Oct. 12, 1943. C. L. TRIER ET AL 2,331,518

APPARATUS AND METHOD FOR STERILIZING FLOWING WATER

Filed May 16, 1940 2 Sheets-Sheet 1

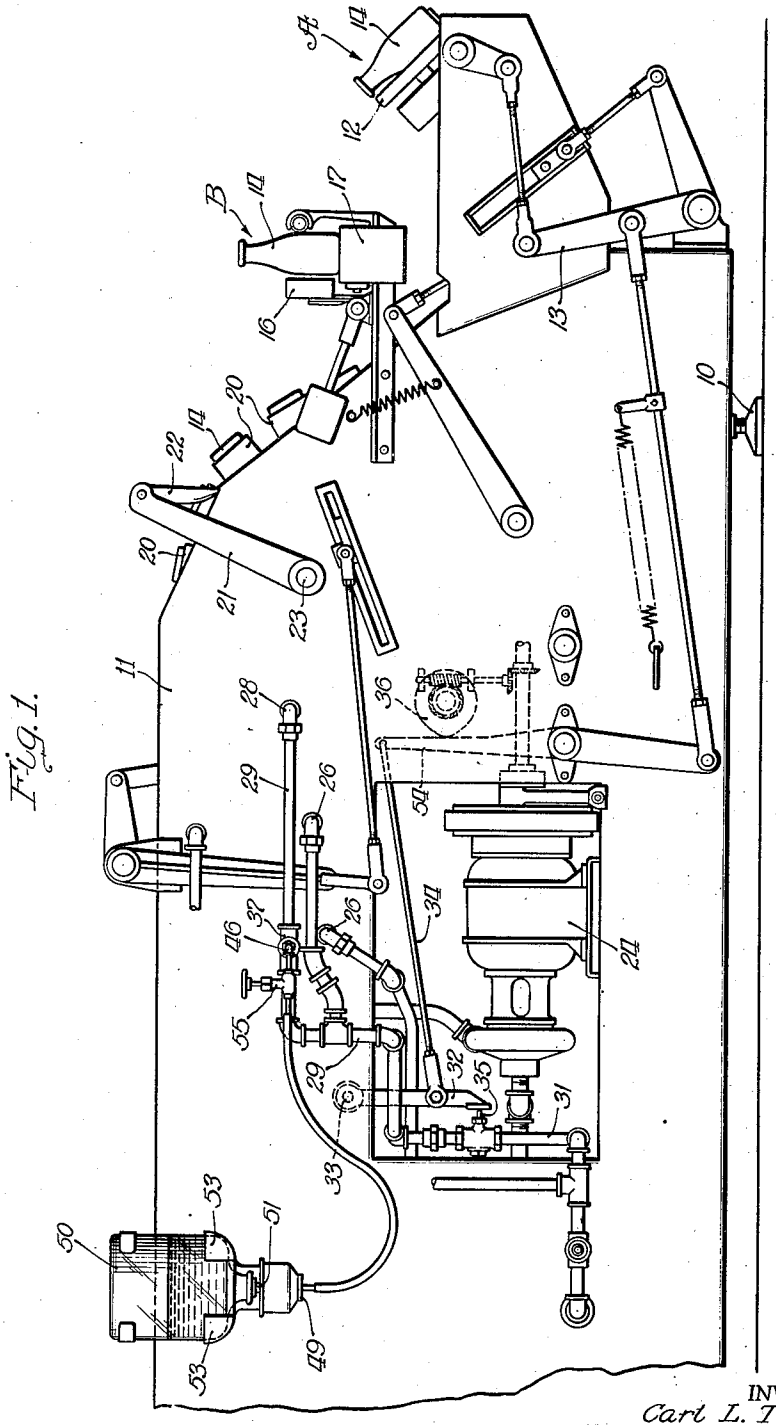


Fig. 1.

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Fig. 2.

