This invention relates to apparatus for cleaning bottles, and has for its general object to provide an apparatus for this purpose wherein bottles may be cleaned most effectively, in a comparatively short time, and with the employment of a relatively small number of operations.

The apparatus shown and described herein is one which is designed to carry out, in an efficient manner, the process set forth and claimed in the application of Charles H. Loew, Serial No. 744,493, filed October 19, 1924, which has matured into Patent No. 1,642,419, granted September 13, 1927. The said apparatus comprises generally an elongated casing divided by partitions into several soaking tanks or compartments arranged in series, with means for jetting and rinsing the bottles prior to and after their transit through such tanks and for cleansing with acid, with water, and with brushes, the interiors and exteriors of such bottles.

The apparatus referred to is shown in the drawings, wherein Figs. 1 and 2 show jointly a longitudinal sectional elevation of said apparatus; Fig. 2, a sectional side elevation of the mechanism for treating the interiors of the bottles with acid; Fig. 3, a transverse sectional view through the apparatus, also showing the last-mentioned mechanism; Fig. 4, a detail in section of a part of the acid tank and one of the pumps for forcing the acid into a bottle thereabove; Fig. 5, a plan view of the top of such pump; Figs. 6 and 7, details in section corresponding respectively to the lines 6--6 and 7--7 of Fig. 4; Fig. 8, a view, similar to Fig. 4, showing a modification of the invention; Fig. 9, a detail in plan of the pump shown in Fig. 8; and Figs. 10 and 11, details in section corresponding respectively to the lines 10--10 and 11--11 of Fig. 8.

Describing the various parts by reference characters, and with respect to Figs. 1-7, inclusive. A denotes an elongated casing having a bottom wall 1, a rear wall 2, a front wall 3, side walls 4, and a cover wall 5. The rear wall is provided with a transverse opening 2a for the passage of an endless conveyor on which the bottles are mounted and conducted through the casing.

The bottom wall of the casing is shown as supported by hollow transverse members 6 upon longitudinal sills 7 which in turn are carried by transverse members 8, 8a. The front member 8a supports the front ends of the longitudinal sills or members 7; also a pair of upright posts or members 9, 10 and 11. The partitions dividing the part of the casing between the walls 1, 2, 3 and 4 into three tanks or compartments, the upper ends of each of the partitions being deflected forwardly toward the delivery end of the apparatus, as indicated at 10a and 11a, respectively. The tanks or compartments thus provided are indicated at B, C and D, respectively.

In front of the tank E is a tank F, formed by and between the walls 1, 3 and 4, and a wall 12, parallel with the wall 3.

13 denotes rear and 14 front sprockets by means of which the bottle conveyor is driven, together with the sprocket wheels 15, 16, 17, 18, 19, 20, 21, arranged within the casing.

The sprocket wheels 15 are mounted in the rear of the casing and above the tank B, while the sprockets 16 are in said tank. The sprockets 17 are mounted above the tanks B and C and the sprockets 18 within the tanks C. The sprockets 19 are mounted above the tanks C and D, while the sprockets 20 are within the latter tank. The sprockets 21 are mounted so as to project in part above the level of the liquid in the tank D. The sprockets referred to support the bottle conveyor and cause the conveyor and the transverse series of bottles therein to pass in operative relation to the various parts of the apparatus by which the bottles are treated.

The shafts for the sprockets are indicated at 13a, 14a, 15a, 16a, 17a, 18a, 19a, 20a and 21a; and one such shaft is shown as adjustable mounted in bearings 19a, whereby the slack of the conveyor may be taken in from time to time, as necessary.

Each tank is provided with a support which is adapted to be engaged by the bottoms of the bottles on the conveyor, thereby to prevent such bottles from dropping out.
of the conveyor as the latter is driven through the tanks.

