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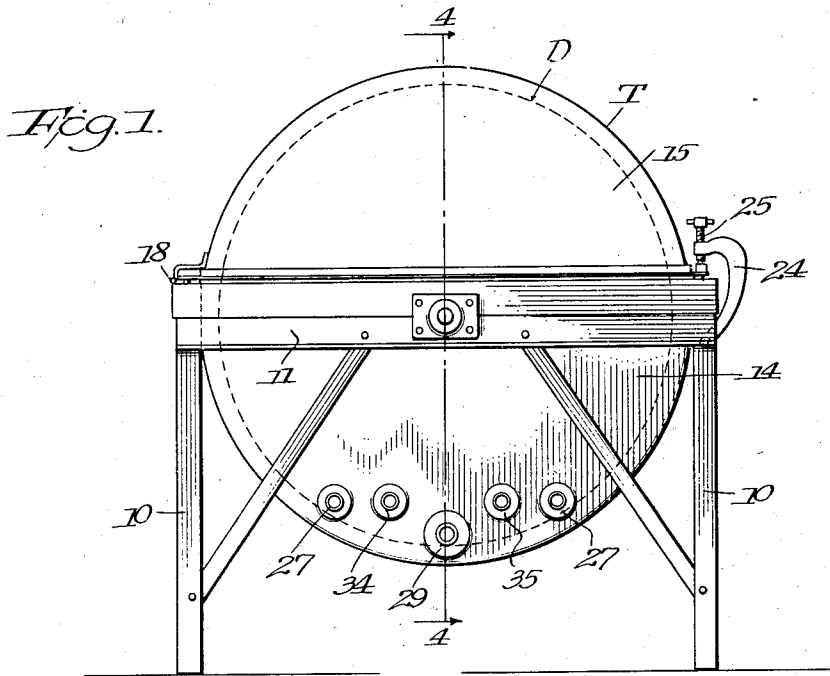
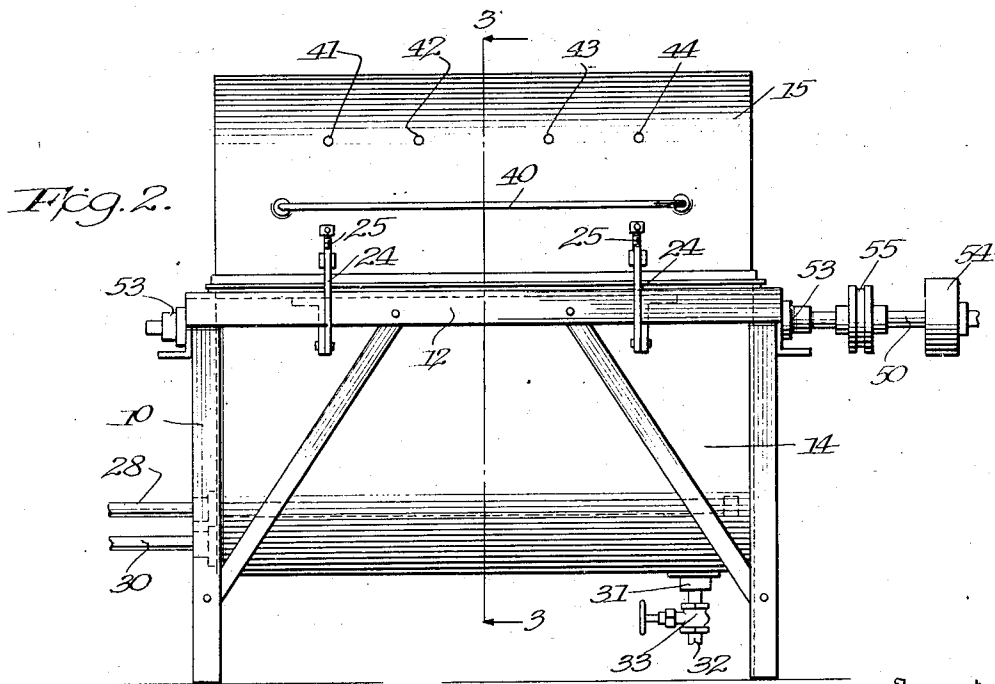
J. H. HAMILTON ET AL

