table, and the loaded rack then placed in the tank, or said rack may be placed in the tank empty, and the articles placed in position thereon subsequently; the rack, in its loaded
 15 condition, rests upon the grid A. The cover 23 is then closed and locked in its closed position by bringing the locking member 31 beneath the latching member 34, which operation, at the same time, closes the cover switch 144. A downward pressure is then exerted upon the bar 104,
 20 either by hand or by foot to swing said bar 104 and with it the levers 103—87 to the position illustrated in Fig. 1. This brings about an operation of the various links constituting the toggle support whereby a lifting force is exerted upon the supports 84 and the tank 15 is elevated to the raised position shown in Fig. 1. With the tank in this elevated position, the funnel 120 is
 25 adjusted until said funnel 120 is directly beneath the outlet nozzle 46, as shown in Figs. 1 and 2. As the drip cup 47 during this shifting of the funnel 120 comes into contact therewith, it will be swung aside on its supports 48 and tilted to a position as shown, for example, in
 30 Figs. 1 and 2, in which any drippings contained in said cup 47 will pass into the funnel 120. When the machine is shifted or the funnel 120 is moved away from the outlet nozzle 46, the drip cup 47 will automatically swing back to a position beneath the nozzle 46 as illustrated in
 35 Figs. 3 and 8. Prior to the operation of the machine, the valve 50 is closed and a cleansing compound, preferably in powdered form, is introduced in the desired quantity into the chamber 39 of the reservoir 36 through the tube 41. Through a hose connected with a conventional hot water faucet, or in any other suitable manner, hot water is then passed into the reservoir 36 through the tube 41 until both of the reservoir chambers 39 and 40 are full, which is indicated when water begins to overflow into the
 40 overflow tube 45 and pass out of the outlet nozzle 46 thereof. The handle 51 is now operated to open the valve 50, the extent of opening being indicated by the pointer 52, on the dial 53, and depending upon the operative period which the machine is intended to have. The opening of the valve 50 immediately permits water and the cleaning compound from the washing compartment 39 of the reservoir 36 to pass through the
 45 pipe 49 into the bottom of the sump 17 until said liquid finally submerges the electrodes 129. The motor 58 will thereupon start and cause a rotation of the impeller 54—55, and also of the blower 79. The starting of the motor 58 also introduces current into the heater element 76 in the heating chamber 75. From this stage on the operation of the machine is entirely automatic. If the machine is being used for rinsing
 50 with very pure water or a liquid of low electrical conductivity insufficient to close the circuit across the electrodes 129 is being utilized, then the momentary switch 145 is closed to start the machine.

When the liquid, that is, the water with the 75

cleaning compound rises in the sump 17, to a point where it comes into contact with the impeller blades 55, the latter will throw said liquid upwardly into the tank 15 in the form of a fine spray and with considerable force against the articles to be washed. In the meantime, the water, as it passes through the portion 49^a of the pipe 49 in the heating chamber 75, is being heated, and at the same time, air forced into the heating chamber 75 by the blower 79 is being heated and passed into the tank 15 through the tube 81 and branch tubes 83 to heat the spray in said tank 15. This heating of the water and the spray is a desirable feature of the invention, as it is important to maintain the temperature of the cleaning water at a fairly high point in order to secure the most efficient cleaning results. Obviously, hot water fed from a faucet or from some other source into the tank 20 will soon become cold when passed into the cold tank of a washing machine.

Part of the liquid that has been thrown upwardly by the impeller blades 55 into contact with the articles being washed, drops back again into the sump 17 and is again thrown upwardly by the impeller blades 55. However, most of the liquid which has been thrown up by the impeller blades 55, and which has become quite dirty after contact with the articles being washed, falls into the canal 74 and revolves therein in the form of a stream in the same direction as the impeller. By the centrifugal force thus developed, the heavy dirty solids contained in the liquid are moved outwardly in the canal 74 close to the vertical tank walls, and are carried toward the upper drain 63 and through the strainer 64 thereof to the drip funnel 120. Such liquid and dirt in the canal 74, as does not pass out of the upper drain 63, is projected back directly onto the impeller by means of the deflectors 71 formed on the dish rack support or grid A, and consequently is again circulated by the impeller before coming into contact with any fresh liquid entering the sump 17. This arrangement expedites the elimination of dirt and dirty liquid from the machine before subsequent fresh liquid is circulated by the impeller whereby the efficiency of the machine is materially increased.