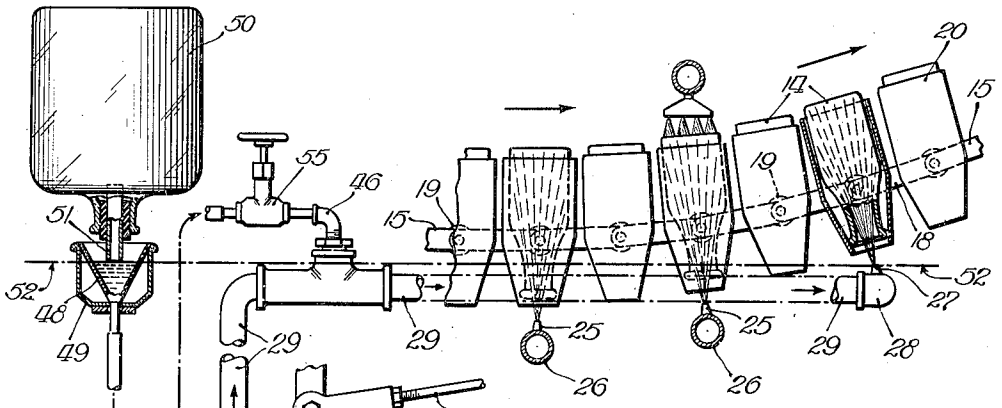


Fig. 3.

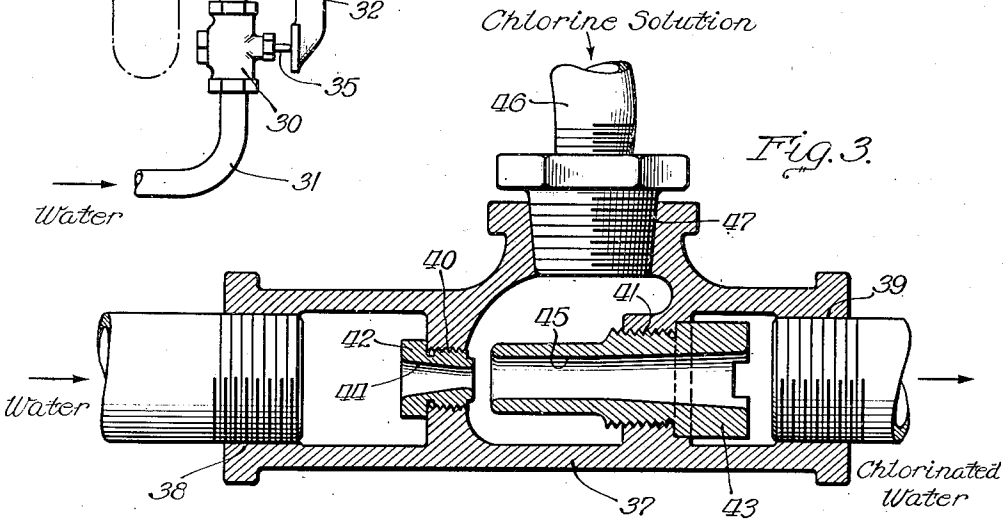
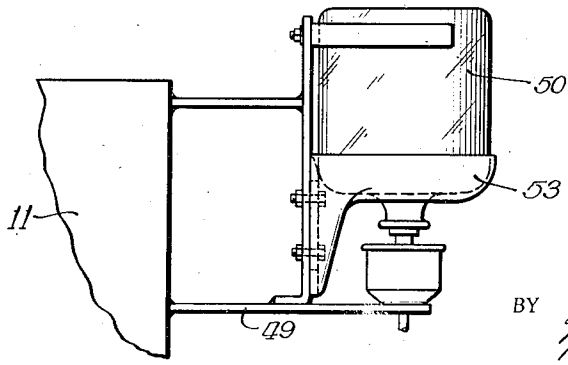


Fig. 4.



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APPARATUS AND METHOD FOR STERILIZING FLOWING WATER

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Application May 16, 1940, Serial No. 335,546

9 Claims. (Cl. 210—28)

The present invention relates to a method of sterilizing and improvements in apparatus for sterilizing a water supply. More particularly the invention relates to the automatic method of mixing predetermined quantities of sterilizing fluid and water or other liquids to sterilize the water or other liquids, and to the improvements in apparatus for mixing such predetermined proportions of sterilizing fluid and water or other liquids and for dispensing the mixed and blended liquids in controlled order.

The preferred embodiment of the invention is shown as a part of the general assembly of a bottle washing machine wherein it is adapted to effect the automatic sterilization of the final rinsing water for the cleansed bottles before they are discharged from the bottle washing machine.

The combination of the improved sterilizing apparatus with elements of a bottle washer is claimed in our divisional application Serial No. 446,718, filed June 12, 1942, and entitled "Sterilizer for receptacle washers."