2,202,344

WASHING MACHINE

Filed Jan. 24, 1936

4 Sheets-Sheet 1



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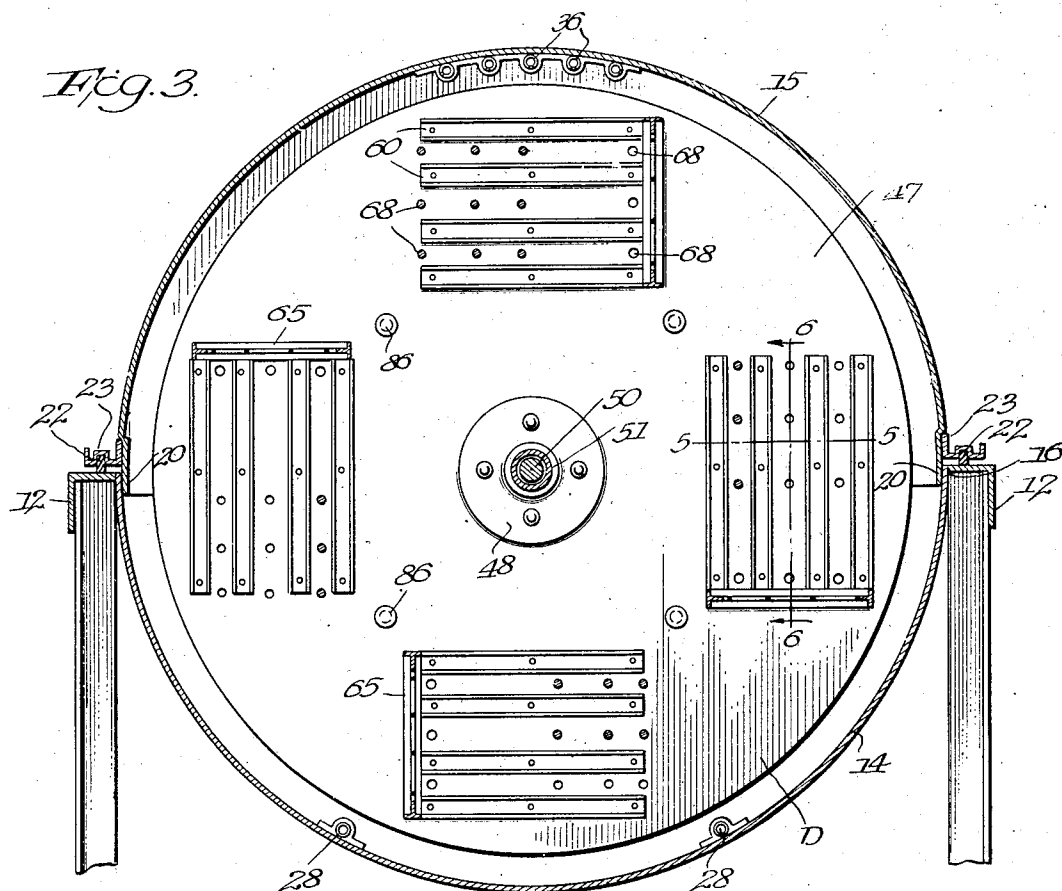
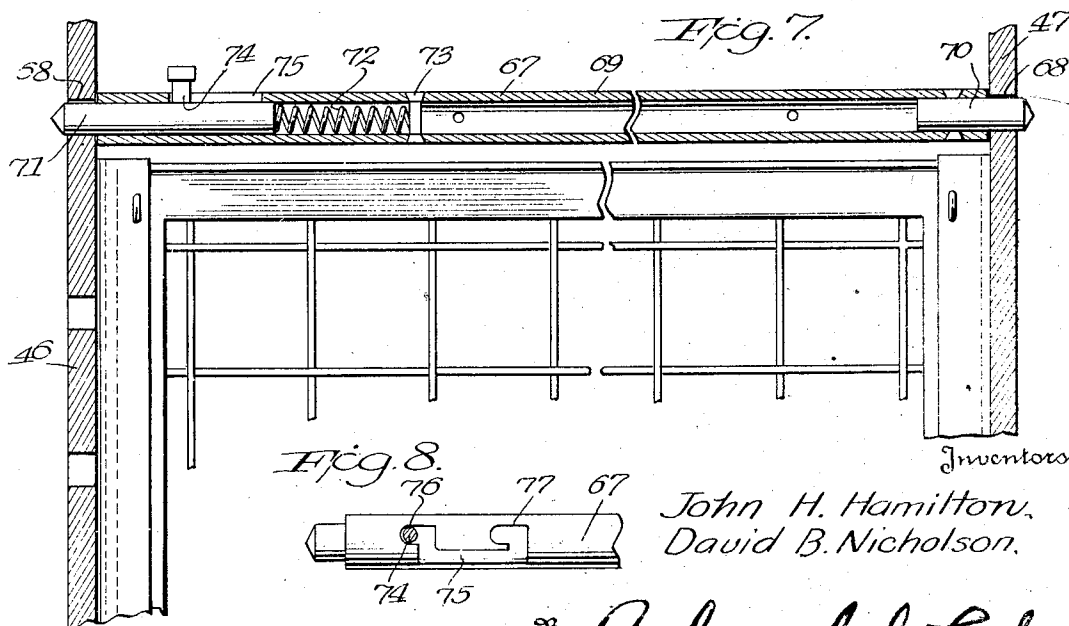
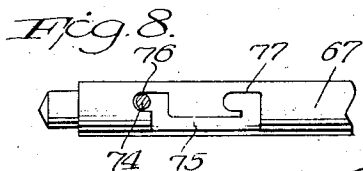
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2,202,344