The support in the tank B comprises a sheet metal member which extends across the interior of the tank and which is of sufficient width to engage the bottoms of each transverse series of bottles on the conveyor. The said member comprises a rear wall 22, the upper end of which is curved to conform to the curvature of the bottle conveyor adjacent thereto, as shown at 22, the lower end of the wall 22 being curved about the shaft 10 (preferably concentric with such shaft) as shown at 23, the said member also comprising a wall 23 extending upwardly and forwardly from the curved wall 22.

A similar member is provided in the tank C, and the parts of the same which correspond to like parts of the member 22 are indicated at 23—23, inclusive. The chamber D contains a similar member, the corresponding parts of the same being indicated at 24—24, the wall 24, however, being substantially vertical, with its upper edge below the top of the liquid.

Immediately below the opening 2 in the rear wall of the casing is a tank F, formed by the rear wall 2 and the side walls 4 of the casing and having a bottom wall 25 and a front wall 26 which is substantially parallel with the top 10 of the wall 10. The walls 22, 23 and 24 are substantially parallel with each other and with the walls 26, 10a and 11a.

Within each of the tanks B, C and D is a steam heater, indicated at B', C' and D', respectively, each of the heaters being connected with a trap B", C" and D", respectively, by pipes B", C", D", respectively, the said traps being provided with a common pipe 27, the said pipe receiving its steam supply from any suitable source.

Extending across the top of the tank E is a screen 28. From the bottom of the tank E a pipe 29 leads to a pump 30 driven by a motor 31. The receiving end of the pipe 29 is covered by a screen E' within the tank E. Water pumped from the tank E is delivered to a pipe 32 and from said pipe to various cleaning or rinsing stations, as will be explained.

A continuation 32 of the pipe 32 extends over the top of the casing and to the rear thereof and delivers into a transverse spraying head 33 located above the tank F, said head being provided with nipples 33, one for each bottle in each transverse series brought intermittently thereabove by the conveyor.

Within a casing M provided in part by and below the forward end of the cover 3 are located rotary brushes 34 arranged to operate upon the bottoms of bottles therebeneath. Above such brushes, within the casing, are a pair of transverse spraying heads 35, each extending above a brush 34 and arranged to discharge thereon liquid supplied through the pipe 32 and a connection 33.

From the pipe 32, a pipe 36 extends through the tank E and into the tank D, where it is formed into a heat-receiving coil 36, whence it extends upwardly, communicating at its end with a transverse spraying head or manifold 37, provided with jet orifices adapted to discharge liquid upon the bottoms of bottles therebeneath.

Extending from the pipe 36, below the head 37, is a connection 36 by which the liquid is delivered into a jet box 38 having two transverse series of nozzles 38 adapted to discharge water under pressure into the interiors of the bottles thereabove.

Below the head 37 and the box 38 is a tray 39 which is adapted to collect the waste water from the said head and nozzles and deliver the same through a pipe 40 into an overflow pipe 41 communicating with the upper portion of the tank E, below the strainer 28.

A flexible pipe connecting the pipe 32 with a vertically movable box 43 having projecting therefrom the internal rinsing tubes 44, the said tubes being guided by sleeves 45 on a tray 45. A flexible tube 46 also connects the pipe 32 with a box 47, which is preferably connected to the box 43 so as to be movable therewith, as by means of a bracket 47. From the box 47 extend hollow stems 48 having rinsing brushes 49 at the upper ends thereof, said stems being guided by sleeves 45 on the tray 45.

A transverse drive shaft 49 lifts the boxes 43 and 47 through an arm 50 and a link 51, the downward movement of the boxes and attached parts being counterbalanced by a weight 52 carried by an arm 53 connected to and extending from said shaft. A counter-shaft 54 moves the tray 45 and the sleeves 40 in synchronism with the boxes 43 and 47, through an arm 55 and link 56, the tray and the parts supported thereby being counterbalanced by the weight 57 on the arm 58.

