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CONTAINER STERILIZING
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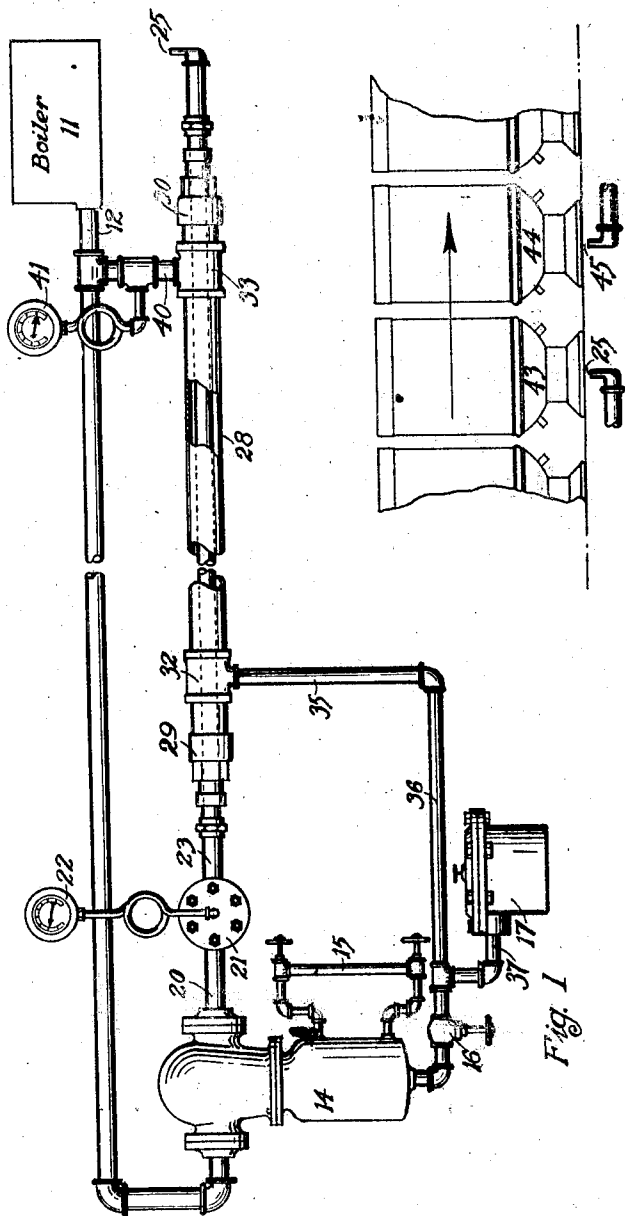


Fig. 1

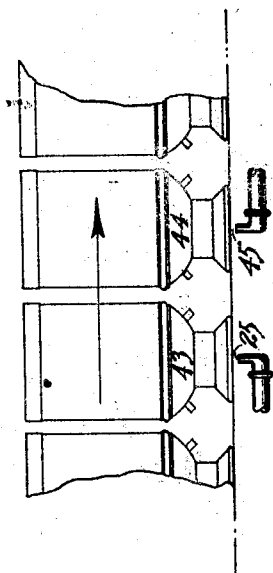


Fig. 3

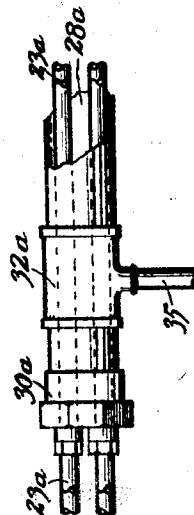


Fig. 2

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CONTAINER STERILIZING.

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This invention relates to the sterilization of containers by means of steam and has for its object the provision of a system for effectively sterilizing such containers as milk cans in a minimum of time and in an economical manner. A further object of the invention is the provision of a system of appliances for conveniently carrying out the process.

Up to the present time there have been two general methods of treating containers, one of which is effective but cumbersome, and the other of which is simple but not sufficiently effective to satisfy the more exacting modern conditions. In the first of these systems the containers are subjected to steam at high temperature in a closed chamber. If the containers are subjected to this treatment for a sufficient time, the containers will be found absolutely sterile, but it is not possible to handle such objects as milk cans through such a system in an economical way and it has therefore been the universal custom to treat milk cans, etc., by the second method, that is, by injecting into the open can a jet of boiler steam which reaches the container walls at atmospheric pressure and never over 212° F.

Bacterial tests of cans treated in this manner show a surprisingly large number of uninjured organisms and tests to determine the reason for this have so far failed to give a clear and logical explanation. The metal walls of the vessel treated by saturated steam do not become more than moderately heated by the treatment and it is noted that a cloud of water vapor rushes from the mouth of the receptacle when so treated, even in states where low humidities are prevalent.

Experiment has also shown that continued heating of the vessel by dry air at a high temperature, say 300° F., for a number of hours does not completely sterilize the container, but it has been found by the use of the apparatus illustrated in the present application, that, if the pressure of the steam is lowered to a small figure, say 10 pounds gage pressure, and this steam is superheated to approximately the temperature at boiler pressure, say 300° F., and this low pressure superheated steam is injected into a can or similar container, the temperature of the can itself rises almost to the temperature of the low pressure steam and that little or no condensed steam can be

seen issuing from the mouth of the inverted vessel.