WASHING MACHINE

Filed Jan. 24, 1936

4 Sheets-Sheet 2



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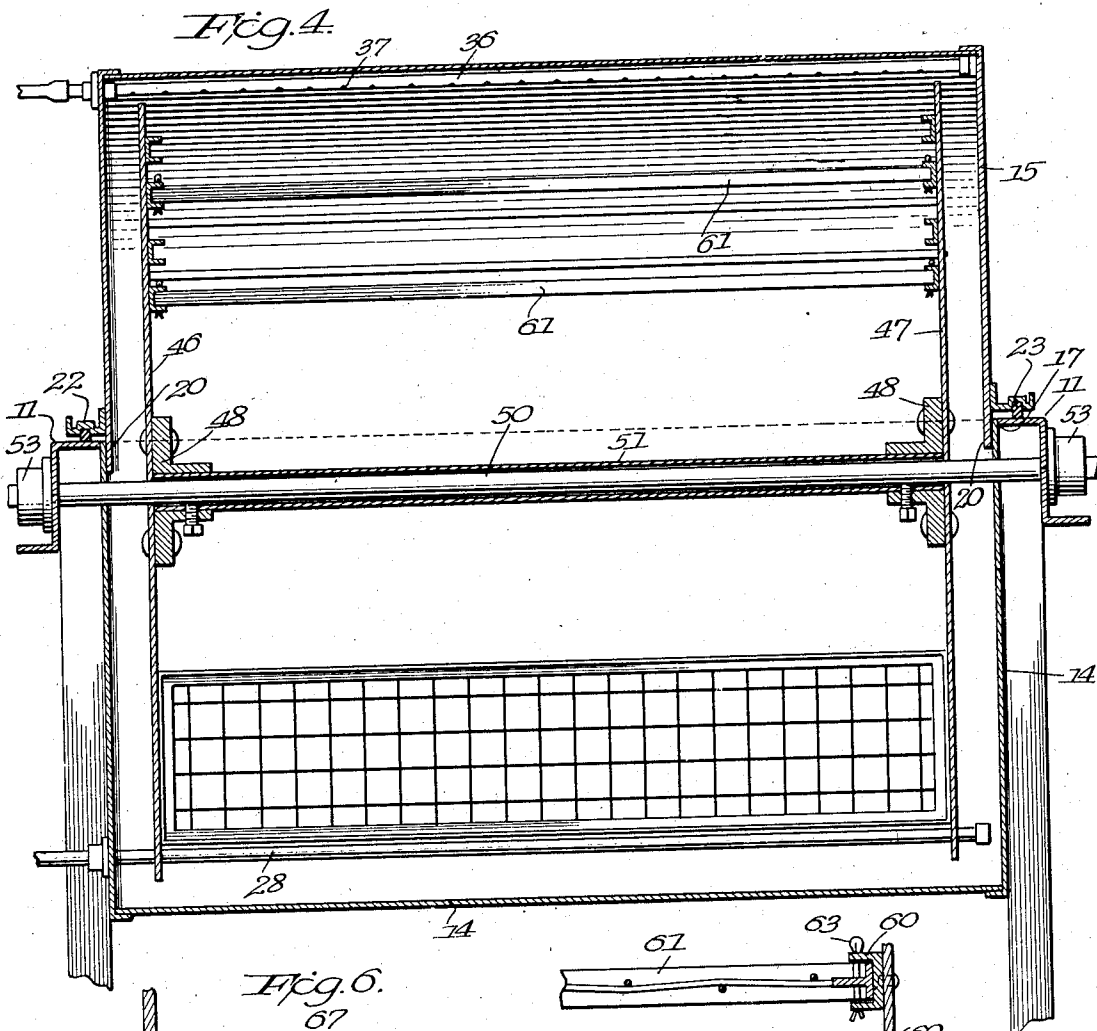
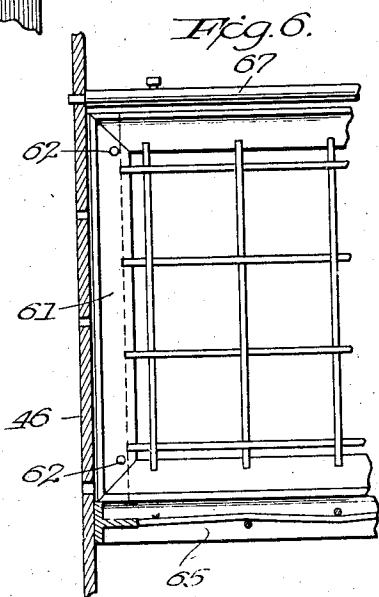
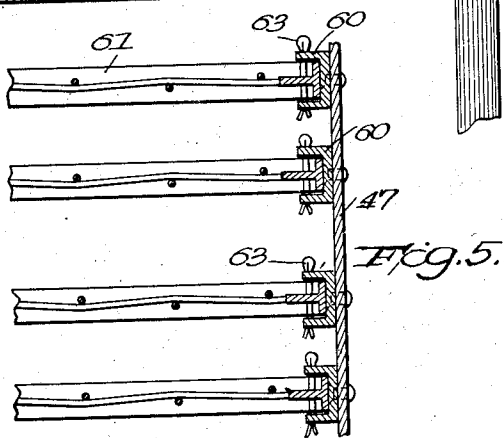
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2,202,344

WASHING MACHINE

Filed Jan. 24, 1936

4 Sheets--Sheet 3



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2,202,344

WASHING MACHINE

Filed Jan. 24, 1936

4 Sheets-Sheet 4

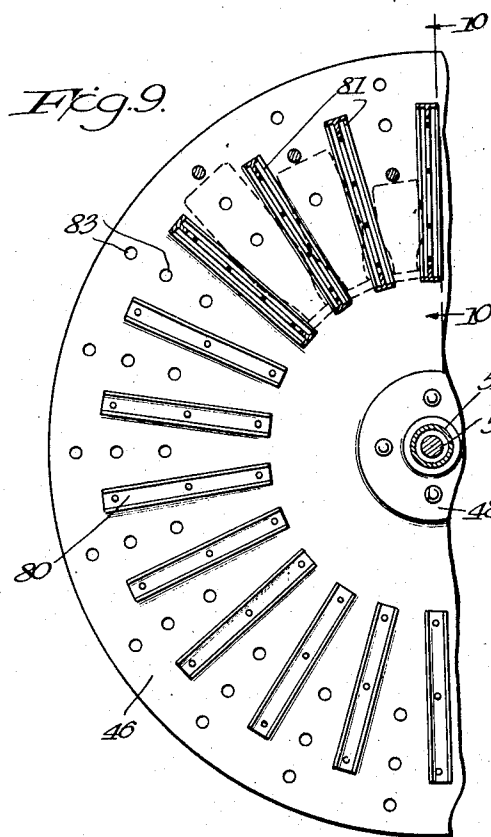


Fig. 10.

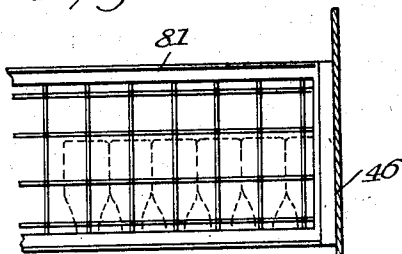
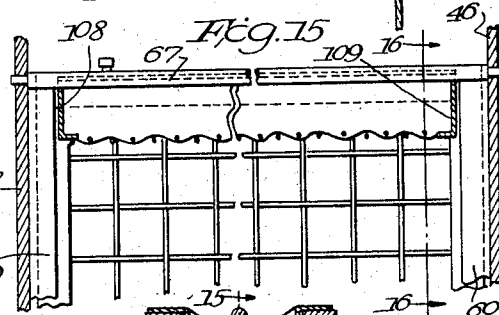


Fig. 16.

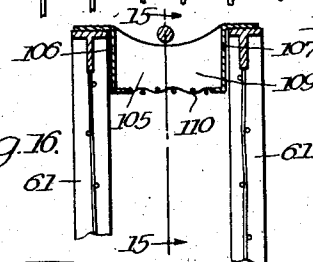


Fig. 11.

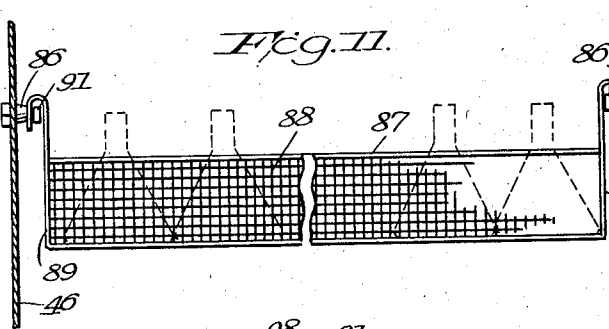
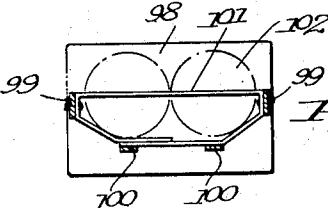


Fig. 14.