Two transverse series of brushes 49 are shown. The brushes are held against upward displacement by reason of the thrust of the brushes 49, by means of the bottom clamps 59, mounted in the frame 60.

The parts 42—60, inclusive, form in their details no part of the invention covered hereby.

61 denotes a pipe delivering the ordinary cold city water to a transverse spraying header 62, which discharges the cold water on the bottoms of bottles, the interiors of the corresponding series of bottles being rinsed with such cold, clean water from a box 63 mounted upon the tray 45 and provided with a series of transverse nozzles 64 arranged to discharge into the bottles as they are brought successively thereabove. The box 63 is connected to the pipe 61 by means of a flexible tube 65.
It will be noted that the bottom of the tray 45 is inclined downwardly from each end thereof, and from the lowest point of such bottom a flexible pipe 66 extends to the tank E, above the strainer 28. At the front or delivery end of the machine there is provided a platform 67 on which the cleaned bottles from the conveyor are discharged.

Reference has been made hereinbefore to the treatment of the bottles with acid. For this purpose, I employ a type of pump which has demonstrated its efficiency and which is capable, not only of withstanding the action of the acid without injury to itself, but which will prevent the acid from splashing upon and injuring other parts of the apparatus.

The part of my apparatus for treating the bottles with acid consists of transverse series of acid pumps, the said pumps being carried by a vertically reciprocable tank, with means for moving the said tank to bring the pumps into engagement with the mouths of the inverted bottles thereabove and with means movable toward and engaging the bottoms of the bottles to hold the latter against vertical displacement through the engagement of the mouths of the bottles by the pumps. The detailed construction by which the results are accomplished is shown in Figs. 2 to 7, inclusive.

67 denotes a shaft which extends transversely of the casing and has thereon a pair of eccentrics 68, each connected by a strap 69 and an arm 70 with the bottom of the acid tank 45. This tank and the walls 4 of the apparatus are provided with cooperating guides G and G2 for the tank during its vertical reciprocations. Mounted in the top wall, or cover G8 of the tank are the acid pumps, one of which is indicated generally at H. Above the tank is the conveyor, indicated generally at J and carrying the bottles K in inverted position. Above the bottles and the conveyor is a frame work, indicated generally at L and carrying the clamps or bottom-supports, indicated generally at M.

In operation, the conveyor is advanced intermittently through the tank or apparatus, whereby each transverse series of bottles thereon is subjected successively to the various cleansing operations. After passing over the sprockets 21, the conveyor is supported by rollers J upon angle iron rails M2 carried by the side walls 4 of the casing. Each transverse link or segment of the conveyor comprises a bottom wall J2 having downwardly flared mouths J2 struck therefrom, for engaging the tapered necks of the bottles K. The upper wall J4 of each link or segment is provided with openings for the bodies of the bottles.

Each pump H comprises generally a piston having a cupped seat for the mouth of a bottle, a cylinder movable with and carried by the tank and adapted to force acid solution through the piston into the mouth of a bottle upon said seat, and means for draining back the acid solution into the tank, together with other details which will now be explained.

Each cylinder comprises a cylindrical wall 71 threaded into a flange 72 on top of the tank and extending downwardly within the tank nearly to the bottom thereof, the portion of the cylinder wall within the tank being indicated at 75 and having its bottom closed, as shown at 74.

The piston for the pump comprises a piston member having a cylindrical side wall 75 provided with liquid packing grooves 75a, the bottom or head of the cylinder comprising a wall 76, from the center of which a tube 77 projects upwardly. The head 76 is provided with a vertical cylindrical collar into which is threaded a cylindrical sleeve 79. The bottom of the head 76 is reduced and threaded for the reception of a disk 80 which supports an annular flap valve 81 which is adapted to cover openings 82 in the head 76, between the parts 75 and 79.

