

June 8, 1943.

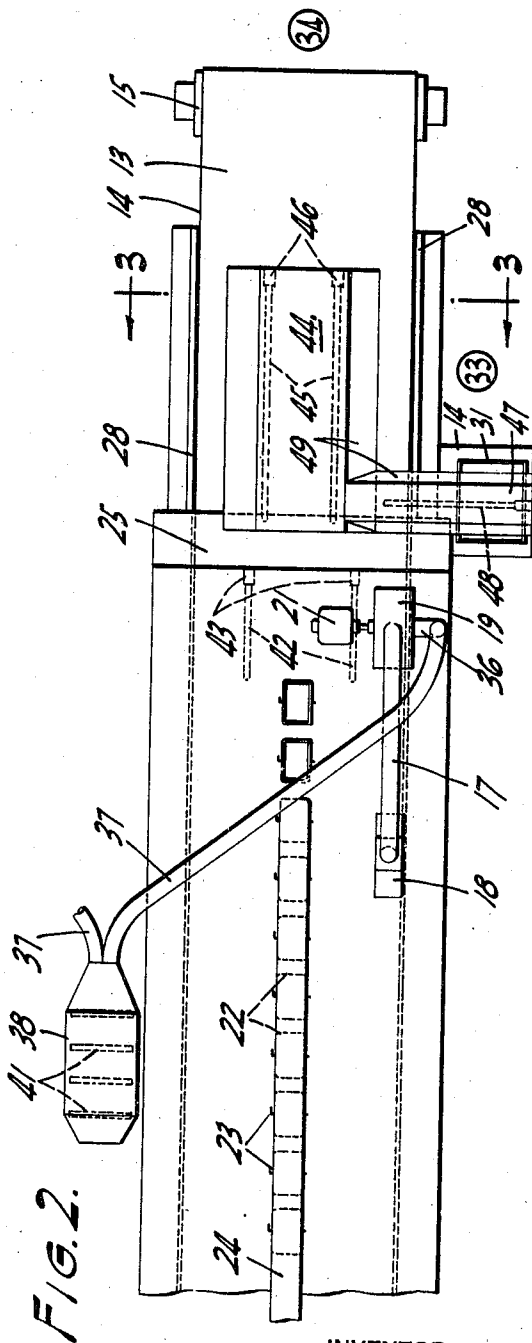
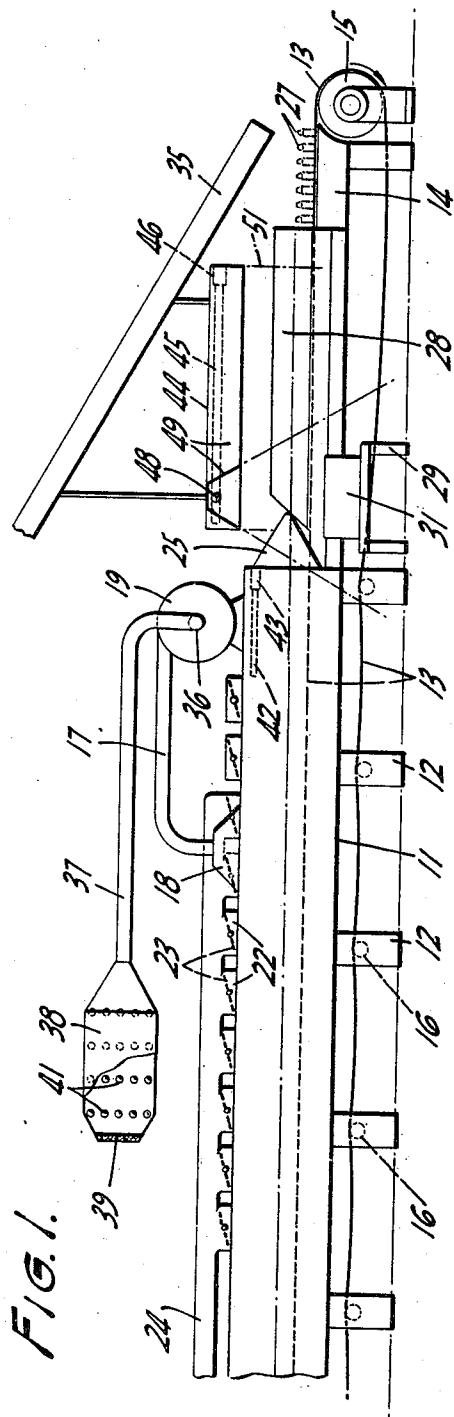
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2,321,152

PROCESS AND APPARATUS FOR SANITIZING GLASSWARE

Filed May 7, 1941

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 4.