Fig. 12.

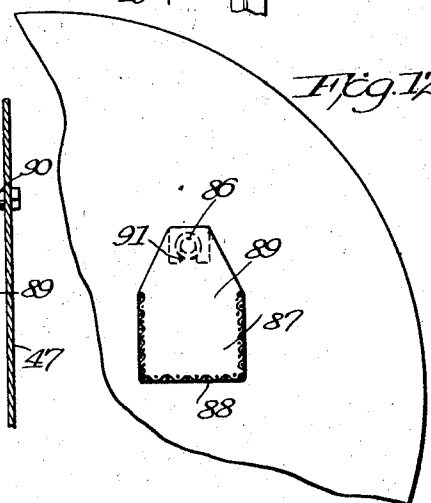
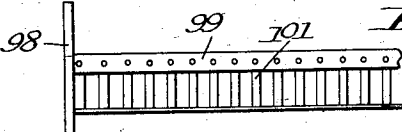


Fig. 13.



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UNITED STATES PATENT OFFICE

2,202,344

WASHING MACHINE

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Application January 24, 1936, Serial No. 60,716

8 Claims. (Cl. 141-7)

The object of the invention is to provide an apparatus for the washing, soaking, rinsing, sterilizing and storing of containers and other similar articles.

5 The invention provides a method of cleansing various types of containers, which will insure that said containers are more rapidly and thoroughly cleansed than when using conventional methods.

10 The drawings disclose several preferred forms of the washing apparatus of this invention, but it will be understood that the details of construction may be varied to adapt the invention for various uses.

15 In the drawings, which are illustrative, and in no sense restrictive:

Figure 1 is an end view of the washing tank.

Figure 2 is a side view of the washing tank.

20 Figure 3 is a transverse vertical sectional view of the washing tank and drum, along the line 3-3 of Figure 2, showing one of the end plates of the drum equipped with the preferred form of channels to receive the article receiving troughs.

25 Figure 4 is a longitudinal vertical sectional view of the tank and drum, along the line 4-4 of Figure 1.

Figure 5 is a sectional view on line 5-5 of Figure 3 of the trough compartment sides in position in the channels.

30 Figure 6 is a partial sectional view of the channel arrangement of the preferred form of the invention, taken along the line 6-6 of Figure 3.

Figure 7 is an enlarged view similar to Figure 6, showing the construction of the keeper bar.

35 Figure 8 is a fragmentary view of the end of the keeper bar.

40 Figure 9 is a partial side elevational view of a modified type of rotatable drum disc, particularly adapted for use in washing milk bottles or the like.

Figure 10 is a partial longitudinal sectional view of the type of rotatable drum shown in Figure 9, and taken along the line 10-10 of Figure 9.

45 Figure 11 is a longitudinal sectional view of a modified form of the invention, wherein swinging baskets are utilized for receiving the articles.

Figure 12 is a transverse vertical sectional view of Figure 11.

50 Figures 13 and 14 are respectively side elevational and transverse vertical sectional views of a type of basket employed in connection with the washing machine of this invention.

55 Figure 15 is a partial longitudinal sectional view of the drum taken on line 15-15 of Figure

16, showing the trough compartment closed by a removable front side.

Figure 16 is a transverse sectional view of the trough compartment, taken on line 16-16 of Figure 15.

5 The washing machine of the present invention, and the methods employed in conjunction therewith, are adapted for the rapid and thorough cleansing of various types of containers. The apparatus is particularly useful in the cleansing 10 out of odd-shaped containers, and containers which may have left in them, after use, residue difficult to remove by ordinary cleaning methods. Receptacles of this type, and from which residue 15 is difficult to remove, are used in laboratories and the like, and it is believed that the present invention solves the problem of keeping such containers in clean and sterile condition at all times, with the minimum expenditure of time and 20 minimum breakage.

Containers such as test tubes, flasks, culture bottles, Petri dishes and the like may be cleansed with facility employing the apparatus and methods of the present invention.

25 While the apparatus is particularly adapted for the cleansing of odd-shaped containers, it may be modified for use in cleansing such ordinary containers as milk bottles. A preferred adaptation of the apparatus for use in cleansing milk bottles is disclosed in the drawings and described 30 herein.

The invention comprises broadly, a sealed tank having mounted for rotation therein a rotatable drum. The tank contains a quantity of water or other washing liquid in the bottom thereof, 35 and may be filled with steam or other sterilizing vapor or gas above the surface of the water. The rotatable drum is equipped to receive various types of containers, and rotates within the sealed tank, carrying the containers alternately and continuously through the cleansing liquid and sterilizing vapor to thoroughly cleanse the same. 40

In Figure 1, the sealed tank is shown at T, said tank having mounted for rotation therein a drum D shown in dotted lines. The tank is preferably 45 of cylindrical shape and may be supported above the floor by any suitable structure. In Figures 1 and 2 the tank is shown carried within a structure formed by the vertical legs 10, the end supporting horizontal bars 11 and the side supporting 50 horizontal bars 12 all being shown in the form of metal angle bars. The vertical bars or legs 10 may be of any desired length, and should be extensive enough to position the bottom of the tank above the floor so that various fittings and 55

connections may be associated with the tank for the control of the same.

The tank comprises two engaging semi-cylindrical parts, the lower part 14 being secured at its open side to the horizontal bars 11 and 12, and the upper part 15 constituting the lid of the tank. As shown in Figure 3, the side of the lower part of the tank is secured to the inner edge of the horizontal bar 12 as at 16 by welding or the like, but, if more convenient, the side may be bolted to the bar. Referring to Figure 4, it will be observed that the ends of the lower part 14 are also secured as by soldering or welding as at 17 to the inner edge of the horizontal end bars 11. By this arrangement, the semi-cylindrical tank 14 is mounted upon the supporting structure to receive the semi-cylindrical lid portion 15 which is hinged to the supporting structure as shown at 18 in Figure 1.