It would thus seem that a very much greater percentage of the heat units of the steam are delivered to the walls of the container when using superheated steam than when using saturated steam. When the containers are treated with low pressure superheated steam followed by a blast of air, the containers are found to be absolutely dry and as sterile as if treated by the first method, i. e., sterilized in a closed chamber at high pressure and temperature.

A convenient system of apparatus for carrying out the process of sterilizing and drying containers is shown in the drawings, in which,—

Figure 1 is a somewhat diagrammatic view of the apparatus.

Fig. 2 is an elevation of a modified form of the interchange piping.

Fig. 3 is a diagrammatic view showing the cans in the process of sterilizing and drying.

The boiler diagrammatically represented by the rectangle 11 delivers steam to pipe 12 at boiler pressure and temperature, pipe 12 discharging into a standard steam separator 14 having the usual gage glass 15 and discharging through a manually operated gate valve 16 to a steam trap 17 also of well known and standard type. Pipe 20 leads the steam from the separator to a pressure regulator 21 supplied with a recorder 22 in order that the pressure of the steam in the pipe 23 may be kept at the desired figure, 10 pounds gage pressure having been found in practice to give efficient sterilization.

The pipe 23 leads direct to the jets 25 passing through an interchange pipe 28 having end caps 29 and 30 and for ease of installation and repair may be provided with a plurality of T's 32 and 33 the former communicating through pipes 35, 36 and 37 with the steam trap 17. The T 33 communicates with the pipe 40 leading from the boiler pipe 12 and carrying a recording gage 41 similar to the gage 22.

In the modified form shown in Figure 2 the end caps 30 are replaced by caps 30^a so as to permit the use of a plurality of low pressure steam conveying pipes numbered 23^a and being similar in general with the single pipe 23, each of the four pipes 23^a leading to respective nozzles 25. The interchange pipe 28^a and the T 32^a will of course be of larger size than the corresponding ele-

ments in Figure 1 but the operation is exactly similar in the two systems, the advantage of the modified form being quicker handling of the containers due to the use of a plurality of steam nozzles.

Figure 3 shows very diagrammatically the method of handling the cans. The containers, such for example as the metallic cans 43 and 44, are advanced preferably step by step in a conveyor of any desired type (not shown) dwelling at one step over a steam jet 25 and dwelling at the next step of the conveyor over an air nozzle 45 injecting air which may or may not be heated and which may be dehydrated if so desired. The function of this air is to remove the steam present in the container and which might condense therein if the can were allowed to cool before removal of the steam. It is my belief that the great superiority of this system over that of systems using saturated steam is due to the fact that in the older systems an appreciable amount of steam escapes from the container as vapor, whereas the low pressure superheated steam gives up a very large proportion of its superheat to the wall of the container, heating the latter to a point above 212° F., thus preventing condensation of the steam to more than the slight amount necessary for most efficient sterilization. It is believed that in using the high pressure saturated steam the steam expands so rapidly and lowers its temperature so quickly that the walls of the container are not permitted to absorb heat sufficient to heat such walls to even the temperature of boiling water. Cans treated with saturated steam do, of course, get hot, but the temperature reached by the containers is only about 120° to 150° F., as a general rule, and in no case reaches a temperature over 212° F., as contemplated by the present invention.

As has hereinbefore been stated it seems that a larger quantity of heat units is transferred to the walls of the container when using superheated steam than when using saturated steam and in view of the fact that in actual practice it has been found that the containers are cleansed, as well as sterilized, after having been treated according to the present process, it is also my belief that the application of this increased number of heat units is such as to raise the temperature of the container walls to a degree capable of liquefying fatty matter that is ordinarily found upon the walls of containers treated with saturated steam. Where saturated steam has been used for sterilizing

an alkali is necessary for removing the residue of fatty matter from the walls of the container, but with the present process the temperature of the container walls apparently reaches a point where liquefaction of this fatty matter takes place so that such matter is removed from the container during the treatment thereof. The present method, therefore, is quite advantageous in that the single treatment of the containers effects a sterilization as well as a cleansing thereof, the use of an alkali for the removal of the fatty matter being totally eliminated.

What I claim is:

1. The art of sterilizing and drying containers, which consists in discharging superheated steam into said containers, and afterwards discharging air into said container while same is still hot.
2. The art of sterilizing and drying containers, which consists in discharging into said containers superheated steam at low pressure and in discharging air into said container while said container is still hot.
3. The art of sterilizing containers which consists in discharging into said containers steam at a pressure, but slightly greater than atmospheric pressure and at a temperature in excess of that of saturated steam at such pressure.
4. The art of sterilizing and drying containers which consists in intermittently moving a series of containers first past a jet of superheated steam and then past a jet of air to drive said steam from said container.
5. The art of sterilizing and drying containers which consists in intermittently moving a series of containers first past a jet of low pressure superheated steam and then past a jet of air to drive said steam from said container.
6. The art of sterilizing and drying containers which consists in discharging superheated steam into said containers at such a rate of flow as to heat the containers to a temperature of at least 212° F.
7. The art of sterilizing containers which consists in removing the moisture from steam at boiler pressure and temperature, reducing the pressure of said steam, reheating said reduced pressure steam to approximately its original temperature and in discharging said reheated low pressure steam into a container to be sterilized.
8. The art of treating containers which consists in discharging superheated low-pressure steam into said containers.

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