In the conventional bottle washing machines it is common practice to provide a sump or basin for sterilizing solutions, for example, sterilized water which has been sterilized by adding a desired quantity of suitable hypo-chloride solutions of the desired concentration for the purpose of sterilizing the water and the bottles to be rinsed therewith. In such apparatus a sterilized solution of water is normally used as the final rinse for the bottles. Such final rinsing is conventionally secured by pumping the sterilized water from the sump or reservoir through spray nozzles onto and into the bottles to thoroughly rinse them therewith.

The sterilized water thus used drains back to the sump or reservoir for subsequent re-use. Obviously a small percentage of the sterilized water is carried away by the bottles and some of the water evaporates. To replace these losses fresh water is added to the sterilized water in the reservoir. To maintain the desired concentration of the water in the reservoir as the machine is operated, additional sterilizing solution is added to the contents of the reservoir from a small supply reservoir through a nicely controlled discharge tube. Obviously, if the bottle washing machine is shut down for a short time without also shutting off the continued supply of sterilizing solution to the contents of the reservoir, the concentration of the sterilizing solution in the reservoir will soon become excessively high.

Excessive concentration of the sterilizing solution may result in bringing about an off-flavor in the product filled into the washed and sterilized bottles. On the other hand, if the supply of sterilizing solution supplied to the contents of the reservoir is not sufficient, the sterilized rinse water may soon be of such low concentration as to be ineffective. At any rate the conventional mechanism for effecting sterilization of the sterile rinse water in a bottle washing machine requires careful adjustment and continued observation if satisfactory results are to be obtained.

In the conventional arrangement for sterilizing bottles, as just described, it is common practice to use pumps for the recirculation of the sterilizing rinse water. These sterilized rinsing waters are usually sterilized by the use of chlorine solutions which, due to their corrosiveness, have very detrimental effects on apparatus, such as pumps, valves, etc. The continued recirculation of the sterilizing water obviously will also result in the pollution of the sterilized water which will necessitate replacement thereof from time to time. Such replacement of the sterilized rinse will require a special treatment of the fresh rinsing water as it is supplied to the reservoir for the sterilized rinse to sterilize the same since the small sterilizing fluid reservor, which usually discharges into the rinse water through a drip type of cock, is intended only to maintain the desired concentration of an already sterilized solution and is not of sufficient capacity to sterilize an entirely new batch of rinsing solution.

In other apparatus of the automatic type for the sterilization of liquids, especially for the sterilization of intermittently flowing streams of liquid, a most common defect is the over-concentration or under-concentration of the first portions of the streams of sterilized liquid immediately following each of the interruptions of the flow of the liquid. In an intermittently flowing stream of liquid, such as would be used in a sterilizing rinse in a bottle washer, the possible over-chlorination of the stream following each interruption of the flow would be a defect of prime importance.

The primary objects of this invention are, therefore, to provide a method and apparatus, as described, for mixing and proportioning sterilizing fluid with a flowing stream of liquid in accurately controlled order in which the quantity of sterilizing fluid to be added is governed by the velocity of the flowing stream of liquid so that, regardless of the amount of fluid required, the desired proportion of sterilizing fluid to sterilized liquid will remain constant; in which the mixing and proportioning apparatus is automatic

in operation regardless of the nature of the flow of the stream of liquid, whether it be fast or slow or whether it be continuous or intermittent; in which the mixing and proportioning apparatus is capable of adding large or small proportions of sterilizing fluid to the flowing stream of liquid; in which adjustments necessary to secure the desired operation of the entire combination are easily secured without the use of complicated apparatus; in which the various cooperative elements are relatively adjustable to enable their adaptation to the normal variations in operating conditions; in which excessive or inadequate sterilization of the liquid is automatically prevented after the apparatus is once satisfactorily adjusted; and in which the necessary apparatus is simple, reliable, efficient and inexpensive in construction.

The foregoing and other objects and important features of the present invention will become more readily apparent to those skilled in the art upon examination of the drawings, appended claims and upon consideration of the following detailed description of the preferred embodiment of the invention. It is to be understood, however, that it is not intended to limit the invention to the particular species thereof as set forth by the drawings and description of the preferred embodiment as obviously other embodiments thereof may be devised within the scope of the appended claims.

The preferred embodiment of the invention as adapted for use in a bottle washer is shown in the drawings in which:

Figure 1 is a view showing in side elevation a bottle washer provided with the improved water sterilizing apparatus.