The lid is constructed to seal tightly with the lower part of the tank 14 when in the lowered position of Figure 1, and to insure a steam tight engagement of the two parts of the tank, the lid is provided with a depending inside flange 20 all around its lower edge, this flange being adapted to closely engage with the inner open edge of the lower part of the tank 14, as shown in Figures 3 and 4. To further insure a steam tight seal between the upper and lower parts of the tank, the lower edge of the lid carries an outside flange 23 provided with a rubber gasket strip 22 which is adapted to engage the upper faces of the horizontal supporting members 11 and 12. Disposed around the tank are locking devices to lock the lid and the lower part of the tank in sealing engagement, these locking devices being shown in Figures 1 and 2 in the form of angular members 24 pivoted to the supporting structure, which members carry at their upper ends bolts 25 in threaded engagement with the pivoted members 24, which bolts may be tightened against the flange 23 carried by the lid 15 to press the inside flange 20 of the lid firmly down within the lower part of the tank 14, and also to press the outside flange 23 and gasket 22 downwardly into firm engagement with horizontal supporting members 11 and 12.

It will be understood that the inside flange 20, the outside flange 23, and the gasket 22 extend entirely around the tank, so that the two parts of the same will be completely sealed and steam tight when the lid 15 is lowered to the engaging position of Figure 1. The bottom part 14 of the tank is equipped with fittings, as shown in Figure 1, to provide for partially filling the tank with liquid and for heating and controlling the same. The fittings 27 in the lower tank section 14 are to receive a pair of steam lines 28, which extend throughout the length of the tank as shown in Figure 2. The fitting 29 is adapted to receive a liquid inlet pipe 30 in order that the lower tank section may be partially filled with water or other cleansing liquid. The lower tank section will be filled above the level of the steam lines 28, and steam may then be blown through a plurality of apertures in the lines 28 into the liquid to heat the same as desired. An outlet fitting 31 is fixed in the bottom of the tank and leading therefrom is a drain pipe 32 controlled by a valve 33, to regulate the level of liquid in the tank, and to drain the same.

The level of water in the tank may be observed by a conventional water gauge secured in a fitting 34 in the end of the lower tank section as shown in Figure 1, and any conventional type of

thermometer may be attached at the fitting 35 in the end of the lower tank section in order that the temperature of the liquid will be indicated.

It will be noted in Figure 3 that the steam lines 28 are mounted on the inner face of the lower tank section 14, and immediately adjacent thereto, so that the rotatable drum D carrying the containers to be washed will clear the same during rotation.

The lid 15 of the tank is also equipped with a plurality of lines 36 extending throughout the length thereof, these lines being provided with a multitude of perforations 37 in order that steam or other sterilizing vapor or gas may be discharged throughout the upper part of the tank in a cloud-like manner, in order to thoroughly cover and sterilize the containers. While steam will ordinarily be discharged into the tank through the lines 36, any suitable valve arrangement may be provided in these lines exteriorly of the tank so that either hot or cold water, or other cleansing or rinsing liquid may be projected into the upper part of the tank through the openings 37 to thoroughly cleanse or rinse with liquid the containers carried in the rotatable drum.

Referring to Figure 2, it will be noted that the lid 15 carries a convenient handle 40 for raising and lowering the top of the tank, and various fittings may be provided along the front face of the lid, so that the attendant may check on the condition within the tank during operation. As shown in Figure 2, a steam gauge may be provided at 41 to indicate steam pressure within the upper part of the tank, and a thermometer may be disposed in a fitting 42 to indicate the temperature of the vapor or gas within the upper part of the tank. A relief valve for relieving vapor from the upper part of the tank may be mounted in the lid as at 43 and an air exhaust valve 44 may be utilized to permit the exit of air from the upper part of the tank when the same is being filled with vapor.

The rotatable drum comprises a pair of end circular discs or plates 46 and 47 mounted on circular couplings 48 by which said discs are fixed to a shaft 50 which extends longitudinally and centrally through the tank. As shown in Figure 4, the shaft is protected by a sleeve 51 which surrounds the shaft at its portions which extend through the tank and where it is exposed to steam or other fluid.

The shaft 50 is mounted for rotation in bearings 53 secured to the horizontal frame members 11, and the shaft may be driven from any suitable source of power. In Figure 2, the shaft is shown provided with a pulley 54 to which may be operatively connected a belt or the like. The shaft is broken and equipped with a clutch 55 which is convenient for use in connection with loading and unloading the drum.

In the preferred embodiment of the rotatable drum as disclosed in Figure 3, the inner faces of the drum discs 46 and 47 are provided with a plurality of correspondingly arranged channel members 60, said members being bolted or riveted at their backs to the inner faces of the discs as shown in Figure 5. Each of these channel members is adapted to receive a removable foraminous trough forming side 61, (Figs. 4 and 5), which is held at its ends within the channels between the opposed drum discs. Each side comprises a substantially rectangular frame of metal members secured together, with wire, screen or the like strung between the frame mem-

bers. The channels 60 are provided as shown in Figures 4 and 5 with aligned openings near each end of the channels, said openings being adapted to register with apertures 62 in the end frame members of the trough sides so that the latter may be removably secured in position in the channels by means of cotter keys 63.

As disclosed in Figure 3, each of the drum discs 46 and 47 is provided with banks of the channel members 60, the banks being disposed substantially 90° apart around the discs. When the drum is in the position shown in Figure 3, the upper and lower banks of channels are disposed in substantially horizontal planes, and the right and left banks of channels are disposed in substantially vertical planes. In the arrangement shown in Figure 3, each bank is shown as comprising four radially spaced parallel channel members.

The washing machine of this invention will be equipped with a plurality of the trough sides 61, and these sides may be selectively positioned in the channels to form trough compartments of various dimensions depending upon the type of container or article being cleansed. For instance, and referring to Figure 4, a top trough side 61 is shown positioned in the second set of channels from the top and a bottom trough side 61 is shown positioned in the bottom set of channels, to form a compartment therebetween to receive containers or articles of a certain size. In Figure 5, a trough side is shown in each set of channels, thus forming three separate compartments in the trough, to accommodate smaller containers or articles. Obviously in Figure 5, the two intermediate trough sides could be omitted to form a relatively large compartment.

Thus it will be seen that we have provided a rotatable drum which may easily be arranged to accommodate containers or articles of various sizes and that the number and dimensions of the compartments in which the articles are to be carried may be varied with facility.