The upper end of the cylindrical sleeve 79 is threaded into a recess formed in the bottom of an upwardly and outwardly flared cup 83, said cup being provided with drain openings 83a communicating at their upper ends with slots 83b, the slots surrounding the top of the passage 84, 84a provided by the bore of the tube 77 and an extension of such bore, provided within the central portion of the cup.

The cup is provided with an outer cylindrical wall 85 adapted to telescope upon the upper end of the cylinder 71, there being a spring 86 interposed between the cup 83 and an annular disk 87 surrounding the cylinder 79 and resting upon an annular seat 71a within the cylinder 71.

The part 73 is provided with openings 73a located below the bottom of the piston wall 75, when the latter is in its lowest position (shown in Fig. 4). The part 73 is also provided with a projection which is adapted to engage the top of the piston wall 75 and assist in the separation of the cup 83 from the cooperating bottle mouth, as will be explained hereinafter. This projection may be formed by a screw, indicated at 86.

By reference to Figs. 2 and 3, it will be seen that the frame L comprises an upper plate 89 and a lower plate 90 fastened to a pair of channel members 91. These channel members are arranged with their webs presented toward each other, and these webs cooperate with vertical guides 92, secured to the side walls K of the casing, to maintain the frame and the parts M in operative relation to the bottles therebeneath.

It will be noted that each bottle-clamping member M consists generally of a stem 93 which is adapted to slide vertically in open-
ings provided in the plates 89 and 90, the top of each stem being provided with a stop collar 94 and the bottom with a suitable pad 95 adapted to engage the bottom of a bottle, each stem being provided with a weight 96, above the pad thereon.

For the purpose of operating the frame L toward and from the bottles K, as the tank G is moved toward and from the bottles, the following construction is provided:— 97 denotes an arm projecting from each side of the tank G through a slot in the adjacent side wall 4. To each arm is secured a link 98. The upper end of each link is connected to one end of a lever 99 by means of a slot 98* in such link and a pin 99* on the lever. Each lever is pivoted intermediate of its ends to a side wall 4, as indicated at 99*, and the other end of each lever is pivotally connected to an arm 100, each secured at its inner end to the adjacent end of the frame L and projecting through a slot 4* in the adjacent wall 4.

With the parts constructed and arranged as described and the tank G charged with an acid solution—preferably a 10% to 30% solution of hydrochloric acid—the transverse series of bottles to be treated in the manner hereinafter described will be brought successively above the pumps H by the intermittent movement of the conveyor.

When the conveyor has been moved forward one step and the movement suspended (as by the use of the well-known Geneva movement) the parts will be so timed that the shaft 67 will operate to move the tank G upward. This movement will enable the frame L to descend by gravity and the clamps carried thereby to engage the bottoms of the bottles.

The upward movement of the tank G will bring the cups 83 into engagement with the mouths of the bottles thereon. As the cups engage the mouths of the bottles the pistons move downwardly, being cushioned by their springs 86, until the piston heads seal the ports 73*, the valves 81 meanwhile closing the ports 82. Further upward movement of the tank will force the acid solution through the tubes 84 into the bottles therefrom. This limited downward movement of the pistons, which is opposed only by their respective springs, serves as shock absorbing means to prevent fracture of the bottles through the engagement of their mouths by the seats upon the tops of the pistons.

The parts are so proportioned that the ports 82* will not allow the liquid to drain back into the sleeves 79 as rapidly as it is discharged into and from the bottles. This will cause the solution to cover the mouths of the bottles to about the level indicated in Figs. 4 and 8, thus cleansing these portions of the bottles.

The upward movement of the cylinders and of the attached parts compresses the springs 86, and the cups 83 will be held in their elevated positions by the springs, as the tank starts on its downward movement, until the stop projections 86 engage the tops of their pistons, whereupon the pistons, cylinders and tank move downwardly in unison. This protracted engagement between the mouths of the bottles and the cups therefor enables the acid to remain in contact with the exteriors of the bottle mouths before being drained back into the sleeve 79, and thence through the ports 73* and 82 into the cylinder 75.