Figure 2 is an enlarged detail view partially in broken-away section showing the arrangement of elements and parts of the improved sterilizing apparatus.

Figure 3 is a longitudinal cross sectional view of the improved ejector and mixing nozzle of the sterilizing apparatus.

Figure 4 is a detail view showing the adjustable support for the sterilizing fluid container.

Referring to the drawings, in which like numerals are used to identify like elements, 10 represents a support for the casing 11 of a bottle washing machine which is provided at one end with a loading station A and a discharge station B.

In the operation of the bottle washing machine soiled bottles to be washed are normally loaded onto a tiltable receiving table 12 which, through appropriate linkages 13, is intermittently tilted to pass the bottles onto an intermittently movable transfer table (not shown) which is synchronized in its motions with table 12 to pass the bottles 14 onto the bottle washer conveyor 15 positioned on the inside of the casing 11. The bottles 14 are then transported by the conveyor 15 through the various bottle soaking, washing, rinsing and sterilizing operations to be subsequently discharged from the conveyor 15 onto a discharge transfer table 16. The transfer table 16 in turn directs the bottles 14 onto a discharge conveyor 17. Like unto the tiltable receiving table 12 and the infeed transfer table which receives the bottles from the table 12, the discharge transfer table 16 is synchronized with the motions of the conveyor 15. Such synchronism is obtained by any suitable arrangement of linkages of the conventional type.

The conveyor 15 is comprised of spaced conveyor chains consisting of links 18 and rollers 19 which are supported on spaced conveyor tracks (not shown) on the interior of the bottle washer casing 11. Intermediate the spaced conveyor chains is provided a series of transversely extending rows of bottle pockets 20 which are supported in the conventional manner upon framework structure extending between the conveyor chains, which pockets 20 are provided with openings at each end, and which pockets support the bottles 14 in spaced relation thereto.

The conveyor 15 is preferably given an intermittent step-by-step motion in any suitable manner, such, for example, as by driving arms 21 provided with dogs 22 pivoted thereto for engagement with the rollers 19 of the conveyor chains. Upon the clockwise partial rotations of the arms 21 the conveyor 15 will be moved forwardly due to the engagement of the dogs 22 with the rollers 19 of the conveyor chains. The extent of the movement of the arms 21 is, of course, regulated by suitable driving mechanisms (not shown) which act on the rock shaft 23 to which the arms 21 are keyed and upon which the arms 21 are supported to thereby move the conveyor 15 in steps equal in length to the distance between adjacent rows of the bottle pockets 20 of the conveyor 15.

The starting and stopping positions of each intermittent step of the conveyor 15 are such that, during each period of dwell between the intermittent steps of the movement of the conveyor 15, one of the rows of the bottle pockets 20 will come to rest with the openings in the bottom of the bottle pockets placed in registry with the nozzles or orifices 25 of the wash water spraying mechanism positioned immediately below the row of bottle pockets during the period of rest. The driving mechanisms which effect the rocking motion of the conveyor moving arms 21 through the rock shaft 23 are synchronized in their actions with the actions of the driving linkages which actuate the various bottle transfer tables at the infeed and discharge stations A and B.

The general arrangement of bottle infeed, bottle discharge and bottle conveying mechanism of the bottle washer, as just described and as shown in the drawings, as well as the synchronized driving mechanisms therefor, are all more or less of the conventional type quite commonly used in commercial automatic bottle washers in which substantially all of the moving elements thereof are normally driven by a central power unit 24 through suitable driving mechanisms and linkages.

The various wash water spraying or rinsing orifices 25 are supplied with washing or rinsing water through conduits 26 which are supplied in the conventional manner either from a source of pressure water, such as city water supply, or from a water recirculating pump.

In the procedure of washing bottles in the automatic bottle washers, the bottles are normally subjected to a pre-rinsing operation at the infeed station A. After pre-rinsing the bottles, if the washer is of a soaker washer type, the bottles are carried by the conveyor through a soaking solution in which the bottles remain submerged for some time. From the soaking solution the bottles are elevated to the upper portion of the washing machine and, while being elevated, are inverted and drained of their content of soaking solution. In the upper portion of the washer the bottles are subjected to a powered

wash with a tempered water which may be sprayed onto the bottles. This tempered wash is normally followed by a cold rinse and then, immediately before the bottles reach the discharge station B, they are subjected to a sterilizing rinse which normally consists of cold chlorinated water.