As shown in Figures 3 and 6, each bank of channels may have mounted at one end thereof a permanent trough back side 65 which is secured to the inner face of the discs 46 and 47 at right angles to the direction in which the channels 60 extend. The trough back side members 65 are of sufficient width to extend across the entire line of channels 60 in each bank, so that said trough back side will form the back of the compartment formed no matter how many or in what manner the trough sides are assembled in the channels. While we have disclosed the trough back sides 65 as being permanently attached between the drum discs 46 and 47, these back sides may be removably mounted in channels in a manner similar to that shown in connection with the trough sides 61.

In using the embodiment of the invention of Figure 3, articles of glassware, such as bottles, flasks, test tubes and the like, will be placed in the trough or compartment formed by the trough top and bottom sides 61 and the trough back sides 65. These articles may be placed loosely within the trough compartment if they are of sufficient size, or if small they may first be placed in baskets or racks in a manner hereinafter described and then said baskets or racks may be placed within the trough. In either event, the loose articles, baskets or racks of containers are retained within the trough by a keeper bar 67 of the type shown in Figure 7. The drum discs 46 and 47 are provided with a plurality of apertures 68 dis-

posed between the channel members 60 as desired. Referring to Figure 3, three of these apertures 68 are shown in alignment between each of the channel members 60, and one of such apertures is shown at the opposite end and between the channels adjacent the back trough side 65. By reason of these apertures, a keeper bar may be positioned to securely hold the articles or racks of articles within the trough compartments to prevent the articles from moving about during the rotation of the drum. Furthermore, by reason of the plurality of aligned apertures 68, the longitudinal dimension of the trough may be varied to accommodate the number or size of articles being cleansed.

If it is not desired to utilize a permanent back trough side 65, this member may be omitted, and the back of the trough may be closed by means of a keeper bar or bars placed in the aperture 68 located adjacent the normal position of the back trough side 65. Such an arrangement is suited to the type of containers being cleansed and will increase the flexibility of the assembly.

The keeper bar is shown in Figures 7 and 8 as comprising a tube 69 having a pin 70 of slightly smaller diameter than the tube permanently secured as by riveting in one end thereof, and a movable pin or latch 71 of like diameter in the other end thereof. The pin or latch 71 is normally urged toward an outward position by means of a spring 72 carried within the tube and retained at one end by a pin 73 extending through the tube. The latch 71 is provided with an engaging handle 74 which extends through a slot 75 in the tube 69. The slot 75 has offset portions 76 and 77 at its ends, so that the latch 71 may be secured in locked or unlocked condition. In use, pin 70 of the keeper bar is inserted in one of the apertures 68 in one of the drum discs, and the latch 71 is drawn inwardly by the handle 74 against the tension of the spring 72 until the keeper bar is in proper position with its latch aligned with the proper aperture 68 in the other drum disc. The engaging handle 74 may be placed in the extension 77 to hold the latch 71 retracted to facilitate this operation. When the keeper bar is in position the engaging handle may be permitted to move through the slot 75, thus forcing the latch 71 into its proper aperture 68, after which the engaging handle may be moved into the extension 76 of the slot 75 to lock the keeper bar in place. It will be noted that the ends of the tube 69 abut against the inner faces of the drum discs 46 and 47 to assist in retaining the keeper bar in place.

In operating the washing machine of the present invention, the troughs may be formed with top, bottom and back sides as desired, after which loose containers or articles or baskets or racks of containers or articles may be placed in the trough. These articles may then be secured in position by placing the keepers in the apertures. The tank top 15 will, of course, be raised during this operation, and each of the banks of channels may be brought to the upper position, at which time the troughs will be filled with the articles. The tank is then closed and sealed, and water or other cleansing solution is admitted to the lower part of the tank and is heated to the desired temperature by steam which is blown in through the lines 28. If it is desired to have a sterilizing atmosphere in the upper portion of the tank, live steam or other vapor or gas may be blown in through the steam lines 36 in the lid of the tank. Air may be

exhausted during the inflow of vapor, through the air relief valve, and the desired condition in the upper and lower parts of the drum may be brought about by regulating the liquid by inlet and outlet valves, and the steam by inlet and outlet valves, in the lower and upper parts of the tank. When the proper temperature of the water or other cleansing solution and steam or other vapor or gas is obtained, the drum may be rotated slowly to cleanse the containers housed in the troughs. The level of liquid in the lower part of the tank will be sufficient to immerse the containers or other articles as they are carried through the same, and the speed of rotation of the drum will preferably be such that as the containers pass through the fluid in the bottom of the tank, they will become filled, and will empty when they pass through the upper part of the tank. To carry out these operations, it is desirable that the containers be positioned in the troughs with their mouths directed toward the axis of rotation of the drum whether they are disposed alone in the trough compartments, or in baskets or racks placed thereon, so that they will fill by gravity during the lower part of the cycle of rotation, and discharge by gravity during the upper part of their cycle of rotation. Obviously, the movement of the drum and containers through the fluid will cause considerable agitation, which will assist in a more thorough cleansing of the containers or other articles. Furthermore, steam may be blown into the water or other cleansing solution through the pipes in as violent a manner as desired to secure further agitation of the cleaning fluid.

In the normal operation of washing laboratory equipment, we have found that temperatures within the tank of from 135° F. to 212° F. are suitable, depending upon the condition of the article being cleansed, and the kind of residue or foreign matter to be removed. When more complete sterilization is desired, steam pressure of fifteen pounds per square inch may be maintained. After the containers or articles have been thoroughly cleansed, each trough may be stopped beneath the perforated pipes and cold water or other fluid may be projected upon the articles from these pipes in order to rinse the same. The articles may be removed after rinsing or articles may be removed from one trough and replaced with soiled articles and these may then be washed along with the articles already in position in the other trough compartments.

The washing apparatus of this invention has been found to be particularly successful in cleansing ampoules or other narrow necked containers. As is well known, containers of this character are very difficult to wash owing to the fact that fluid cannot be readily expelled through the narrow neck due to the capillary effect.

