C. H. LOEW.

PROCESS OF PASTEURIZATION.

APPLICATION FILED DEC. 8, 1909.

1,004,885.

Patented Oct. 3, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

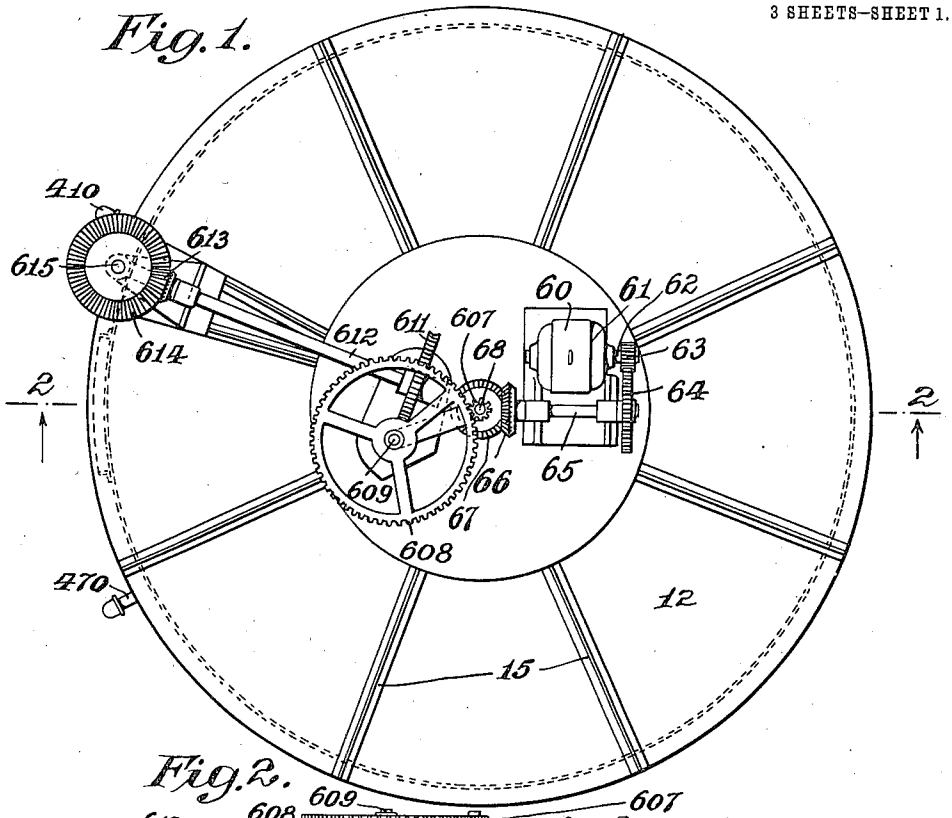

Fig. 2.