The liquid is circulated or projected by the impeller many times a minute, the number depending upon the extent to which the valve 50 is open; if the valve 50 is opened wide, the machine works faster, and consequently the liquid is not circulated as many times as it would be with the valve in a lesser open position. It will be understood, however, that regardless of the speed at which the liquid is admitted to the sump 17, the upper drain 63 is large enough to carry it off at the predetermined level, that is, the level determined by the extent to which this drain, or more specifically, the strainer 64 thereof projects upwardly into the tank 15.

While this "washing" period is progressing, the liquid feed to the sump 17 is solely from the "washing" compartment 39 of the reservoir 26; in other words, the check valve 36^a at the top of the "rinsing" compartment 40 of the reservoir 36 prevents the clear rinsing water therein from escaping. As the washing operation proceeds, the liquid in the washing compartment 39 eventually will have its level brought below the levels of the openings 38 in the partition 37 so as to expose the communication between the washing and rinsing compartments before men-

tioned herein. When this happens, the liquid seal between these two compartments is broken and clear water begins to escape from the rinsing compartment 40 and to flow through the bottom of the washing compartment 39 and through the connection or pipe 49 into the sump 17. Before this takes place, or more correctly, before the clear rinsing water begins to be projected upwardly by the impeller blades 55, all, or practically all, of the washing liquid has passed out of the tank 15.

When the rinsing water is exhausted to the extent that the amount in the sump 17 is not sufficient to reach the bottom edges of the impeller blades 55 and to be thrown up thereby, the spray in the tank 15 ceases, but the motor 58 continues to operate, and accordingly the impeller 54—55 and fan 79 also continue to operate, so that a supply of hot air is continued to be forced into the tank through the connection 81 and branch tubes 82, and serves to dry the articles which previously have been washed. As the operation continues, the water in the sump 17 flows out through the lower drain 62 until its level finally recedes to a point below the electrodes 129; when this stage is reached, the electric circuit is broken and the motor 58 and its associated elements, as well as all other moving parts, are stopped automatically.

As the last portion of the rinsing water leaves the reservoir 36, and enters the sump 17, a small amount of such water remains in the flattened bent portion 49^a of the pipe 49, which functions in the nature of a trap. This water being thus stationary and confined within the heating chamber 75, the action of the heating element 76 promptly converts the same into steam which, because of the form of the bent portion 49^a, passes into the sump 17 and upwardly into the tank 15 and not backwardly to any extent into the reservoir 36. Any steam which may pass backwardly into the reservoir 36 is immediately condensed therein and accordingly flows back into the bend 49^a where it is again converted into steam, this operation being repeated until all of the water has been converted into steam and passed into the tank 15. This steam contacts with the articles contained in the tank and serves to sterilize the same, this operation being arranged to immediately follow the termination of the spraying operation, yet long enough before the motor 58 automatically cuts off to permit a continuing hot air blast to pass into the tank for the purpose of drying the articles subsequently to the sterilizing thereof.

If during an operative period of the machine anyone carelessly or otherwise attempts to open the cover 23, the switch 144 will be thrown to its open position as soon as the locking member 31 is moved from beneath the latching member 34, and thus immediately brings about a stoppage of the motor 58 and a discontinuance of the spray in the tank 15.

The entire operation takes a predetermined period of time, dependent upon the setting of the valve 50, and may be selectively adjusted to most efficiently meet the requirements of any given operations which the machine is designed to perform. From the above it will be obvious that the machine once started may be left without supervision, and it will perform its functions efficiently until completed, after which the articles which have been washed or otherwise treated, may be left in the tank 15, as long as desired or immediately removed therefrom.

The purpose of dividing the reservoir 36 into a plurality of compartments, for instance, two, is to insure uniformity in the strength of the cleansing liquid throughout the washing period.