The present invention is primarily concerned with the improvements in apparatus and methods used in the sterilizing or chlorinating of the water utilized for sterilizing bottles immediately before they are discharged from an automatic bottle washer. As previously stated, the sterilizing station is positioned immediately ahead of the discharge station in the path of the travel of the conveyor 15 which, as shown in Figure 1, travels in a clockwise direction.

The sterilizing rinse is supplied to the bottles while they are supported in the pockets 20 in the form of a spray from the duct-like spray nozzles or orifices 27 which are positioned in the upper wall of the sterilized water header or discharge tube 28. The header or discharge tube 28 is positioned immediately below a station of dwell of the transversely extending row of bottle pockets 20 carried by the intermittently movable conveyor 15 and completely bridges the space between the chains of the conveyor 15 at the sterilizing position.

The header or discharge tube 28 communicates with one end of the conduit 29 through which water under pressure is supplied to the tube 28. The water under pressure is admitted into the conduit 29 through an automatically operable "whistle" valve 30 communicating with the opposite end of the conduit 29 and with a conduit 31 which supplies water under pressure.

By the intermittent opening and closing of the valve 30 water is forced to flow through conduit 29 into the discharge tube 28 and out of the nozzles 27 in intermittent sprays or streams. The period of frequency of these intermittent sprays is synchronized with the periods of dwell of the conveyor 15 so that at the time of each discharge of liquid from the nozzles 27 a row of bottle pockets 20 with its bottles 14 will be registered with the nozzles 27.

Such synchronized automatic opening and closing of the valve 30 is effected by the pivoted lever 32 which, when rocked on its pivot 33 toward the valve 30 by link 34, contacts and compressively engages the spring-biased valve stem 35 of the valve 30, thereby opening the valve. Upon the retraction of the pivoted lever 32 in the opposite direction the valve 30, due to its constructional and operative characteristics, will automatically close. Link 34 may be actuated in any conventional manner, such, for example, as by a pivoted cam follower 54 which engages a cam 36 geared to and driven by the primary power unit 24 in any desired manner.

As above set forth in the preceding paragraph, the operation of the valve 30 is synchronized with the operation of the power unit 24 which in turn drives the infeed, discharge and conveying mechanisms of the bottle washer, all of which operate in synchronism with the central power unit 24. By this arrangement it is possible to time the opening and closing of the valve 30 with the periods of dwell of the conveyor 15.

A fluid injector or suction T 37 comprising a tubular body provided with a longitudinal passage is placed in conduit 29 so that the longitudinal passage of the T 37 communicates with the conduit 29 through the intake aperture 38 and the discharge aperture 39 of the suction T 37. The adjacent ends of the conduit 29 are threaded into the intake and discharge apertures 38 and 39 of the suction T 37 so as to establish a sealed communication between the conduit 29 and the T 37.

The longitudinal passage of the T 37 is provided with two partitions having flow restricting apertures 40 and 41 into which are threaded a pressure nozzle 42 and suction nozzle 43, respectively. The pressure nozzle 42 is provided with a converging throat 44 converging in the direction of flow of water passing through the longitudinal passage of the suction T 37. The suction nozzle is provided with a diverging throat 45 which diverges in the direction of the flow of the water passing through the longitudinal passage of the suction T 37. The throats 44 and 45 of the nozzles 42 and 43 are in axial alinement one with another and with the axis of the longitudinal passage of the suction T and are positioned with their minimum diametered ends closely adjacent one another.

By this arrangement of the converging and diverging throats 44 and 45 the stream of high pressure water jutting forth from the restricted end of the throat 44 of the pressure nozzle 42 will be centrally directed into the restricted end of the suction throat 45 of the nozzle 43, thereby causing a suction in the portion of the longitudinal passage of the T 37 between the two partitions supporting the nozzles 42 and 43. Such a suction between these two partitions will induce a flow through the sterilizing fluid conducting pipe 46 which communicates with the space between the said partitions 40 and 41 through the aperture 47 in the wall of the T 37 into which aperture the end of the pipe 46 is threaded to establish a sealed communication.