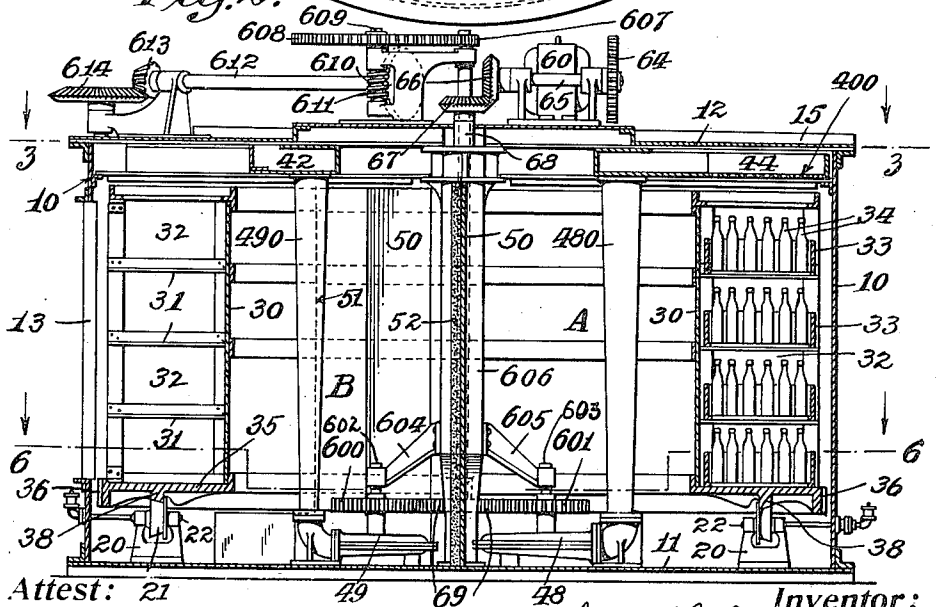

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Fig. 3.

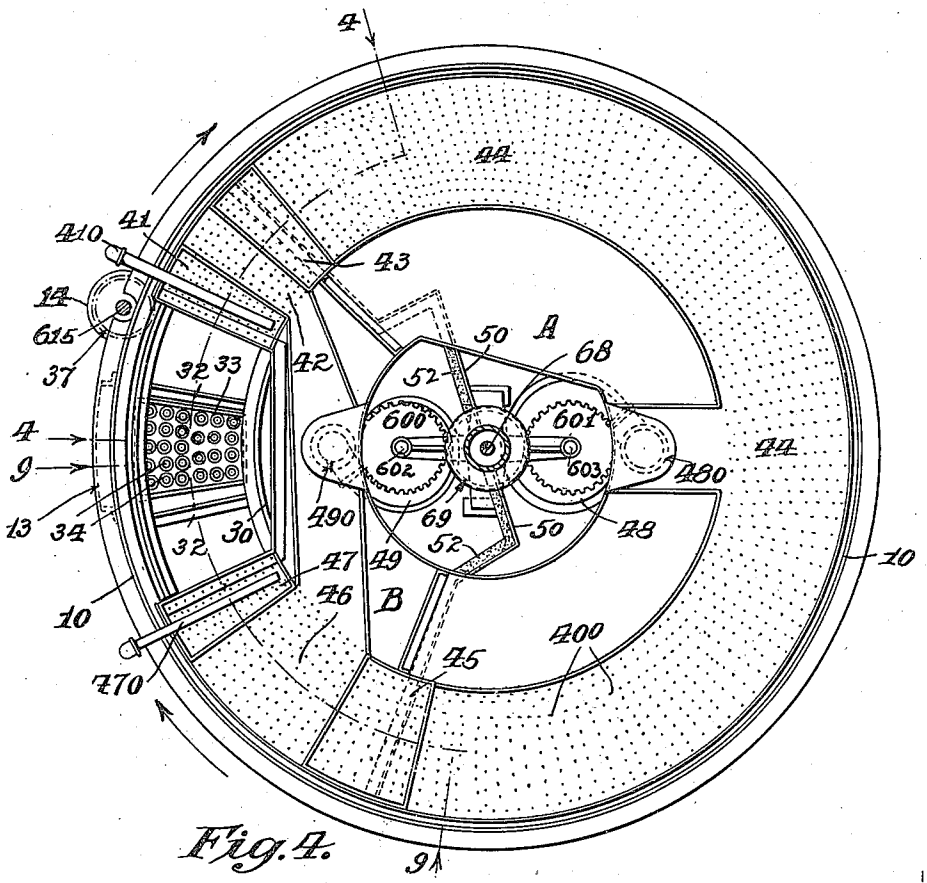


Fig. 4.

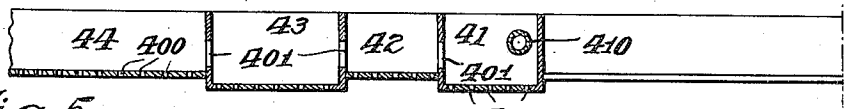


Fig. 5.