5 If the cleaning powder is placed directly in the tank 15, the washing liquid at the beginning of the washing period would be excessively strong and would gradually become weaker as drainage and the washing period progresses, until

10 finally the cleansing liquid would become too weak for efficient action which would occur early in the washing period; in other words, such an arrangement would be wasteful of cleaning powder and result in inefficiency. However,

15 under certain conditions, it might be desirable to place a cleaning powder, or some other material, directly in the tank 15, and it is accordingly to be understood that such an arrangement is not excluded from the limits of the instant invention; under such conditions, a reservoir hav-

20 ing only a single compartment might be utilized. It will further be obvious that while in the illustrated example the reservoir 36 includes but two compartments, any number of compartments

25 might be used and arranged to drain in succession, without in any way departing from the spirit of the invention. Such arrangement of more than two compartments would be of advantage, in that it would permit the operation

30 of the machine to start with a compound adapted, for instance, to cut or remove carbon and to follow this with a compound designed to remove grease, etc., or, in other words, to use two different cleansing compounds in succession. Such

35 an arrangement would also be of advantage for enabling two compounds to be used for cleaning silverware, or to permit the washing period to be followed with a spray of some germ killing liquid.

40 Another advantage of feeding the machine from a reservoir, regardless as to the number of compartments therein, resides in the fact that the liquid enters the machine gradually, so that its level slowly rises and imposes the load

45 upon the motor gradually and without excessive strain.

By placing the hand operated valve 50 in the pipe line 49 between the tank 15 and the reservoir 36, the rate at which the liquids enter the

50 machine may be selectively varied, so that the length of an operative period may be regulated to a fine degree to secure the most efficient results. This feature is of importance, because it obviously takes longer to carry out some cleaning and other processes than it does to complete

55 others.

The use of the conical sump 17 having a diameter just enough larger than the diameter of the impeller at the blades 55 for safe clearance, makes it possible to submerge the impeller to the proper extent for most efficient spraying with a minimum amount of liquid. This feature is important in the illustrated machine, and results in a rapid change to clear water

60 after the washing period has been completed. In machines in which the tank holds a large amount of liquid, the change to clear water is undesirably slow and in some instances may be so sluggish that at the end of the rinsing period, the

70 water would still be contaminated. Furthermore, when the amount of liquid utilized is small, as in the illustrated machine, the dirt and food particles and other material removed from the articles being washed pass out of the machine

75 very soon after removal; obviously, the washing

and cleansing is more thorough when dirt, etc., is ejected from the machine promptly. As long as the dirt or other foreign matter stays in the machine, it will be thrown back again upon the articles and thereby delay the cleansing operation.

5 The advantages of providing the upper drain 63 and the lower drain 62 are as follows: The lower drain 62 is essential to effect complete drainage of the sump 17 after the spray

10 in the tank 15 has ceased, and furthermore is essential to break the contact between the tank electrodes 129, which operate the relay 133 just before the complete drainage of the sump 17 has been effected, this being arranged to occur

15 some time after the impeller 54—55 has ceased to project spray. This intervening period is devoted to the projection of hot air blasts into the tank 15 for drying the articles previously washed. The lower drain 62 also serves as an

20 exit for heavy dirt particles, which remain in the bottom of the sump 17 and are not projected upwardly by the impeller 54—55. The lower drain 62 is preferably made somewhat smaller than the upper drain 63 and is just large enough

25 to accommodate the largest dirt particles which may be expected to develop in the operation of the machine. It is, in reality, a supplementary or auxiliary drain which, if made excessively

30 large, would prevent the liquid from reaching the desired predetermined level in the sump 17. The upper drain 63 is of sufficient dimensions

35 to pass off all liquid that enters the tank 15 and is, in effect, an overflow drain which controls the level of the liquid with respect to the impeller 54—55. It also is the drain through which passes the lighter floating dirt particles and floating

40 oils and grease.