Upon the opening of the valve 30 the high pressure water will flow rapidly through conduit 29 and through the nozzles 42 and 43 of the T 37, thereby inducing a flow of sterilizing fluid through the pipe 46 in proportion to the flow of water through the conduit 29. The sterilizing fluid is thus drawn into the suction nozzle 43 and mixed with and injected into the water passing therethrough, sterilizing the same before the mixed water and sterilizing fluid is sprayed through nozzles 27 of the discharge tube 28 into and over the bottles on the conveyor 15 while they dwell over the position of the discharge tube 28.

The sterilizing fluid which normally consists of a hypo-chloride solution is supplied to the pipe 46 from an open reservoir 48. The reservoir 48 is supported at approximately the elevation of the nozzles 27 by a bracket 49 fixed to the washer casing 11. The reservoir 48 is supplied with sterilizing fluid from an inverted carboy 50 provided with a discharge tube 51 in its downwardly directed mouth. The discharge tube 51 extends into the reservoir 48 to exactly the elevation of the discharge openings in the nozzles 27, as indicated by line 52—52 of Figure 2 of the drawings.

Obviously, in the installations of the bottle washing machines provided with sterilizing apparatus, as just described, it may be necessary to adjust the elevation of the carboy 50 to secure the essential and desired relation between the elevation of the sterilizing fluid in the reservoir 48 and the elevation of the orifices of the nozzles 27. To facilitate such adjustment of the carboy 50 it is adjustably supported by a holder 53 upon the bracket 49. The holder 53 is adjustably

supported in any conventional manner, such, for example, as by providing complementary slots in the portion of the holder 53 and bracket 49 through which the clamping bolts pass.

By this arrangement the level of the fluid in the reservoir 48 will rise to the bottom of the discharge tube 51 of the carboy 50 which has previously been adjusted to the same elevation as the orifices of the nozzles 27, thereby assuring the maintenance of the level of the liquid in the reservoir 48 at the same elevation as the orifices of the nozzles 27. Obviously, therefore, when the level of the liquid in the supply reservoir 48 is of the same elevation as the discharge apertures or orifices of the nozzles 27 and the conduit 29, suction T 37 and pipe 46 are each filled with water or sterilizing fluid, no flow of fluid in any portion of any of these combined elements will occur excepting when valve 30 is opened to the high pressure water supply to produce the initial flow through the conduit 29.

By the above described arrangement a sterilizing apparatus is provided which, due to its unique construction and method of operation, achieves the various objectives and advantages set forth in the foregoing part of the specification. However, it may from time to time be desired to adjust the quantity of sterilizing fluid which is admitted into the suction T 37 to thereby secure the desired degree of concentration of the sterilizing fluid in the mixture of fresh water and sterilizing fluid discharged through the nozzles 27. For that purpose a valve 55 is provided in the sterilizing fluid supply pipe 46. By the proper adjustment of the valve 55 the quantity of sterilizing fluid flowing therethrough may be regulated, thus also regulating the resultant concentration of the sterilizing fluid in the sterilized water discharged from the nozzles 27. For the purpose of preventing the tendency of the sterilizing fluid to drain by gravity into the suction T 37 if the suction T is positioned below the elevation of the reservoir 48 it may be desirable to position a portion of the sterilizing fluid conducting pipe 46 at an elevation above the level of the suction T 37 and above the elevation of the sterilizing liquid reservoir 48.

Having thus described the invention and the preferred embodiment thereof, in which certain of the improved features and advantages have been particularly stressed, it is desired to point out that the preferred embodiment of the invention is probably subject to various modifications as to form and details of construction which will become apparent to those skilled in the art upon examining the specification, drawings and claims. Accordingly, it is desired to point out that this invention is not to be limited to the specific disclosure except in so far as it is necessitated by the teachings of the prior art and the spirit of the appended claims.

The invention is hereby claimed as follows:

1. A device of the class described comprising, in combination, a conduit adapted to have a liquid intermittently flowing therethrough, means in said conduit for causing said intermittent flow of a liquid, a discharge opening in said conduit at a liquid consuming point, liquid injecting means communicating with said conduit ahead of said discharge opening, a liquid supply receptacle, and liquid conducting means between said receptacle and said injecting means, said receptacle being so constructed and positioned that the level of the liquid therein is of the same elevation as said discharge opening in said conduit, said injecting means being so constructed and arranged that the flow of liquid through said conduit will induce a flow of liquid from said supply receptacle through said injecting means.