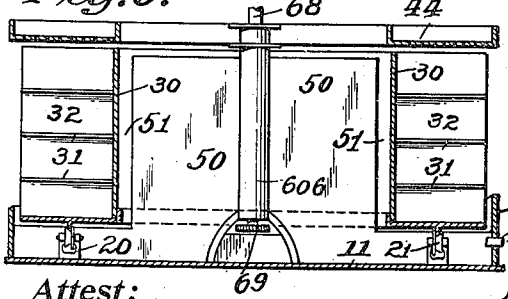
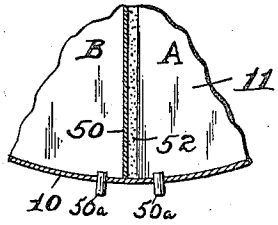


Fig. 5*.



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3 SHEETS—SHEET 3.

Fig. 6.

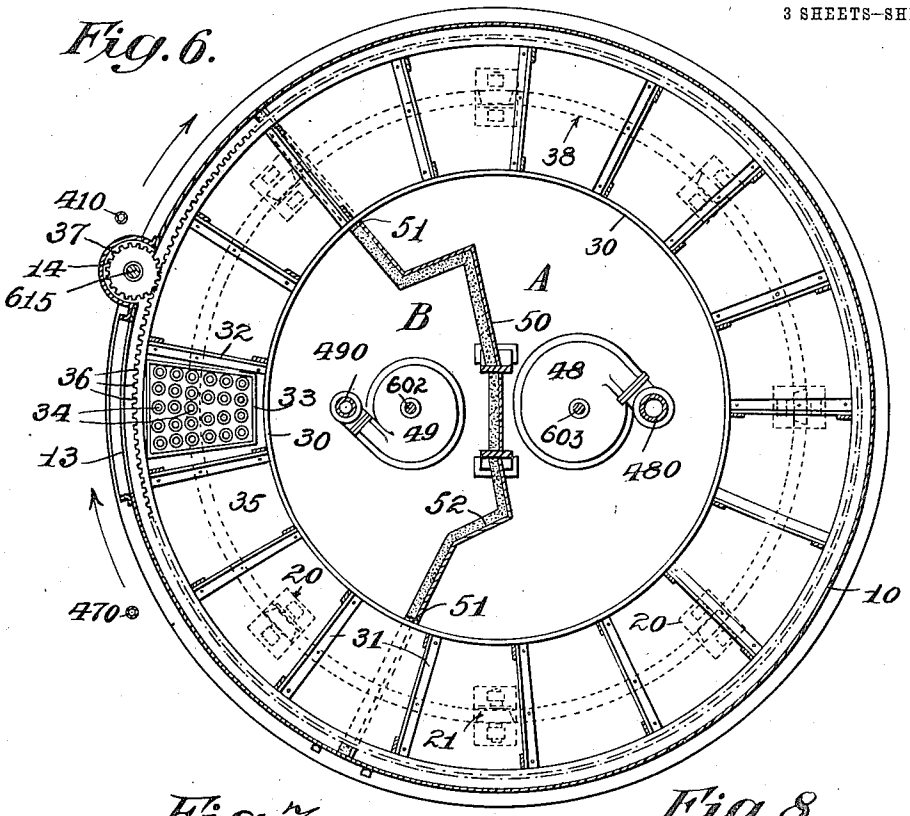


Fig. 7.

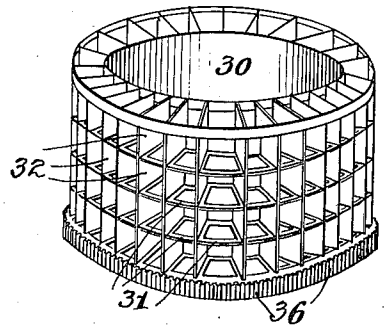


Fig. 8.