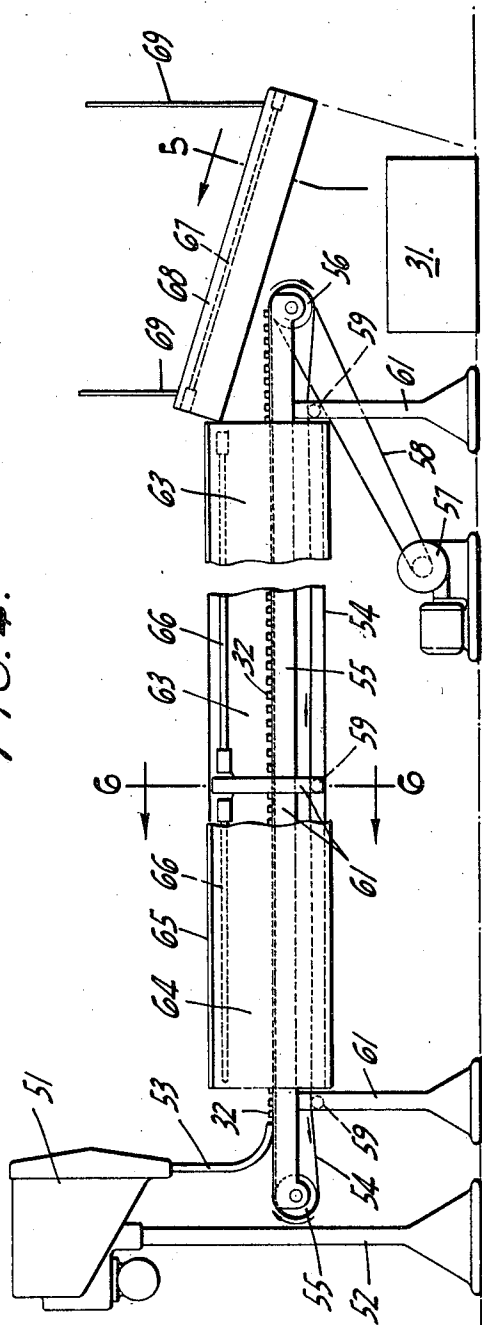


FIG. 5.

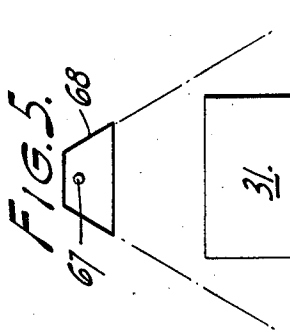


FIG. 6.

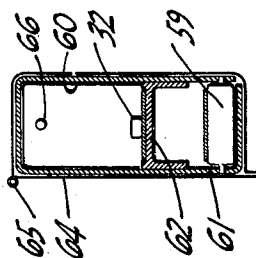
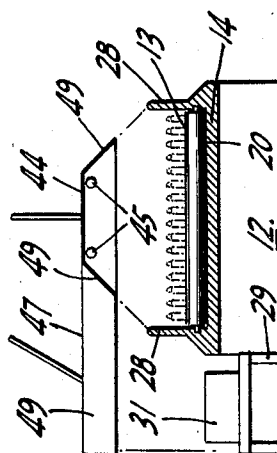


FIG. 3.



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PROCESS AND APPARATUS FOR SANITIZING
GLASSWAREGlenn A. Mengle, Brockway, Pa., assignor to
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Application May 7, 1941, Serial No. 392,293

10 Claims. (Cl. 250—52)

The present invention relates to the manufacture of bottles and similar containers and has particular reference to a novel mode of manufacture and preparation for use whereby the containers are sanitized and may be substantially free from bacteria when they reach the ultimate consumer.

In the conventional manufacture of glass containers, such as medicine bottles intended to be filled by druggists or pharmacists for example, the bottles are formed in molds at high temperatures and are thereafter subjected to a heat treatment in a normalizing or annealing lehr, for the purpose of removing strains in the glass that have resulted from the forming operation. Before leaving the lehr the bottles are cooled by air to temperatures at which bacteria may exist, and after leaving the lehr the bottles may be exposed to air containing bacteria. The bottle caps, which may be similarly exposed, ordinarily are loosely applied by hand to the bottles, and the latter thereafter are packaged for shipment and pass through the channels of commerce to the druggist or pharmacist, who ordinarily does not sterilize or otherwise treat them to remove bacteria before using.