By virtue of the slidable mounting of the bottles clamps or supports, the said clamps or supports are adapted to cooperate with bottles of varying length as well as to yield to prevent breakage of the bottles should they be projected with undue force against the said clamps or supports.

The slots 98* enable the links 98 to move upwardly after the cups 83 engage the bottle mouths, without thrusting the clamps downwardly, it being noted that the frame L and attached parts will operate by gravity on their downward movement, being held against too rapid movement by the engagement of the pins 99* with the tops of the slots 98*. On the reverse movement of the tank G and the links 98, the bottom clamps are allowed to rest upon the bottles until the stops 88 engage the tops of the pistons, at which time the tops of the slots 98* engage the pins 99* and thereby lift the clamps.

With the parts constructed and arranged as described, the entire operation will generally be as follows:—Bottles will be delivered from the station N at the rear of the machine into the transverse series of seats provided thereon in the individual transverse elements J of the conveyor. The conveyor will be advanced the width of one such element J by the intermittent drive referred to, bringing the next transverse element J in line with the loading stand N, which element will then be charged with bottles from said stand. The conveyor will be driven in this manner, step by step; the bottles on each element J will be brought successively above the preliminary rinsing jets 33*, where the interiors of the bottles will be washed with water having a temperature of about 110° F. The water from this operation will be discharged into the tank F and permitted to go to waste through the outlet pipe F'. From the jets 33*, the bottles will be conducted through the soaking tank B, this tank containing ordinary caustic soda solution of about 2% strength and having a temperature of about 130° F. From the tank B, the bottles will be conducted around the sprockets 17, being emptied during their passage around said sprockets and will then be conducted through the tank C, which contains a caustic soda solution of about 4% to 8% strength and having
a temperature of about 175° F. From the tank C, the bottles are conducted around the sprockets 19, being again emptied as they pass therearound, and are then conducted through the tank D which contains caustic soda solution of about 2% strength and having a temperature of about 130° F.

From the various soaking tanks, the bottles are conducted above the nozzles 35, where they are subjected to an internal rinsing from said nozzles; also to an external rinsing from the spray head 37, the liquid employed for this purpose being lukewarm water having a temperature of about 100° F. The waste water from the last operation will be collected in the tray or tank 39 and be allowed to go to waste through the pipes 40 and 41.

From the last-mentioned station, the bottles are conveyed successively above the two transverse series of acid pumps G, the operation of which has been described at length hereinbefore, it being noted that the acid, which is preferably hydrochloric acid of from 10% to 30% strength and having a temperature from 90° F. to 110° F., is supplied under pressure to the interiors of the bottles above, with an intermediate draining space for each transverse series of bottles, between the two transverse series of pumps G.

Following the treatment by the acid, the bottles are conducted to the external brushing station, where the bottoms are operated upon by the brushes 34 in conjunction with lukewarm water supplied through the heads 35, the bottles being internally rinsed or cleansed by the jets of water supplied from the box 43 and tubes 44. The liquid employed for this internal rinsing through the tubes 44 is water having a temperature of about 110° F.

The bottles are then conducted above the internal brushing and rinsing spindles 48, where they are brushed and rinsed, using lukewarm water at about 110° F. Finally, the bottles are conveyed above the pressure box 63, where they are rinsed internally with cold water supplied from the pipe 61, and externally with cold water from said pipe through the spray head 62.

By reason of the treatments given by my apparatus, bottles which heretofore have been considered to be incapable of cleaning with bottle-washing apparatus with which I am familiar have been successfully, thoroughly and quickly cleaned. In other apparatus with which I am familiar, it has been impossible to clean bottles which have been used for grape juice. However, through the operation of my apparatus, such bottles and other bottles that have defied ordinary cleaning apparatus have been cleaned thoroughly and efficiently.