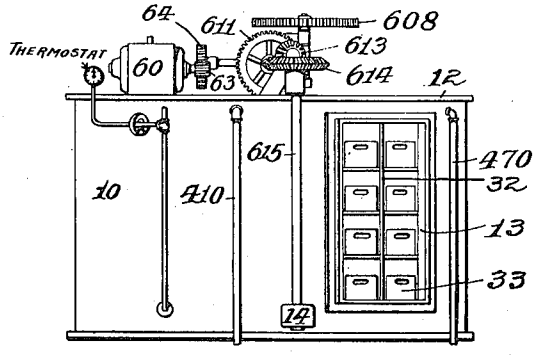
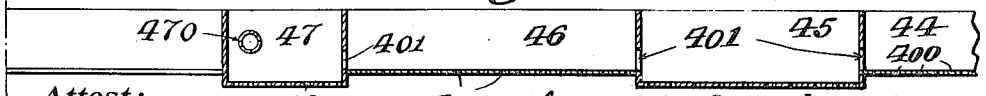


Fig. 9.



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UNITED STATES PATENT OFFICE.

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PROCESS OF PASTEURIZATION.

1,004,885. Specification of Letters Patent. Patented Oct. 3, 1911.

Application filed December 8, 1909. Serial No. 532,092.

To all whom it may concern:

Be it known that I, CHARLES H. LOEW, a citizen of the United States, and resident of Lakewood, Cuyahoga county, Ohio, have invented certain new and useful Improvements in Improved Processes of Pasteurization, of which the following is a specification.

This invention relates to a process of pasteurizing beer and similar materials contained in bottles or the like and its novelty consists in the several successive steps employed in carrying out the process.

There are to be found in the art apparatus whereby bottles are placed on endless carriers and conveyed through bodies of heated water to effect cooking or pasteurizing, and yet other apparatus in which the bottles remain at rest inside of a shell or casing and are subjected to baths of water of proper temperatures for the same purpose. Both of these systems have their advocates and critics. By the system first named, if baths of varying temperatures are employed (and they usually must be employed) the bottles were of necessity lifted from one bath to another and being subjected thus to changes of temperature were apt to break or crack. Usually in carrying out such system the bottles were likewise subjected to lateral movement or even inversion and their gaseous contents were disturbed thereby and conditions frequently resulted under which the bottles burst. This system had the one advantage that it could be made continuous and that unpasteurized bottles could be delivered at one end of the conveyer and removed at the other simultaneously, or that both deliveries and removals could take place at the same end of the apparatus. By the second system the bottles of beer remained stationary during the process, but the temperature of the water was varied to first effect pasteurization and then cool the bottles gradually after this took place. It was difficult at times to properly regulate the temperature without expensive and trained supervision, but the principal objection to the plan resided in the fact that the process was not continuous. Before treatment the bottles had to be placed in the apparatus and after treatment they had to be removed therefrom and different lots could not be at different stages of treatment simultaneously.

By the invention presently to be described, I have I believe eliminated all of the disadvantages and secured all of the advantages of both systems. In brief, I place the bottles in a carrier which is horizontally movable only. They are in an upright position and remain so during the operation. I move the carrier slowly so that the contents of the bottle are no more subject to disturbance thereby than would be the case if the bottles were completely at rest. This carrier is enclosed in a casing to exclude the outer air and it is provided with means whereby successive sprays of water are caused to descend upon the bottles in the carrier and completely surround and envelop them so that the beer in the bottles and the bottles themselves quickly acquire the temperature of each successive spray. These temperatures however I vary. They progressively increase to a pasteurizing point as the carrier travels and progressively decrease to the initial temperature as it continues to progress while at the same time it travels under the influence of the pasteurizing spray long enough to effect the thorough and proper treatment of the beer in the bottles. I also introduce some economies. I use the hot water over and over again and I use part of the preheating and cooling water over again. The chief advantage is, however, that the process is continuous. One workman can both deliver and remove the bottles and while some are at one stage of the operation others are at the other stages and much time, labor, energy and money are thus saved.

In carrying out the process I preferably use an apparatus for which an application for U. S. Letters Patent was filed Dec. 30, 1909, and bears Serial Number 535,700; but it will be understood that the process is quite independent of the apparatus in which it may be carried out and that any apparatus in which the beer can be maintained in the same condition and position and subjected to the same successive series of operations may be used with the same result.