To secure the best results, it is desirable to curtail the drainage through the lower drain 62

45 as much as possible and yet have said lower drain sufficiently large to pass all solids that might be expected to reach the sump 17. This result, which presented a rather difficult problem, is accomplished by having the upper and the lower drain 63 and 62 respectively, lead into

50 a common outlet, as illustrated in the drawings. With this arrangement, when the tank 15 is filled to the extent that liquid is passing out through the upper drain 63, the lower drain 62

55 is also attempting to drain, but is curtailed by the greater head existing on the upper drain 63. This greater head permits the upper drain 63 to drain but slows up or completely stops the drainage through the lower drain 62, as will be

60 apparent. In explanation of this operation, it may be stated that when the impeller 54—55 is rotating, there is very little liquid in the sump 17, which liquid extends up only to or slightly above the bottom of said impeller. Hence there is a comparatively small head of liquid acting

65 upon lower drain 62. Liquid which has been thrown up by the impeller travels around the canal 74, enters upper drain 63 and develops a greater head in 62.

As previously stated herein, a part of the sup-

70 porting grid A defines the canal 74 on the peripheral bottom flange 16 of the tank 15, the top of the inner wall of this canal being approximately at the level of the upper drain, which is located within the confines of said canal. During the operation of the machine, and more specifically, a washing period thereof, liquid containing dirt particles falls into the canal 74 and

75 travels around therein and accordingly said dirt particles are carried outwardly toward the sides

of the tank 15 by the developed centrifugal force. The upper drain 63 being located near a side of the tank 15 and in proximity to a corner thereof, draws liquid downwardly and carries with it most of the aforesaid dirt particles. Such liquid and dirt which escapes the upper drain 63 is passed back into the sump 17, some of said liquid passing over the wall formed by the members 66 of the supporting grid and most of said liquid passing through the openings defined by the deflectors 71. This liquid which escapes the upper drain 63 will either pass out of the lower drain 62 or else escape through the upper drain 63 upon being subsequently again thrown into the canal 74 by the impeller 54-55. Since the latter circulates all of the liquid in the machine many times a second, it will be obvious that with this arrangement the dirt and contaminated liquid is passed out of the tank very quickly.

By examining Figs. 6 and 10 of the drawings, it will be seen that such liquid in the canal 74 as does not pass out through the upper drain 63 or pass into the sump 17 over the canal wall, is thrown with considerable force against the impeller 54-55; it will be understood that this is effected by the deflectors 71 and 71^a, the latter of which operate also to project any liquid located upon the inside of the grid support A against said impeller. This causes the impeller to project this liquid upwardly with greater force and speed than is the case with liquid picked up by the impeller from the bottom of the sump 17. This is an important advantage in that speed and pressure in circulating the liquid result in an increased efficiency in the machine.

The fresh liquid which comes into the machine from the reservoir 36 enters the sump 17 through the sloping side wall thereof and at a point in proximity to the bottom 18. The inward flow of this new liquid is comparatively slow and it travels down a sloping side wall of the sump without reaching the impeller immediately. As a matter of fact, this liquid, which is mostly new liquid, does not meet the impeller until its level has reached a point sufficiently high to enable said impeller to pick it up. Consequently, the dirty liquid projected onto the impeller from the canal 74 in the manner previously described, is thrown upwardly by said impeller in advance of said new liquid, so that the dirty liquid, or most of it, is worked and drained off before the new liquid begins to function.

In machines of the illustrated type, particularly when designed for the purpose of washing dishes and the like, it is desirable, in order to secure the most efficient results, to have the cleansing liquid and rinsing water applied in a heated condition. This result is attained by means of the heating chamber 75 and heating element 76, which serves to heat the liquid and the water and to keep it hot during a given operative period of the machine. This heating means, in combination with the fan 79 or its equivalent, is utilized also for introducing heated air into the tank to effect a drying of the dishes or other articles subsequent to the washing or other treatment thereof. By having the conduit through which such heated air is passed into the tank 15 terminate in branch tubes of substantially ram's horn shape, liquid is prevented from passing out of the tank and into the heating chamber 75.

As previously set forth herein, the strainers 64 which cover the inlet ends of the drains 62

and 63 have holes pointing only in a direction away from the direction from which the liquid in the tank approaches said strainers. When this liquid is acted upon by the impeller 54-55, it whirls around both in the sump 17 and on the peripheral bottom 16 which surrounds the same, in the same direction as that in which the impeller 54-55 revolves. If the aforesaid strainers 64 have holes facing this direction, the whirling liquid will be forced out of the drains with some little pressure, and consequently drainage will take place at a higher speed than is the case with the illustrated arrangement, or than is desirable. By placing the strainer holes in a direction away from the approaching liquid, the speed of drainage is materially reduced, which is desirable in the machine under discussion, in which for the most efficient results, drainage should be as slow as possible.