In cleansing ampoules in accordance with the method of the present invention, they may be disposed in the troughs with their mouths facing toward the axis of rotation of the drum and then they may be slowly immersed and raised from the cleansing fluid by revolving the drum at a slow speed, usually around three revolutions per minute. When carrying out this method, we have found that the temperature of the water or cleansing fluid should be materially lower than the temperature of the steam or other sterilizing vapor in the upper part of the tank. We have found that a desirable condition exists when the temperature of the water or other cleansing liquid is approximately 135° F. and

the temperature of the vapor in the upper part of the tank is approximately 200° F.

When the ampoules with their mouths disposed radially toward the axis of rotation are rotated in the machine with the above conditions existing, they will alternately be exposed to relatively cold liquid or other fluid and relatively hot steam or other vapor or gas. When the ampoules pass through the relatively cold liquid, the air in the same will contract and draw liquid into the side of the ampoules, and when they are slowly passed through the upper part of the tank, and through the relatively hot steam or other vapor, the change of temperature will cause the air trapped within the ampoules to expand, thus expelling the water or other cleansing liquid from the ampoules. Thus it will be seen that during each rotation of the drum, the ampoules will be partially filled with liquid and then will be caused to expel the same, thus thoroughly cleansing their interiors.

In Figures 9 and 10 is shown an alternative rotatable drum disc construction adapted for use in cleansing such containers as milk bottles and the like. It will be understood that this form of drum may be used in the same tank arrangement as shown in Figures 1 and 2. In this embodiment, the channel members, similar to the channel members of the embodiment of Figure 3, are bolted or riveted radially to the drum discs, so that when the trough sides are fixed in these channels they will converge toward one another as the center of rotation of the drum is approached. The milk bottles or the like may be positioned between the trough sides as shown in Figure 9. Between adjacent channels members, a plurality of keeper receiving apertures are provided in the drum discs, said apertures being spaced radially along a diameter of the drum and between adjacent channel members. With this arrangement, different sizes of bottles may be accommodated between the trough sides and retained by disposing a keeper bar in the proper apertures. As shown in Figure 9, identical adjacent troughs may accommodate, for instance, a half pint, a pint and a quart bottle as shown. If a larger bottle such as a flask of some sort is to be washed in a rotatable drum of this type, certain of the channels may not be provided with trough sides, thus providing a larger compartment to retain the larger article or container. That is, trough sides may only be inserted in alternate or every third channel to make the trough compartments as extensive as needed.

In washing milk bottles or the like with a drum of this embodiment of the invention, it is preferred that the bottles should be disposed within the trough with their mouths directed toward the center of rotation of the drum, as shown in Figures 9 and 10.

In operating the machine employing the drum of this embodiment, the drum will be rotated in the tank and the open mouth containers will alternately be exposed to the cleansing liquid and the sterilizing vapor in the tank, and it will be obvious that the containers will be alternately immersed with their mouths directed upwardly and permitted to drain with their mouths directed downwardly. The rotation of the drum through the liquid will cause agitation of the latter which may be increased as desired by increasing the pressure of the steam projected into the liquid through the steam pipes.

The drum of this embodiment may also be con-

veniently used in the pasteurizing or sterilization of containers filled with milk. In this use, the bottles of milk or cream with their tops applied, will be positioned in the troughs as shown in Figure 9. Liquid may or may not be present in the bottom of the tank, and the tank may be completely filled with steam or other vapor or gas at the desired temperature and pressure. The closed bottles of milk or cream may then be slowly revolved in the vapor atmosphere or through the liquid to accomplish the sterilization or pasteurization. It will be apparent that the rotation of the drum will continue to turn the bottles upside down, resulting in an even distribution of the cream content of the fluid during the sterilization or pasteurization. In carrying out this method, the temperature within the tanks should be from approximately 142° to 145° F. After the bottles have been subjected to this temperature for the desired length of time, they may be rapidly cooled by passing cold water or brine through the tank, or spraying said bottles with cold water or brine from the lines 36, or both.

In laboratory operations, it is frequently desirable to sterilize flasks of liquid of the type shown in Figure 11. These flasks will contain a quantity of liquid, and the necks of the flasks will generally only be closed by a wad of cotton or the like to prevent contamination of the contents. In sterilizing the liquid in such flasks, it is necessary to keep the flasks at all times in upright position, although we have found it to be desirable to move the flask and contents throughout the atmosphere in which they are being sterilized. Referring to Figures 3, 11 and 12, four lugs 86 are disclosed projecting inwardly from the drum discs and disposed substantially 90° apart, alternately with respect to adjacent banks of the channel members 60. When it is desired to sterilize open mouthed flasks of liquid, the trough sides may be omitted from the channel members 60 and a flask cradle 87 of the type shown in Figures 11 and 12 may be mounted on opposed lugs 86. The cradles 87 comprise a foraminous body 88 and metallic end members 89. The end members 89 extend upwardly and are bent outwardly and downwardly at their ends to form hook-shaped portions 90, said hook-shaped portions being slotted as at 91 in order to fit over the projecting ends of the lugs 86. Referring particularly to Figure 11, it will be noted that the projecting ends of the lugs 86 are enlarged as at 91 in order to retain the hook-shaped end of the cradle in position when mounted thereon. By this arrangement, the flask cradles are suspended on the lugs 86 and they will remain in upright position throughout the complete cycle of rotation of the drum, the hook-shaped ends of the plates 89 being adapted to pivot upon the lugs 86.

The lugs 86 are of such length that they project inwardly from the inner face of the drums 46 and 47 to a sufficient extent so that the channels 60 will not interfere with the relative movement of the cradles with respect to the drum during the rotation of the latter.

In Figures 13 and 14, a rack arrangement is shown adapted to hold a number of Petri dishes. This rack comprises end plates 98 connected together by longitudinal side members 99 and longitudinal bottom members 100. Riveted or bolted along the members 99 and 100 are a plurality of spacing elements 101, as shown in Figure 13, which divide the length of the rack

into a plurality of compartments to receive and hold in spaced relation the Petri dishes 102.

This rack may be filled with Petri dishes outside of the tank, and the rack will be of such dimension that it may be disposed within the trough compartments formed by the trough sides 61 as shown in Figures 3 and 4. The racks may be of such dimension as to extend the entire length of the troughs, or they may be of smaller overall length and a plurality of them may be positioned within the troughs in end to end relation. In either case, these racks will be retained in the troughs by properly positioning one of the keeper bars.