In Figs. 8 to 11 inclusive, there is illustrated a modification of the acid pump shown in Figs. 4 to 7 inclusive. In these views G denotes the acid tank and G the cover thereof. The cylinder of the pump is shown at 100 and is provided with two or more rounded projections 101 at the bottom thereof, which projections are adapted to be inserted through correspondingly-shaped openings 101 in the upper bottom wall of the tank G. After the lugs or projections 101 have been inserted through their openings 101, the cylinder will be turned to bring the lugs out of register with said openings, after which stop lugs 101 may be struck from the bottom to engage opposite sides of one of lugs 101, thereby to retain their cylinder in position.

The piston comprises a solid body 103, which may be of hard rubber, the said body having its lower end formed into a piston proper, indicated at 103 and having the liquid packing grooves 103 therearound. Intermediate of its ends, the piston is provided with an enlargement 104 providing an annular shoulder 104 on its upper face. This shoulder forms a stop which is adapted to be engaged by the tank on its downward movement, in the same manner as the stop 86 engages the piston 75 in my prior modification. To permit the tank to engage this stop, the piston above the shoulder 104 is surrounded by a collar formed by a pair of symmetrical members 105 each having a semi-annular lower end 105 adapted to fit within a circular opening in the cover 82 of the tank and to engage at its inner edge the shoulder 104. These members 105 are inserted in place and fastened to the tank cover, as by means of the screws 106.

The upper end of the piston 103 is formed into a cup 107 similar to the cups 83. Surrounding the upper portion of the piston is a spring 108 which bears at its upper end and within a recess 107 beneath the cup and at its lower end on a collar formed by the members 105. The piston is provided with a central passageway 109 corresponding to the passageway 84 of the former modification and with radial grooves 107 corresponding to the grooves 84, there being in this case a single drain passage 110 communicating with one of said grooves and arranged to discharge the acid from the cup into the tank.

Having thus described my invention, what I claim is:

1. In a bottle-cleaning apparatus, a conveyor having a series of seats for supporting bottles in an inverted position, means for moving said conveyor, a tank below the said conveyor and having a series of pumps projecting from the top thereof, each pump having a seat adapted to engage the mouth of a bottle and means for yieldably supporting such seat, each seat having a discharge outlet leading therethrough, means for moving the said tank toward and from the said conveyor and the bottles thereon, and means operative,
after the engagement of the mouths of the bottles by such seats, for forcing liquid from each pump through the outlet in the seat thereof into the bottle thereabove.

5. In a bottle cleaning apparatus, a conveyor having a series of seats for supporting bottles in an inverted position, means for moving said conveyor, a tank below the said conveyor and having a series of pumps provided each with a piston having a portion projecting above the top of such tank, the projecting portion of each such piston having a seat adapted to engage the mouth of a bottle and a cylinder and means for yieldably supporting such seat, means for moving the said tank toward and from the said conveyor and the bottles thereon, said piston being operable, through the engagement of the bottle mouths with such seats, for forcing liquid from the said tank into the bottles thereabove.

3. In a bottle cleaning apparatus, a conveyor having a series of cupsed seats for supporting bottles in an inverted position, means for moving said conveyor, a tank below the said conveyor and having a series of pumps projecting from the top thereof, each pump having a cupped seat adapted to engage the mouth of a bottle and means for yieldably supporting such seat, means for moving the said tank toward and from the said conveyor and the bottles thereon, each pump having means operative, after the engagement of the mouths of the bottles by such seats, for forcing liquid from the said pumps into the bottles thereof, and means for draining the liquid from the said seats back into the tank, the draining means being of less capacity than the pumping means whereby portions of the mouths of the bottles will be submerged in liquid accumulating within said seats.