The present invention contemplates the treatment of the bottle, and its cap or other closure, in such manner that the interior surfaces will be sanitized and will remain sanitary until the time of filling, so that, particularly if the bottle be filled under a bactericidal ultra-violet lamp, the ultimate consumer will be assured of a product substantially free from contamination from the bottle.

According to the invention, air introduced into or entering the heat treating lehr, at points therein where the temperatures are sufficiently low that bacteria can survive, is bactericidally treated by exposure to ultra-violet light rays. The bottles, cooled by the treated air, upon leaving the lehr pass through a zone subjected to bactericidal ultra-violet rays and in this zone they are tightly capped, the caps also having received a bactericidal treatment, which may be effected by exposure to a bactericidal ultra-violet lamp, so that the containers are sealed in a sanitized condition, in which they will remain until uncapped by the druggist just prior to filling.

The invention contemplates that the subsequent uncapping, filling and recapping of the bottles, as for example by the druggist in the case of a medicine bottle, be performed under a bactericidal ultra-violet lamp, so that bacteria

in the atmosphere that contacts the opened bottle and cap will be eliminated.

These and other objects and advantages will become apparent from the following description of the apparatus and method involved, typical apparatus being illustrated in the accompanying drawings, wherein:

Fig. 1 is a side elevation of the discharge end of the lehr provided with the bactericidal lamps;

Fig. 2 is a plan view of the apparatus shown in Fig. 1;

Fig. 3 is a vertical section taken approximately along line 3—3 of Fig. 2;

Fig. 4 is a side elevational view of a cap treating apparatus;

Fig. 5 is a section taken along line 5—5 of Fig. 4; and

Fig. 6 is a section, on a larger scale, taken along line 6—6 of Fig. 4.

As shown in the drawings the lehr 11 mounted upon supports 12, has extending therethrough and thereunder an endless conveyer belt 13. The belt extends over a plurality of rollers 20, and adjacent the discharge end of the lehr the belt constitutes a table 14. The belt passes around a rotating drum 15 disposed adjacent the end of the table and also around a similar drum adjacent the other end of the lehr, being supported under the lehr on rollers 16. One of the drums may be rotated by suitable drive means (in a clockwise direction as viewed in Fig. 1) so that bottles placed on the belt at the entry or heated end of the lehr will be carried through the latter and will be brought onto the table 14 from which they may be removed by operators and placed in suitable boxes or cartons for shipment to a packer or user.

Upon entering the lehr upon the conveyer belt 13 the bottles are subjected to an elevated temperature, in the neighborhood of 1100° F., and while passing through the lehr the temperature of the bottles is reduced, at a controlled rate, the temperature as they pass from the lehr 11 to the table 14 ranging from room temperature to approximately 50° F. thereabove.

In some types of lehrs, as for example the type illustrated, air for cooling the bottles in the discharge end of the lehr is forced thereinto through a conduit 17 and inlet 18 by a blower 19 operated by a suitable motor 21, the lehr being substantially closed on its top, sides and bottom. Exhaust air may leave the lehr through flues 22, controlled by dampers 23, into the atmosphere or into exhaust air conduit 24.

As the bottles, now cooled, are carried from the

lehr on the conveyer belt 13 into the zone which comprises the table 14, they pass under a shroud 25 which may be adjusted to a minimum height above the belt sufficient to permit the movement of the bottles thereunder. By reason of the shroud the discharge opening from the lehr is as small as possible so that intermixing of air in the room with air in the lehr is reduced to a minimum. Such intermixing is further reduced by the blower 19 maintaining in the lehr a slight pressure differential over the atmosphere so that air tends to flow outwardly from the lehr through the bottle discharge opening, discouraging the ingress of air at this point.

On the sides of the table 14, on which the bottles 27 are capped, are stationary side walls 28, and adjacent these walls may be disposed a table 29 for supporting a container 31 of bottle caps 32, within convenient reach of a person standing at the station indicated at 33 beside a wall 28 for placing the caps upon the bottles, prior to the latter's being packed in suitable shipping containers or cartons by one or more operators at the station indicated by numeral 34. These shipping containers or cartons may be delivered to station 34 by a chute 35.