In addition to its other functions, the grid A serves as a support for a conventional plate rack, or said grid may be utilized to support articles directly as may be desired.

The drip cup 47, which normally is located beneath the exit nozzle 46 to catch any drippings from the machine after an operative period has been completed, is moved to one side by engagement with the drip funnel 120 and is tilted by the latter so that any liquid contained in said cup as a result of a previous operation of the machine, spills into the funnel 120 without requiring any manual manipulation of said cup. The latter automatically returns to its position beneath the nozzle 46 the moment the machine is moved away from the funnel 120 or the latter is shifted from beneath the nozzle 46. The sink trap attachment, of which the funnel 120 forms a part, because of its swivel construction, may be adjusted to the most desirable operative position when in use and may be folded out of the way beneath the sink trap in inoperative periods of the machine. The spring 124 as previously stated also serves to compensate for any inequalities or the like which may be present in the floor or other support in which the machine is located. This attachment may be utilized for other purposes than illustrated in the drawings and may constitute an auxiliary drain, for instance, in steamship staterooms, hotel rooms, and the like, as a substitute for the customary toilet facilities when the latter, for instance, are not easily accessible.

While the machine is specially adapted for use as a portable machine for washing dishes in domestic use, it is obvious that it may be utilized for many other purposes and for otherwise treating articles, either during the manufacturing thereof, or subsequent to such manufacture.

Various changes in the specific forms shown and described may be made within the scope of the claims without departing from the spirit of the invention.

I claim:

1. A machine of the kind described comprising a tank having a relatively flat bottom, a sump depending from said bottom and communicating with said tank, a reservoir for liquid, a heating chamber, a connection from said reservoir to said sump passing through said heating chamber whereby liquid is conducted to the sump, heating means in said heating chamber effective on said connection during an operative period for progressively heating the liquid as it flows through said connection before said liquid reaches said sump, impelling means in said sump for throwing

the liquid therein upwardly into said tank, means for operating said impelling means, and a hot air connection from said heating chamber to said tank.

8 2. A machine of the kind described comprising a tank having a relatively flat bottom, a sump depending from said bottom and communicating with said tank, a heating chamber, a reservoir for liquid, a connection from said reservoir to said sump whereby liquid is conducted to the latter, said connection having a flattened, downwardly bent portion located in said heating chamber, heating means in the latter whereby the liquid passing through said connection is heated before it reaches said sump, and whereby liquid remaining in said flattened bent portion after the flow ceases is converted into steam arranged to pass through said connection into said tank for sterilizing purposes, impelling means in said sump for throwing the liquid therein upwardly into said tank, a connection from said heating chamber to said tank, and means whereby air is forced in contact with said heating means and through said connection for heating the upwardly impelled liquid in said tank.

25 3. In a machine of the kind described, a tank, means for impelling liquid upwardly into said tank in the form of a spray, a heating chamber, a connection from said chamber to said tank terminating in forked ram's horn tubes, and a blower connected with said impelling means for forcing air through said heating chamber and

through said connection into the tank for heating the spray therein.

4. In a machine of the kind described, a tank, means for impelling a liquid into said tank, a reservoir, a heating chamber, a connection from said reservoir to said impelling means passing through said heating chamber and bent to form a trap therein, and heating means in said chamber whereby liquid trapped in said trap is converted into steam and passed into said tank for sterilizing purposes.

5. In a machine of the kind described, a tank for holding liquid and having a drain passage leading therefrom for the removal of liquid from said tank, means for causing liquid in the tank to flow over the inlet end of said drain passage, and outlet means associated with said drain passage at said inlet end and facing in the direction of liquid flow whereby the movement of said liquid at said outlet means curtails drainage through said drain passage.

6. In a machine of the kind described, a tank to hold articles to be washed and liquid for washing, means for imparting a substantially horizontal rotary movement to the liquid in the tank, and an outlet in the tank to drain liquid therefrom, said outlet facing in the direction in which the liquid is moved whereby the movement of said liquid at the outlet curtails drainage through said outlet.

DOUGLAS E. BONNER.