In the drawings Figure 1 is a top plan view of an apparatus embodying the invention; Fig. 2 is a partial vertical section on the plane of the line 2—2 in Fig. 1 and an elevation of the parts back of the section plane; Fig. 3 is a plan view of the parts beneath the plane 3—3 in Fig. 2; Fig. 4 is a vertical circular section through the water pans along the line 4—4 in Fig. 3; Fig. 5 is an elevation of the transverse portion and a verti-

cal section of adjacent parts; Fig. 5* is a horizontal sectional view through the lower portion of the shell below the truck or carrier; Fig. 6 is a horizontal section on the plane of the line 6—6 in Fig. 2 and a plan view of the parts beneath that plane; Fig. 7 is a detail of the revolving carrier on a small scale; Fig. 8 is an elevation of the outside of the apparatus when the parts are assembled and Fig. 9 is a vertical circular section through the pans along the line 9—9 in Fig. 3.

In the drawings 10 is the shell, or outer casing, of the apparatus made preferably of sections of sheet steel secured together in any usual manner and of a generally circular or polygonal outline in cross section. It is provided with a bottom 11 and top 12 so that it has a cylindrical shape and at one side it is provided with a suitable aperture 13 so that access may be had to the revolving truck or carrier which it is adapted to contain. At a convenient place on its outer surface it is provided with an offset chamber indicated at 14 adapted to contain a portion of the power transmitting mechanism as hereinafter described. L-shaped radial ribs 15 serve to stiffen and strengthen the structure.

At suitable intervals along the bottom of the casing and near its vertical shell, are arranged bearings 20 adapted to support rollers 21 provided with shafts 22. The longitudinal axes of the rollers and their shafts are preferably radially arranged with respect to the vertical axes of the shell 10 and the rollers themselves are preferably frusto-conical in shape with their smaller ends pointing inwardly. These rollers are adapted to serve as rolling supports for the revolving truck or carrier on which the beer bottles are placed during the pasteurizing operation.

The revolving truck or carrier comprises an inner cylindrical or polygonal shell 30, divided by horizontal partitions 31 and radially arranged vertical partitions 32 into a series of compartments each one of which is adapted to receive a tray 33 in which are placed the bottles 34 of beer to be treated. The truck or carrier is provided with a horizontal annulus 35 along its lower edge and which annulus is provided with teeth 36 forming a large gear firmly secured to or made integral with such truck. The teeth 36 are adapted to mesh with the teeth of a pinion 37 arranged in the offset chamber 14. Beneath the annulus 35 is a projecting annular rib 38 having its lower edge sloping obliquely inward to engage the frusto-conical surfaces of the rollers 21. This construction prevents the truck from tipping outwardly and serves to keep it in circular adjustment.

The water supply system is arranged immediately beneath the top 12 of the casing 10 and above the revolving truck or carrier. It comprises a series of pans or chambers 41, 42, 43, 44, 45, 46, and 47 arranged in circular succession and suitably secured to the top or sides of the casing in any usual manner. Each pan has a perforated bottom 400 and each pan communicates with the adjacent pan by means of lateral apertures indicated at 401. The pans 41, 43, 45 and 47 are somewhat deeper than the others. The pan 44 is supplied with hot water from a suitable source of supply through a pump indicated at 48 and a pipe 480 leading therefrom to the pan. The pans 41 and 47 are each supplied with cold water through pipes 410 and 470 connected to a source of water supply, for instance the city water mains. A pump indicated at 49 and pipes 490 leading therefrom to the pans 42 and 46 serve to keep the cold water in circulation.