According to the present invention, the air inlet 36 of the blower 19 is connected by a conduit 37 to a housing 38, one end of which is provided with an air filter 39 for removing dust and other foreign matter from the air entering the blower. Extending across the housing, in the path of air flowing therethrough, are a plurality of bactericidal lamps 41. These lamps, and also those described hereinafter and indicated by numerals 42, 45, 48, 66 and 67, may be of the mercury vapor type designed for producing ultra-violet light and comprising transparent tubes filled with inert gases and mercury vapor with electrodes at their opposite ends, and operating by an electrical discharge between the electrodes.

The lamps employed preferably generate a large quantity of light of the wave length which has been found to be bactericidal, falling within the ultra-violet portion of the spectrum between approximately 2000 and 2950 Angstrom units. Lamps satisfactory for this purpose are now on the market, having effective lengths of from 14½" to 34½", having operating voltages of from 275 to 475 volts at approximately .030 to .050 ampere. A suitable transformer may be provided for each lamp, or for each group of lamps, this apparatus and the electrical connections therefor being in accordance with conventional practice in the art of mercury vapor lamps.

In Fig. 2, the lamp housing 38 shown is provided with a connection to a second conduit 37, adapted to extend to another lehr, the single lamp unit being of sufficient capacity to bactericidally treat the air introduced into both lehrs for cooling purposes.

For the purpose of bactericidally treating the small quantities of air that may enter the lehr through the bottle discharge opening beneath or around shroud 25, there are provided within the lehr, on the upper wall thereof adjacent the opening, lamps 42, having associated therewith suitable electrical transformers 43. In lehrs such as those wherein no blower is provided, wherein the cooling air enters through air intake openings, similar lamps are placed adjacent such openings to bactericidally treat the entering air.

Above the portion of table 14 adjacent the station 33 and suspended from the chute 35 is a

lamp housing 44 containing lamps 45 provided with transformers 46, the housing having a lateral extension 47 extending over the table 29 and containing lamp 48. The housing 44, including extension 47, has inclined side shades 49 so arranged as not to interfere with direct rays from the lamp falling on all portions of the table 14 between and including the inner surfaces of the side walls 28, and between the forward portion of the shroud 25 and the line, indicated by numeral 51, representing the position on the table behind which the capping of bottles is completed. These shades 49 are formed of ordinary silica glass which affords the persons performing the capping operation unobstructed vision of the table and the bottles thereon, while the eyes of the operator are protected from the direct ultra-violet rays from the lamps 45 and 48.

From the foregoing it will be understood that in practicing the process of the present invention, the prescription ware or other bottles, after being molded, are placed upon the belt 13 at the entry side of the annealing lehr, and are carried through the latter by movement of the belt. In the event the bottles are not sufficiently hot for annealing, at temperatures of approximately 900° to 1100° F. when they enter the lehr, they are, while in the latter, heated to such temperature, approximately 1100° F., induced in practice by combustion of gas, or oil, or by electricity, for removing from them strains resulting from the molding operations, and the bottles are then allowed to cool at a controlled rate as they approach the bottle discharge end of the lehr. At temperatures above approximately 180° F., bacteria cannot survive, so that the bottles approaching the discharge or final cooling portion of the lehr are substantially sterile.

Final cooling of the bottles in the lehr is effected by air introduced through conduit 37, blower 19, conduit 17 and air intake 18, and all such air has dust and other air borne foreign matter removed by passage through the filter 39, and is sanitized by the bactericidal action of the lamps 41 in the housing 38. In this manner air borne bacteria are removed from the cooling air and cannot contaminate the bottles which have been sterilized by the heat treatment.

Likewise, small quantities of air which may enter the lehr, counter to the pressure maintained therein, entering around or beneath the shroud 25, by admixture of outside air with air in the lehr, are sanitized by the action of lamps 42.

When the bottles leave the lehr they immediately enter the zone beneath the sanitizing lamps 45, and before passing from this zone, in which the air contacting the bottles is subjected to the bactericidal action of the lamps 45, the caps 32 are firmly screwed or otherwise applied to the bottles by one or more operators at station 33. Thus when the bottles pass onto the extreme end portion of table 14 at which they are placed in shipping cartons by one or more persons at station 34, they are completely capped with their interior surfaces in a sanitized condition.