2. A device of the class described comprising, in combination, a conduit adapted to have a liquid intermittently flowing therethrough, means in said conduit for causing said intermittent flow of a liquid, a discharge opening in said conduit at a liquid consuming point, liquid injecting means communicating with said conduit ahead of said discharge opening, a liquid supply receptacle, liquid conducting means between said receptacle and said injecting means, and liquid flow restraining means in said conducting means, said receptacle being so constructed and positioned that the level of the liquid therein is of the same elevation as said discharge opening in said conduit, said injecting means being so constructed and arranged that the flow of liquid through said conduit will induce a flow of liquid from said supply receptacle through said injecting means.

3. A device of the class described comprising, in combination, a conduit adapted to have a liquid intermittently flowing therethrough, means in said conduit for causing said intermittent flow of a liquid, a discharge opening in said conduit at a liquid consuming point, liquid injecting means communicating with said conduit ahead of said discharge opening, a liquid supply receptacle, liquid conducting means between said receptacle and said injecting means, and means for supplying liquid to said receptacle so constructed and arranged as to be adapted to automatically maintain a predetermined level of liquid in said receptacle, said receptacle being so constructed and positioned that the automatically maintained level of the liquid therein is of the same elevation as said discharge opening in said conduit, said injecting means being so constructed and arranged that the flow of liquid through said conduit will induce a flow of liquid from said supply receptacle through said injecting means.

4. A device of the class described comprising, in combination, a conduit adapted to have a liquid intermittently flowing therethrough, means in said conduit for causing said intermittent flow of a liquid, a discharge opening in said conduit at a liquid consuming point, liquid injecting means communicating with said conduit ahead of said discharge opening, a liquid supply receptacle, liquid conducting means between said receptacle and said injecting means, liquid flow restraining means in said liquid conducting means, and means for supplying liquid to said receptacle so constructed and arranged as to be adapted to automatically maintain a predetermined level of liquid in said receptacle, said receptacle being so constructed and positioned that the automatically maintained level of the liquid therein is of the same elevation as said discharge opening in said conduit, whereby the flow of liquid from said receptacle into said conduit will occur only while said liquid is flowing, said injecting means being so constructed and arranged that the flow of liquid through said conduit will induce a flow of liquid from said supply receptacle through said injecting means.

5. In combination, a conduit, means for intermittently delivering liquid into said conduit.

a reservoir for chemicals, injector means for injecting a chemical into said conduit in proportion to the quantity of liquid intermittently flowing therethrough, means for conducting chemicals from said reservoir to said injecting means, and a discharge opening in said conduit positioned at the same elevation as the level of the chemicals in said reservoir.

6. In combination, a conduit, means for intermittently delivering liquid into said conduit, a reservoir for a fluid chemical, automatic injecting means for injecting a fluid into said conduit in proportion to the quantity of liquid intermittently flowing therethrough, valve means for conducting said fluid from said reservoir into said injecting means, and a discharge opening in said conduit positioned at the elevation of the level of the fluid in said reservoir.

7. A chlorinator comprising, in combination, a conduit adapted to have a liquid intermittently flowing therethrough, a discharge opening in said conduit at a liquid consuming point, a reservoir for chlorinating fluid, means for maintaining a level of chlorinating fluid therein at the elevation of said discharge opening, means for conducting chlorinating fluid from said reservoir to an injector means, and injector means for injecting chlorinating fluid into said conduit in quantities proportionate to the quantities of intermittent liquid flow therethrough.

8. Apparatus for treating a stream of intermittently flowing water comprising a source of chlorinating fluid, means communicating with said source adapted to deliver to a stream of intermittently flowing water a quantity of chlorinating fluid proportionate to the quantity of flowing water, discharge means adapted to discharge chlorinated water at a point of consumption, and automatic means for constantly maintaining the level of the chlorinating fluid in said source at the elevation of said discharge means.

9. The method of uniformly sterilizing an intermittently flowing stream of liquid which includes the steps of flowing said liquid through means which automatically and intermittently introduce sterilizing fluid thereinto in proportion to the flow of the liquid through said means, and maintaining the effective pressure upon said sterilizing fluid at the point of admission thereof to said means equal to the pressure of the sterilizing fluid at the point of discharge from said means by so constructing and arranging the effective supply of sterilizing fluid and the discharge outlet of the sterilized fluid so that the discharge outlet is at the same level as the supply of sterilizing fluid.

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