A diaphragm or partition 50 vertically arranged across the casing serves to divide the space within the carrier into two compartments. This partition abruptly drops at 51 when it reaches the inner drum 30 of the carrier and extends radially to the outer casing 10 beneath the plane of movement of the geared annulus 35, so that while it divides the bottom portion of the casing into two chambers, it divides only the portion of the casing inside the carrier into two chambers above the plane of such movement. This partition is of any suitable material preferably of sheet metal, but is provided with a sheathing of asbestos or similar non-conducting material indicated at 52. Referring to Figs. 3 and 4, it will readily be seen that this partition practically divides the apparatus into a chamber A substantially coincident with the circular extent of the hot water pan 44 and into another chamber B smaller than this.

The power transmitting mechanism comprises the following parts: 60 is a motor of any suitable size and construction mounted in a housing 61 on the top of the apparatus. 62 is its main shaft carrying a driving pinion 63 adapted to mesh with a spur gear 64 mounted on a shaft 65 on which is secured a miter gear 66 adapted to mesh with a similar miter gear 67 mounted upon and adapted to rotate a vertical shaft 68 located in suitable bearings in the frame of the apparatus. Near its lower end this shaft 68 carries a pinion 69 which meshes with and drives two pinions one 600 adapted to drive the cold water pump indicated at 49 and the other 601 adapted to drive the hot water pump indicated at 48, the shafts 602 and 603 of these pumps being adapted to rotate in suitable bearings formed in brackets 604 and 605 extending from a framework 606 which surrounds the shaft 68. To the upper end of the shaft 68 is secured a pinion 607 which meshes with and drives a gear 608 the shaft 609 of which is provided with a worm 610

which meshes with a worm gear 611 the shaft 612 of which, through two beveled gears 613 and 614, rotates a shaft 615 arranged outside of the casing 10 and upon the lower end of which is mounted the pinion 37 which meshes with the teeth 36 of the annulus and so rotates the revolving truck or carrier.

The mode of using the apparatus is as follows: The motor 60 is first started to actuate the power transmitting mechanism. This, operating through the described train of mechanism, causes the revolving truck or carrier slowly to revolve on its rollers 21 inside of the casing 10, and actuates the hot and cold water pumps 48 and 49. At the same time cold water is turned into the pipes 410 and 470 from the city mains. The parts are so proportioned that the carrier revolves very slowly, and in practice in the described apparatus it revolves only once an hour. The hot water pump 48 is then connected to the source of hot water supply. Preferably the bottom of the chamber A is used for that purpose water being supplied thereto in suitable quantity and heated by steam supplied through pipes passing into the same. The hot water is by means of the pump 48 delivered to the pan or chamber 44. By means of a thermostat stationed at a suitable place in the current of water the steam delivery can readily be automatically controlled and the water in this pan maintained at any desired temperature. This is a usual expedient in the art and needs no further description. The water in this pan should be kept at above a pasteurizing temperature because it parts with some of its heat rapidly as will presently be described. The cold water is delivered to the pans 41 and 47 by the pipes described. The hot water is delivered to the pan 44. From this latter pan it passes at either end through the apertures 401 to the pans 43 and 45, and when these pans are filled it flows into the pans 42 and 46 where it meets the cold water from the pans 41 and 47. By this arrangement as the bottoms of all the pans are perforated there is a constant spray or series of jets of hot water descending from the pan 44 upon the carrier and consequently upon the bottles which it contains. There is likewise a similar constant spray of relatively cold water descending from the pans 41 and 47, while as the water from both the pan 44 on the one hand and the pans 41 and 47 on the other mingle and mix in the pans 42 and 43 on the one side and 45 and 46 on the other there is a similar constantly descending spray from each of these pans, the water in the pans 42 and 46 being warmer than that in the pans 41 and 47 and the water in the pans 43 and 45 being warmer than that in the pans 42 and 46 and cooler than that in the pan 44. The water from the pans 41, 42 and 43 on the one side and the pans 47, 46 and 45 on the other side of the door 13 collects in the bottom of the compartment B and is raised by the pump 49 and delivered to the pans 42 and 46. As it mingles in the bottom of the tank it is of about the temperature of the water in these pans and it is there delivered in the interests of economy. It will thus be seen that the hot water in compartment A is constantly in circulation, the water in the pan 44 being kept at a substantially uniform temperature and that the colder water in compartment B is constantly in circulation, but that there are three zones of falling water on each side of this compartment, being zones of gradually increasing temperature on the one side and gradually diminishing temperature upon the other side. Proper overflows designated 50^a are provided at the bottom of the casing so that the hot and cold water will not pass over the partition 50 and mingle.