4. In a bottle cleaning apparatus, a conveyor having a series of seats for supporting bottles in an inverted position, means for moving said conveyor, a tank below the said conveyor and having a series of pumps each comprising a cylinder connected to and movable with the tank, a piston within each cylinder having a passageway for supplying liquid from the cylinder into a bottle thereabove, each piston being provided at its upper end with a seat for the mouth of a bottle and each seat being provided with a cup or depression having one or more drain openings arranged to discharge liquid from the said cup back into the tank, the parts being constructed to provide for an accumulation of liquid within the cup whereby the exterior of the bottle mouth will be submerged in such liquid and means for moving the said tank toward and from the said conveyor thereby to bring the cups of the said pumps into and out of engagement with the bottles thereof.

5. In a bottle cleaning apparatus, a conveyor having a series of seats for supporting bottles in an inverted position, means for moving said conveyor, a tank below the said conveyor and having a series of pumps, each pump comprising a cylinder connected to and movable with the tank, a piston within each cylinder having a passageway for supplying liquid from the cylinder into a bottle thereabove, each piston being provided at its upper end with a seat for the mouth of a bottle, a spring yieldingly supporting each piston in elevated position, and means for moving the said tank toward and from the said conveyor thereby to bring the seats on the said pistons into and out of engagement with the bottles.

6. In a bottle cleaning apparatus, a conveyor having a series of seats for supporting bottles in an inverted position, means for moving said conveyor, a tank below the said conveyor and having a series of pumps, means for moving said tank toward and from said conveyor, each pump comprising a cylinder connected to and movable with the tank, a piston mounted within each cylinder and extending through and above said tank and provided at its upper end with a cupped seat for the mouth of a bottle, each piston being provided with a passageway for supplying liquid under pressure to the interior of a bottle having its mouth engaged by its seat and being also provided with one or more drain openings to return the liquid from the seat to the tank, a spring surrounding each piston and tending to hold the same in elevated position, and a member adapted to engage said piston during the downward stroke of the tank and cylinders, thereby to cause the pistons to move in opposition to the action of said springs with the cylinders.

7. In a bottle cleaning apparatus, a conveyor having a series of seats for supporting bottles in an inverted position, means for moving said conveyor, a tank below the said conveyor and having series of pumps, means for moving said tank toward and from said conveyor, each pump comprising a cylinder connected to and movable with the tank, a piston mounted within each cylinder and extending through and above said tank and provided at its upper end with a cupped seat for the mouth of a bottle, each piston being provided with a passageway for supplying liquid under pressure to the interior of a bottle having its mouth engaged by its seat and being also provided with one or more drain openings to return the liquid from the seat to the tank, and means tending to hold each piston in elevated position.

8. In a bottle cleaning apparatus, a conveyor having a series of seats for supporting bottles in an inverted position, means for moving said conveyor, a tank below the said conveyor and having a series of pumps, means
for moving said tank toward and from said conveyor, each pump comprising a cylinder connected to and movable with the tank, a piston mounted within each cylinder and extending through and above said tank and provided at its upper end with a seat for the mouth of a bottle, each piston being provided with a passageway for supplying liquid under pressure to the interior of a bottle having its mouth engaged by its seat and being also provided with one or more drain openings to return the liquid from the seat to the tank, a spring surrounding each piston and tending to hold the same in elevated position, and means whereby each piston may have a limited movement relative to the cylinder after the engagement of its seat with the mouth of its bottle and in advance of the forcing of liquid into such bottle.

11. In a bottle cleaning apparatus, a conveyor having a series of seats for supporting bottles in an inverted position, means for moving said conveyor, a tank disposed below and movable toward and from said conveyor and having a series of pumps, each pump comprising a cylinder connected to and movable with the tank, a piston mounted within each cylinder and extending through and above said tank and provided at its upper end with a seat for the mouth of a bottle, each piston being provided with a passageway for supplying liquid under pressure to the interior of a bottle having its mouth engaged by its seat and being also provided with one or more ports communicating with the tank and normally located below the piston, whereby each piston may have a limited movement relative to the cylinder while being cushioned by its spring, before the liquid will be trapped between the cylinder and the bottom of the piston and forced into the bottle thereabove.