In connection with the embodiment of Figure 15, a front side member 105 of the type shown in Figures 15 and 16 may be used if it is desired to completely close the trough compartment, in order to carry articles too large for racks such as is shown in Figures 13 and 14. This member is composed of metallic side members 106 and 107 of angular form, adapted to rest on the edges of adjacent trough sides 61 as shown in Figure 16, metallic end members 108 and 109 and a foraminous bottom 110. This front side member is held in place by one or the keeper bars 67, thus completely closing the trough compartment.

It will be noted in Figure 15 that the member 105 is of such length that it may be positioned between the inner edges of opposed channel members 60, on opposite drum discs 46 and 47. While in Figure 16 we have disclosed the member 105 as being only wide enough to extend between adjacent channel members, this front side member may be wide enough to bridge any number of channel members, depending on the size of the trough compartment which has been formed, as hereinbefore described, without interfering with the channel members not in use.

The use of this front side member has been found useful in washing Roux culture bottles and Blake flasks, and might be found to be convenient in washing any articles or material where it is desirable to completely close the trough compartment.

In connection with any of the embodiments of the invention discussed above, and if the cleansing and sterilizing operations have been completed, it will be obvious that the containers may be stored within the tank until such time as their use is desired, at which time any or all of the containers or other articles may be removed. Furthermore, if it is desired to store the containers or other articles in a sterile atmosphere until their use is desired, the liquid cleansing solution may be removed from the tank and the articles left sealed in the tank which may be kept filled with steam at any desired temperature and pressure.

While we have found that better results are accomplished by using steam in the upper part of the tank, it is obvious that simple washing of containers or other articles may be carried out by continuously immersing the containers in the cleansing liquid without using steam or other sterilizing vapor in the upper part of the tank.

If desired, the lower part of the tank may be filled with liquid and articles carried in the trough compartments may be soaked therein, the drum remaining stationary.

It will be obvious that we have provided an apparatus of great flexibility which may be employed in cleansing and sterilizing containers and other articles of various sizes and shapes.

The details of the construction shown herein may be considerably modified without departing from the scope of the invention, and the apparatus described above is susceptible of great variation in size to accommodate the machine to the type of work for which it is desired. Furthermore, it will be evident that the apparatus shown herein may be used, or modified for use, in cleansing any type of articles or materials and is not limited in its usefulness solely to the cleansing of containers.

We claim:

1. In an apparatus of the class described, a drum comprising a pair of opposed end plates, a plurality of substantially rectangular trough sides, cooperating means on said plates and the ends of said sides for removably securing said sides between said plates in spaced relation to one another, to form a trough compartment with an open side for receiving articles to be cleansed, and a keeper bar, said plates having aligned openings between said trough sides for removably securing the ends of said bar between said plates across an open side of said trough compartment, to retain the article therein.

2. In an apparatus of the class described, a drum comprising a pair of opposed plates, a plurality of substantially rectangular trough sides, cooperating means on said plates and the ends of said sides for removably securing said sides between said plates in spaced relation to one another to form a trough compartment with an open side for receiving articles to be cleansed, and a keeper bar, said plates having a plurality of pairs of aligned openings between said trough sides for removably securing the ends of said bar between said plates across an open side of said trough compartment, to retain articles of various sizes therein.

3. An apparatus of the class described, a drum comprising a pair of opposed plates, a plurality of substantially rectangular trough sides, a plurality of pairs of aligned means on said plates cooperating with the ends of said sides for removably securing said sides between said plates in spaced relation to one another to selectively form trough compartments of various sizes having open sides for receiving articles to be cleansed, and a plurality of keeper bars, said plates having aligned openings between said trough sides for removably securing the ends of said bars between said plates across the open sides of said trough compartments, to retain the articles therein.

4. An apparatus of the class described, a drum comprising a pair of opposed plates, a plurality of substantially rectangular trough sides, a plurality of channel members on the opposed faces of said plates, the ends of said trough sides being adapted to be positioned between said plates with their ends in said channels to form trough compartments having open sides for receiving articles to be cleansed, and a plurality of keeper bars, said plates having aligned openings between said channel members for removably securing the ends of said bars between said

plates across the open sides of said trough compartments to retain the articles therein.

5. An apparatus of the class described, a drum comprising a pair of opposed plates, a plurality of substantially rectangular flat trough sides, cooperating means on said plates and the ends of said trough sides for removably securing said sides between said plates in spaced parallel relation to one another to form a trough compartment with an open side for receiving articles to be cleansed, and a keeper bar, said plates having aligned openings between said trough sides for removably securing the ends of said bar between said plates across an open side of said trough compartment, to retain the articles therein.

6. In an apparatus of the class described, a rotatable drum comprising a pair of opposed end plates, a plurality of substantially rectangular trough sides, cooperating means on said plates and the ends of said sides for removably securing said sides between said plates in spaced relation to one another and radially with respect to the axis of rotation of said drum, to form a trough compartment with an open side for receiving articles to be cleansed, and a keeper bar, said plates having aligned openings between said trough sides for removably securing the ends of said bar between said plates across an open side of said trough compartment, to retain the articles therein.

7. In an apparatus of the class described, a rotatable drum comprising a pair of opposed plates, a plurality of substantially rectangular trough sides, cooperating means on said plates and the ends of said sides for removably securing said sides between said plates in spaced relation to one another, and radially with respect to the axis of rotation of said drum, to form a trough compartment with an open side for receiving articles to be cleansed, and a keeper bar, said plates having a plurality of pairs of aligned openings between said trough sides for selectively and removably securing the ends of said bar between said plates across an open side of said trough compartment, to retain articles of various sizes therein.

8. In an apparatus of the class described, a rotatable drum comprising a pair of opposed plates, a plurality of flat foraminous trough sides, a plurality of pairs of means on said plates for cooperation with the ends of said trough sides for removably securing said sides between said plates in spaced relation to one another and radially with respect to the axis of rotation of said drum, to form trough compartments of various sizes having open sides for receiving articles to be cleansed, and a plurality of keeper bars, said plates having aligned openings between said trough sides for removably securing the ends of said bars between said plates across open sides of the trough compartments, to retain the articles therein.

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