The water supply and circulation system having been established and supposing the carrier to be moved in the direction of the arrows as indicated in Fig. 3, the workman places the bottles of beer in trays 33 completely filling a vertical series of compartments in the carrier. As the carrier slowly revolves he fills the next vertical series and so on. As the carrier revolves it brings this series of compartments first under the pan 41. This is filled with cold water which is descending in a shower. It would usually be somewhere about 70° Fahr. and would have no injurious effect on the bottles which would probably be at a temperature of from 45° to 55° Fahr. By the time the carrier passed completely through this zone of descending water the bottles and the beer within them would be of substantially that same temperature of 70° Fahr. As the carrier continues to revolve it brings the bottles beneath the pan 42 and under the influence of the water descending therefrom which would usually be at a temperature of about 90° Fahr. The carrier still continuing to revolve, the bottles are next brought beneath the pan 43 and subjected to the action of the water descending therefrom at a temperature of 120° Fahr. Then passing out of this zone the bottles are brought beneath the pan 44 from which the water descends at a temperature of about 140° Fahr. and they continue to be subjected to this temperature during the whole time that that portion of the carrier revolves beneath the pan 44. In the described apparatus this takes more than half an hour and the beer is completely and thoroughly pasteurized during this travel. As the carrier continues to revolve the bottles pass successively beneath the pan 45 from which the water descends at a temperature of about 120° Fahr. the pan 46 from which it descends at a temperature of

about 90° Fahr. and the pan 47 from which it descends at a temperature of about 70° Fahr., thus gradually cooling it to the temperature of the outside air or of the bottling house. As the series of vertical compartments containing the pasteurized beer are brought opposite the door 13 the trays 33 with the bottles are removed by the workman who fills the compartments with a fresh lot of bottles to be treated. The horizontal shelves of the carrier on which the trays 33 rest and the trays themselves are perforated so that the falling water coming from the pans above the carrier passes from one shelf and one tray to the one beneath it and the bottles are practically in a body of falling water all of the time that they are under treatment.

What I claim as new is:

1. The method of pasteurizing, which consists in producing a single continuous field of spray, having spaced portions at different temperatures and the portions therebetween being evenly graduated from the temperature of one of said first mentioned portions to that of the other, and causing the material that is to be pasteurized, to traverse said field.

2. The method of pasteurizing, which consists in producing a single continuous field of spray having spaced portions at different temperatures and the portions therebetween graduated from the temperature of one of said first mentioned portions to that of the other, and causing the material that is to be pasteurized, to traverse said field.

3. The method of pasteurizing, which consists in commingling separate streams of liquid that are of different temperatures to produce a body of liquid that varies gradually in temperature between that of the two streams, forming a field of spray from such body, having the same gradual variation in temperature, and causing the material that is to be pasteurized, to pass through said spray.

4. The method of pasteurizing, which consists in commingling an intermediate stream of liquid at a high temperature with two outer streams of liquid at lower temperatures and located on opposite sides of the same, forming a body of liquid having an intermediate high temperature and gradually decreasing in temperature to the two outer streams, converting the said body of liquid throughout its extent into a field of spray, having an evenly graduated temperature, with the end portions of said field substantially the same as the temperature of the two outer streams, the central portion of substantially the same temperature as that of the stream of high temperature and the portions between the same gradually increasing in temperature from the ends to the central portion, and causing the material that is to be pasteurized, to traverse the said field of spray from one of the ends to the other.

Witness my hand this 4th day of December, 1909, at New York, N. Y.

CHARLES H. LOEW.

Witnesses:

DAISY WESTERVELT,

ALAN C. MCDONNELL.