12. In a bottle cleaning apparatus, a conveyor having a series of seats for supporting bottles in an inverted position, means for moving said conveyor, a tank below the said conveyor, each pump comprising a cylinder connected to and movable with the tank, a piston mounted within each cylinder and extending through and above said tank and provided at its upper end with a seat for the mouth of a bottle, each piston being provided with a passageway for supplying liquid under pressure to the interior of a bottle having its mouth engaged by its seat, yieldable means tending to hold each piston in elevated position, each cylinder being provided with one or more ports communicating with the tank and normally located below the piston, whereby each piston may have a limited movement relative to the cylinder, cushioned by such yieldable means, before the liquid will be trapped between the cylinder and the bottom of the piston and forced into the bottle thereabove.
and yieldable means engaging the bottoms of the bottles during the operation of the pumping means.

13. In a bottle cleaning apparatus, a conveyor having a series of seats for supporting bottles in an inverted position, means for moving said conveyor, a tank below the said conveyor, means for moving said tank toward and from said conveyor, a series of pumps each comprising a cylinder connected to and movable with the tank, a piston mounted within each cylinder and extending through and above said tank and provided at its upper end with a seat for the mouth of a bottle, each piston being provided with a passageway for supplying liquid under pressure to the interior of a bottle having its mouth engaged by its seat, a spring surrounding each piston and tending to hold the same in elevated position, and a member adapted to engage each piston during the downward stroke of the tank, thereby to cause the pistons to move in opposition to the action of said springs with the cylinders, and yieldable means timed with the movement of the tank for engaging the bottoms of the bottles during the operation of the pumping means.

14. In a bottle cleaning apparatus, the combination of a conveyor having a series of seats arranged to support bottles in an inverted position, means for moving the said conveyor, a tank below said conveyor, means for moving the tank toward and from the said conveyor, and a series of pumps carried by said tank and comprising each a cylinder secured to the tank and having one or more openings above its bottom for liquid from said tank, a piston in each cylinder and each having a head with one or more openings therethrough and a valve arranged to close said openings, there being a tubular passageway extending upwardly from each head and a seat supported from said passageway and adapted to engage the mouth of a bottle on the conveyor thereabove, a spring tending to hold the piston in elevated position with the bottom of the piston head above the opening or openings in the cylinder, the cup being provided with means for draining the contents thereof back into the tank, and a projection carried by each cylinder above the piston head and adapted to engage the latter when the tank is moved downwardly away from the conveyor and the bottles thereon.

15. In a bottle cleaning apparatus, the combination of a conveyor having a series of seats arranged to support bottles in an inverted position, means for moving the said conveyor intermittently, a tank located below said conveyor, series of seats carried by said tank and each seat adapted to engage the mouth of a bottle therebelow, each seat having a discharge outlet leading therethrough, means for moving the said tank toward and from the conveyor between intermittent movements of said conveyor, and means operative by the movement of the tank toward the conveyor for forcing liquid into the bottles by means of the outlets in said seats, the distance between adjacent series of seats being at least twice as great as the distance the conveyor is advanced by a single intermittent movement, whereby the bottles are enabled to drain between successive treatments from the tank.

18. An apparatus for cleaning bottles comprising means for preliminarily treating the insides and outsides of the bottles with cleaning liquid, a series of acid pumps, each pump having a seat for a bottle mouth, means for removing from the bottles the acid supplied thereto by said pump, a bottle conveyor having series of seats thereon for supporting the bottles in an inverted position, means for driving the said conveyor to bring the bottles
thereon successively in operative relation to the aforesaid treating and removing means and above the aforesaid pumps, and means for moving the pumps to bring the seats thereof into engagement with the mouths of the bottles thereof and to force acid solution into said bottles.

In testimony whereof, I hereunto affix my signature.

ROBERT R. McKECHNIE.