During the capping operation, the caps may be removed from container 31 and placed on the bottles, the caps all this time being in the zone beneath and which is subjected to the influence of rays from the lamps 48 and 45, so that all air contacting the caps has been sanitized. In the drawings the lamp housing 44 has

extension 47 to only one side of the table 14, but it will be understood that the arrangement may be duplicated to overlie a table 29 on the opposite side of the table for supporting caps within convenient reach of an operator stationed there.

While the invention is conveniently practiced in connection with the usual heat treating lehr, it will be understood that sanitizing of the glassware may be accomplished subsequently thereto by heating it in another chamber in which the air temperature is sufficiently high so that bacteria are destroyed, such as from 200° to 300° F., and then cooling and capping in an atmosphere that is treated with ultra-violet light to remove bacteria therefrom.

The pre-treatment of the caps by the apparatus shown in Figs. 4, 5 and 6, to sanitize them prior to bringing them to the bottle capping station 33, will now be described.

A conventional cap separator 51 mounted upon a standard 52 feeds the caps through a chute 53 onto a continuous conveyer belt 54. The belt operates over rollers 55 and 56, the latter of which is driven from a power unit 57 by a drive belt 58. Intermediately of the rollers the lower portion of the belt is supported by rollers 59 mounted in a suitable framework, 61, the upper reach of the belt being supported on a flat bed 62 that extends along the underside of the belt.

Supported on the framework 61 and extending around the belt 54 is a tubular housing 63 including a front wall 64 that is preferably hinged along its upper edge as indicated at 65. The housing 63 including the front wall thereof is lined with metallic foil 66 having good light reflective properties. Mounted in the housing above the upper reach of the belt are a plurality of lamps 66 arranged in tandem, for directing bactericidal ultra-violet rays onto the caps traveling therebeneath on the belt. The caps are disposed on the belt by the separator with their open ends uppermost, and they receive not only the direct rays from the lamps, but also rays from the lamps reflected by the metallic foil lining of the housing.

The bactericidally treated caps pass from the housing 63 and drop into a container 31 disposed beneath the roller 56. Above the container 31 and arranged so that its rays will fall upon the container and also upon the adjacent uncovered upper end portion of the belt 54 is a sanitizing lamp 67. The latter is mounted in a housing 68 supported by suitable hangers 69 and preferably having a light reflective inner surface for directing downwardly all of the rays from the lamp, as indicated in Figs. 4 and 5. According to the invention the container 31, if exposed to untreated air, is sanitized by having an ultra-violet lamp inserted and operated therein, before sanitized caps are entered.

In operation it will be understood that the bottle caps, and particularly the interiors and the outer side walls thereof, will be sanitized by the action of rays from the lamps 66 as the caps pass thereunder upon the traveling belt 54, and that upon dropping into the container 31 the caps are protected from contamination by air borne bacteria by reason of the bactericidal action of rays from the lamp 67 upon air in the zone adjacent the container 31. When the container 31 has been filled to the desired degree with caps 32, it may be covered with a suitably

sanitized closure and be carried to the table 29 adjacent the bottle capping station 33.

It will be understood that if desired, the cap sanitizing apparatus shown in Figs. 4 to 6 inclusive may be disposed adjacent the lehr, instead of remote therefrom as in the embodiment herein specifically illustrated, so as to deliver the sanitized caps directly to the zone beneath the lamps 45 or 48, thereby dispensing with need for transporting the container 31.

When a bottle sanitized as herein described is placed into use, the invention contemplates that the caps be removed under an ultra-violet bactericidal lamp, and that while under such lamp and in an atmosphere protected by ultra-violet rays, the bottle, or other container, be filled or packed and recapped. In the case of a medicine bottle, such a lamp may be disposed upon the druggist's prescription counter adjacent the place of filling so that the bacteria in the atmosphere contacting the bottle and cap, while opened, will be destroyed.

It will be understood further that the apparatus and method herein shown and described is merely illustrative of the preferred embodiments of the inventive principles involved, and that these principles may be otherwise embodied without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. In the processing and capping of glass bottles, the steps of subjecting the bottles in an annealing lehr to a temperature of approximately 1000° F., of lowering the temperature of the bottles to below 180° F. in said lehr by exposing them to a cooling atmosphere, of bactericidally treating with ultra-violet light the atmosphere which contacts the bottles when their temperature is below approximately 180° F., of removing the bottles from the lehr directly into an atmosphere treated bactericidally with ultra-violet light, and of capping said bottles in said atmosphere.

2. In the processing and capping of glass bottles, the steps of subjecting the bottles in a lehr to a temperature above the degree at which bacteria can survive, of lowering the temperature below said degree by exposing the bottles in said lehr to an atmosphere of lower temperature, of bactericidally treating with light rays the zone of said atmosphere which contacts the bottles when their temperature is below said degree, and of capping said bottles while they are in said bactericidally treated zone.

3. In the processing of glass bottles, the steps of subjecting the bottles in an annealing lehr to a temperature of approximately 1000° F., of lowering the temperature of the bottles in the lehr to within approximately 50° F. of room temperature by contact with the atmosphere in said lehr, and of bactericidally treating with light rays the portion of said atmosphere which contacts said bottles when the temperature thereof is below the temperature at which bacteria can survive.

4. In the processing of glass bottles, the steps of passing the bottles through an annealing lehr, of heating the bottles in the entrance end of the lehr to a high temperature, of allowing the bottles to cool in the lehr, the cooling of the bottles to a temperature below approximately 180° F. being effected in the discharge end of the lehr, of introducing air into said discharge end of the lehr to effect the cooling of bottles therein, and of treating said air with bactericidal light rays before its introduction into the lehr.

5. In the processing and capping of glass bot-

ties, the steps of passing the bottles through an annealing lehr, of heating the bottles in the entrance end of the lehr to a high temperature, of allowing the bottles to cool in the lehr, the cooling of the bottles to a temperature below the maximum at which bacteria can survive being effected in the discharge end of the lehr, of introducing air into said discharge end of the lehr to effect the cooling of bottles therein, of treating said air with bactericidal light rays before its introduction into the lehr, of removing the bottles from the lehr directly into a zone of atmosphere subjected to bactericidal light rays, and of closing the bottles with sanitized caps before removing them from said zone.

6. In the processing and capping of glass bottles, the steps of passing the bottles through an annealing lehr, of heating the bottles in the entrance end of the lehr to a high temperature, of allowing the bottles to cool in the lehr, the cooling of the bottles to a temperature below the maximum at which bacteria can survive being effected in the discharge end of the lehr, of introducing air into said discharge end of the lehr to effect the cooling of bottles therein, of treating said air with bactericidal light rays before its introduction into the lehr, of removing the bottles from the lehr directly into a zone of atmosphere subjected to bactericidal light rays, of treating caps for the bottles to bactericidal light rays, and of applying the treated caps to the bottles before removing the latter from said zone of atmosphere subjected to the bactericidal light rays.

7. Apparatus for treating bottles and the like, comprising an annealing lehr having means for conveying bottles therethrough, a bottle capping table adjacent the bottle discharge opening of the lehr for receiving bottles that have been conveyed therethrough, means for introducing air into the discharge end of the lehr for cooling bottles therein, this air introducing means including

means for treating the air passing therethrough to bactericidal light rays, means emitting bactericidal light rays in the lehr adjacent the bottle discharge opening, and means adjacent said capping table for treating with bactericidal light rays the atmosphere surrounding bottles from the moment of their discharge from the lehr until their removal from said capping table.

8. In apparatus for treating bottles and like glassware, a chamber having means for conveying the ware therethrough, means adjacent the entrance end portion of the chamber for heating said ware to a temperature at which bacteria cannot survive, means for admitting air to the opposite end portion of the chamber for cooling said ware to a temperature at which bacteria can survive, and means for subjecting said air to bactericidal light rays to eliminate living bacteria from said air and prevent contamination of the ware thereby.

9. In apparatus for treating bottles and like glassware, an annealing lehr having means for conveying the ware therethrough, the ware being discharged through a discharge opening in one end of the lehr, and means comprising lamps for generating light of bactericidal wave length mounted in the lehr adjacent said opening for treating air entering the lehr therethrough.

10. In the processing and filling of glass containers, the steps of subjecting the containers to a temperature above the degree at which bacteria can survive; of lowering the temperature below said degree by exposing the containers to an atmosphere of lower temperature; of bactericidally treating with light rays the zone of said atmosphere which contacts the containers when their temperature is below said degree; of capping said containers while they are in said bactericidally treated zone; and of uncapping, filling and recapping said containers under a bactericidal ultra-violet lamp.

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